

# Muck Vegetable Cultivar Trial & Research Report 2025

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Office of Research &  
Dept. of Plant Agriculture  
Report No. 75

Ontario Crops  
Research Centre  
Bradford, Ontario

## Research and Cultivar Trial Report for 2025

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**STAFF - 2025**

**UNIVERSITY OF GUELPH  
Ontario Crops Research Centre - Bradford  
Office of Research and  
Department of Plant Agriculture**

**MUCK CROPS RESEARCH STATION****Staff:**

Shawn Janse	Research Station Manager
Mary Ruth McDonald, Ph.D., P.Ag.	Research Scientist
Kevin Vander Kooi	Agricultural Technician
Tyler Blauel	IPM Supervisor / Facility Technician
Julia Scicluna	Agricultural Technician
Afsaneh Sedaghatkish	Post Doctoral Fellow

**IPM Scouts:**

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**Seasonal Contracts:**

Janel Dykstra	Summer Assistant
Kieran Farhall	Summer Assistant
Brooklyn Lloyd	Summer Assistant
Maddi Sandler	Summer Assistant
Madison Sirois	Summer Assistant
James Watt	Summer Assistant

**Graduate Students:**

Ifesinachi Ezeh	Department of Plant Agriculture
Domenic Blass	Department of Plant Agriculture
Kelly Ruigrot	Department of Plant Agriculture
McKenna Campbell	Department of Plant Agriculture

## **CO-OPERATING COMPANIES 2025**

### **CO-OPERATING RESEARCH STAFF - EDUCATION/RESEARCH/GOVERNMENT**

Phil Simon	USDA/ARS, Madison, WI, USA
Dennis Van Dyk	Ontario Ministry of Agriculture, Food and Agribusiness, Guelph, ON, Canada
Kristen Obeid	Ontario Ministry of Agriculture, Food and Agribusiness, Harrow, ON, Canada

### **CO-OPERATING RESEARCH STAFF - INDUSTRY/PRIVATE SECTOR**

Matt Sheppard	Bradford Cooperative Storage Ltd, Bradford, ON, Canada
Alan Butterfield	California Fresh Carrot Advisory Board, Dinuba, CA, USA
Dan Brotslaw	California Garlic & Onion Research Advisory Board, Clovis, CA, USA
Norm Charbonneau	Fresh Vegetable Growers of Ontario, Ridgetown, ON, Canada
Marinda DeGier	Syngenta Canada Inc., Plattsville, ON, Canada
Chuck Baresich	Haggerty Creek Ltd, Bothwell, ON, Canada
Jason Gharibo	Haggerty Creek Ltd, Bothwell, ON, Canada
Cheryl Trueman	Syngenta Canada Inc., Guelph, ON, Canada
Sherri Tedford	Bayer Crop Science, ON, Canada
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Xavier Hebert-Couturier	Picketa Systems Inc, Fredricton, NB, Canada
Wesley Cook	Belchim Canada, Guelph, ON, Canada
Carol McLennan	BASF Canada Inc., Saskatoon, SK, Canada
David Tao	BH Frontier Solutions Inc., Markham, ON, Canada

**SEED SOURCES - 2025 - CULTIVAR TRIALS**

- Bejo **Bejo Seeds Inc.**, 1088 Healey Road, Geneva, New York, 14456, U.S.A.  
Tel: (308) 789-4155
- CF **Clifton Seed Company**, P.O. Box 206, Faison, North Carolina, 28341, U.S.A.  
Tel: (800) 231-9359
- Cro **Crookham Company**, P.O. Box 520, Caldwell, Idaho, 83606, U.S.A.  
Tel: (208) 459-7451
- EZ **Enza Zaden**, 360 St Patrice, Sherrington, Quebec, J0L 2N0, Canada  
Tel: (518) 390-2837
- ILL **Illinois Foundation Seeds Inc**, 1083 County Road 900N, Tolono, IL, 61880, U.S.A.  
Tel: (217) 485-6260
- Nor **Norseco**, 2914 Boul. Cure-Labelle, Laval, Quebec, H7P 5R9, Canada  
Tel: (514) 332-2275
- RZ **Rijk Zwaan**, 701 La Guardia Street, Suite A, Salinas, California, 93905, U.S.A.  
Tel: (831) 455-3000
- Sem **Seminis Vegetable Seeds**, 2700 Camino Del Sol, Oxnard, California, 93030, U.S.A.  
Tel: (866) 334-1056
- SN **Seminova**, 20 rue de l'Industrie, C.P. 3640, St-Remi, Quebec, J0L 2N0, Canada  
Tel: (450) 454-5155
- Sto **Stokes Seed Ltd.**, 296 Collier Rd, Box 10, Thorold, Ontario, L2V 5E9, Canada  
Tel: (800) 396-9238
- Tak **American Takii Inc.**, 301 Natividad Rd., Salinas, California, 93906, U.S.A.  
Tel: (408) 443-4901
- Vil **Vilmorin Inc.**, 2551 N Dragoon Street # 131, Tucson, Arizona, 85745, U.S.A.  
Tel: (520) 884-0011

**We would like to thank our seed suppliers for the various  
cultivar trial submissions in 2025.**

## LEGEND OF SEED SOURCES

Bejo	Bejo Seeds Inc.	RZ	Rijk Zwaan Export B.V.
BCSVS	Bayer Crop Science Vegetable Seeds	Sak	Sakata Seed America Inc.
CF	Clifton Seed Company	Sem	Seminis Vegetable Seeds
Cro	Crookham Company	Sieg	Siegers Seed Co.
EZ	Enza Zaden	Sol	Solar Seed Co.
Haz	Hazera Seeds Inc	Sto	Stokes Seeds Ltd.
HM	Harris Moran Seeds	SN	Seminova
ILL	Illinois Foundation Seeds	Swy	Seedway Inc.
Pure	Pure Line Seeds	Toz	Tozer Seeds America
Nor	Norseco Inc.	Tak	American Takii Inc.
Rog	Rogers Seed	UNF	Co-op Uniforce
		Vil	Vilmorin Inc.

## INTRODUCTION AND ACKNOWLEDGMENTS

The Ontario Crops Research Centre – Bradford Station, as part of the Department of Plant Agriculture and the Office of Research, University of Guelph, is responsible for conducting and coordinating research projects to solve problems in the production of vegetables grown in organic soils.

In 2025, Muck Crops Research Station staff conducted, and/or co-operated on research projects with researchers from the Department of Plant Agriculture at the University of Guelph; researchers from OMAFRA, Agriculture and Agri-Food Canada, the USDA, and Cornell University; research departments of the Crop Protection Chemical Industry, numerous seed companies, growers' organizations and growers.

This report consists of two sections: the first contains highlights of research projects which were conducted in 2025 under the supervision of Professor Mary Ruth McDonald and other researchers at the University of Guelph. The second section contains highlights of various muck crops cultivar evaluations in 2025 in-field and storage trials, under the supervision of the Research Station Manager, Shawn Janse. The results published in this report should be treated as a progress report. Some of the chemicals used in the trials are not registered for use on the crops they were applied to. Additional trials may be necessary before firm conclusions and recommendations can be made.

The Muck Crops Research Station is an active participant in the training of new researchers on muck vegetables through the Graduate Student Program of the University of Guelph. Presently the Muck Crops Research Station has five M.Sc. and one Ph.D. graduate students working on muck vegetables.

The Muck Crops Research Station continues to conduct research to assist in the future registration of chemicals for muck vegetables. Recently, research programs have aided in the registration of Chateau herbicide for onions (Dr. Clarence Swanton) and the registration of Delegate and Movento for thrips on onions and Evergol Prime (penflufen) for onion smut (Dr. Mary Ruth McDonald). While not a common muck vegetable, research also supported the registration of Velum Prime (fluopyram) for the control of stem and blub nematode on garlic.

We would like to take this opportunity to express our sincere appreciation to the staff for their efforts in conducting these research projects, cultivar evaluation trials and producing this report. Many thanks also to all the co-operating researchers, technicians, industry personnel, and growers for their continued support and interest in muck crops.

Mary Ruth McDonald, Ph.D., P.Ag.  
Professor  
Department of Plant Agriculture

Shawn Janse  
Research Station Manager  
Office of Research



# **Weather Data 2025**



## PRECIPITATION

Month	2015		2016		2017		2018		2019		2020	
	Rain mm	Snow cm	Rain mm	Snow cm	Rain mm	Snow cm	Rain mm	Snow cm	Rain mm	Snow cm	Rain mm	Snow cm
January	0	15	23	2	61	14	34	25	14	52	84	24
February	0	32	29	12	28	23	28	32	14	43	0	44
March	10	5	80	30	54	8	21	14	39	17	42	5
April	48	0	22	18	87	12	117	12	89	0	30	0
May	40	0	45	0	120	0	82	0	77	0	38	3
June	171	0	39	0	209	0	59	0	100	0	77	0
July	36	0	51	0	74	0	104	0	93	0	58	0
August	79	0	58	0	53	0	109	0	80	0	140	0
September	27	0	25	0	38	0	20	0	61	0	65	0
October	54	0	41	0	99	0	69	0	74	0	61	0
November	40	0	40	5	22	11	63	31	27	31	27	22
December	39	3	20	65	2	32	44	10	44	40	29	39
<b>Annual</b>	<b>544</b>	<b>55</b>	<b>473</b>	<b>132</b>	<b>847</b>	<b>100</b>	<b>750</b>	<b>124</b>	<b>712</b>	<b>183</b>	<b>651</b>	<b>137</b>
<b>Total Precip.</b>	<b>599</b>		<b>605</b>		<b>947</b>		<b>874</b>		<b>895</b>		<b>788</b>	

LTA = Long Term Average for U of Guelph, Dept. of Plant Agriculture - Kettleby  
1125 Woodchoppers Lane, King, ON, L7B 0E9 51 Years (1975-2025)

**PRECIPITATION**

Month	2021		2022		2023		2024		2025		LTA	
	Rain mm	Snow cm	Rain mm	Snow cm	Rain mm	Snow cm	Rain mm	Snow cm	Rain mm	Snow cm	Rain mm	Snow cm
January	4	22	1	46	38	33	69	32	9	22	22	28
February	5	44	25	41	45	24	18	9	7	81	19	28
March	34	3	21	21	17	35	32	20	90	2	32	14
April	44	4	44	5	28	0	128	0	70	2	57	4
May	22	0	50	0	52	0	83	0	112	0	72	0
June	56	0	90	0	82	0	79	0	46	0	80	0
July	105	0	74	0	113	0	85	0	84	0	85	0
August	41	0	82	0	61	0	54	0	55	0	78	0
September	173	0	43	0	4	0	21	0	82	0	77	0
October	77	0	30	0	35	0	20	0	46	0	66	1
November	24	13	43	10	42	2	38	0	26	17	49	10
December	36	21	43	12	52	15	39	34	42	19	28	28
<b>Annual</b>	<b>621</b>	<b>107</b>	<b>546</b>	<b>135</b>	<b>569</b>	<b>109</b>	<b>666</b>	<b>95</b>	<b>669</b>	<b>143</b>	<b>666</b>	<b>112</b>
<b>Total Precip.</b>	<b>728</b>		<b>681</b>		<b>678</b>		<b>761</b>		<b>812</b>		<b>778</b>	

LTA = Long Term Average for U of Guelph, Dept. of Plant Agriculture - Kettleby  
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## MEAN TEMPERATURE (°C)

Month	2015		2016		2017		2018		2019		2020	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
January	-3.2	-13.1	0.4	-7.8	0.8	-5.2	3.3	-3.2	-3.7	-12.3	0.9	-6.5
February	-8.2	-19.8	1.9	-8.3	3.7	-5.0	1.7	-7.7	-0.4	-9.9	-0.1	-8.3
March	2.7	-7.4	6.6	-2.8	3.4	-5.0	2.9	-4.5	2.8	-6.0	6.6	-1.6
April	13.0	0.8	10.3	-1.7	14.4	3.4	7.0	-1.9	5.8	1.3	10.0	0.0
May	23.5	8.3	21.2	6.3	17.3	7.2	23.4	9.0	16.5	6.3	17.4	5.7
June	23.8	11.8	26.2	11.1	24.1	12.8	25.1	12.2	23.5	11.6	26.4	12.0
July	28.1	13.3	28.8	15.3	26.4	14.9	28.4	15.0	29.3	15.4	29.6	16.9
August	25.7	13.2	29.6	15.5	25.2	12.6	27.8	16.9	26.3	12.4	26.8	14.3
September	25.9	12.1	24.8	10.0	25.0	9.6	23.7	11.3	21.6	9.6	21.3	8.7
October	14.6	3.9	15.9	5.9	17.2	5.8	12.2	3.8	14.8	4.3	12.6	3.6
November	10.8	0.6	11.5	0.9	7.3	-1.8	3.3	-3.2	4.0	-3.9	10.7	1.5
December	6.9	-0.1	1.3	-5.8	-2.0	-11.6	1.7	-4.3	2.2	-6.7	1.7	-4.0
<b>Mean</b>	<b>13.6</b>	<b>2.0</b>	<b>14.9</b>	<b>3.2</b>	<b>13.6</b>	<b>3.1</b>	<b>13.4</b>	<b>3.6</b>	<b>11.9</b>	<b>1.8</b>	<b>13.7</b>	<b>3.5</b>

LTA = Long Term Average for U of Guelph, Dept. of Plant Agriculture - Kettleby  
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**MEAN TEMPERATURE (°C)**

Month	2021		2022		2023		2024		2025		LTA	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
January	-0.5	-6.9	-4.1	-16.0	1.0	-3.6	-0.9	-5.4	-2.8	-10.1	-2.2	-10.5
February	-1.6	-11.6	-0.5	-10.5	1.8	-7.9	3.7	-5.0	-1.8	-11.0	-1.0	-10.3
March	8.7	-3.7	4.3	-3.4	4.3	-4.8	7.2	-1.4	7.0	-3.4	3.7	-5.2
April	12.6	2.3	11.0	1.0	15.1	2.6	12.7	3.0	12.4	1.0	11.4	1.1
May	19.9	5.2	22.1	8.0	20.5	4.1	21.4	9.4	18.7	6.6	19.3	6.8
June	27.0	15.2	25.7	10.8	24.4	11.8	24.7	13.7	26.3	13.6	24.3	11.7
July	25.2	14.2	27.7	12.6	26.8	15.0	28.0	14.6	29.3	15.8	26.9	14.2
August	28.9	15.5	27.3	13.9	24.7	13.1	26.2	12.9	26.5	12.5	25.7	13.1
September	22.1	9.5	22.3	10.7	26.9	9.5	24.9	10.2	24.0	9.2	21.6	9.2
October	16.8	8.7	16.9	2.1	16.0	7.0	18.0	3.1	16.3	3.5	14.1	3.9
November	7.5	-1.6	9.8	-0.1	6.9	-1.7	9.5	0.8	6.2	-1.0	6.9	-0.9
December	3.8	-3.0	1.7	-4.7	4.0	-0.6	1.3	-5.0	-0.6	-9.7	0.6	-6.4
<b>Mean</b>	<b>14.2</b>	<b>3.7</b>	<b>13.7</b>	<b>2.0</b>	<b>14.4</b>	<b>3.7</b>	<b>14.7</b>	<b>4.2</b>	<b>13.5</b>	<b>2.3</b>	<b>12.6</b>	<b>2.2</b>

LTA = Long Term Average for U of Guelph, Dept. of Plant Agriculture - Kettleby  
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## EXTREME TEMPERATURE (°C)

Month	2015		2016		2017		2018		2019		2020	
	H	L	H	L	H	L	H	L	H	L	H	L
January	5.3	-21.4	10.3	-19	7.2	-16.8	11.4	-28.6	6.6	-23.5	10.5	-24.1
February	-1.8	-30.8	15.4	-28.8	16.7	-14.8	14.7	-21.7	11.2	-23.4	8.9	-25.4
March	12.9	-26.3	18.5	-14.7	14.8	-17.3	10.3	-11.7	11.6	-18.7	17.4	-18.7
April	22.7	-5.1	26.2	-15.3	26.6	-1.6	18.8	-8.3	14.4	-6.4	17.2	-5.6
May	30.8	-1.2	33.2	-1.6	31.5	1.1	30.6	-1.0	24.2	-0.3	33.3	-5.4
June	29.1	4.1	34.2	3.1	32.6	4.5	33.2	5.9	31.4	2.8	33.6	3.6
July	34.2	7.2	35.1	8.4	30.8	10.5	35.3	8.6	34	9.3	35.1	11.5
August	32.8	6.9	34.8	9.8	30.4	5.3	33.1	10.9	30.8	6.8	32.3	8.0
September	34.1	4.3	34.2	1.2	34.6	1.1	33.4	1.9	29.9	1.0	28.0	-1.3
October	23.9	-3.1	25.8	-3.5	26.0	-1.6	28.7	-3.3	27.2	-2.4	24.4	-6.1
November	22.1	-6.8	19.1	-6.5	22.6	-14.4	14.5	-25.3	11.5	-19.1	24.0	-7.4
December	15.4	-8.1	9.1	-15.9	12.1	-29.0	11.0	-12.4	8.9	-21.6	8.6	-13.1
<b>Annual High &amp; Low</b>	<b>34.2</b>	<b>-30.8</b>	<b>35.1</b>	<b>-28.8</b>	<b>34.6</b>	<b>-29.0</b>	<b>35.3</b>	<b>-28.6</b>	<b>31.4</b>	<b>-23.5</b>	<b>35.1</b>	<b>-25.4</b>

Extreme Temperatures for U of Guelph, Dept. of Plant Agriculture - Kettleby  
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**EXTREME TEMPERATURE (°C)**

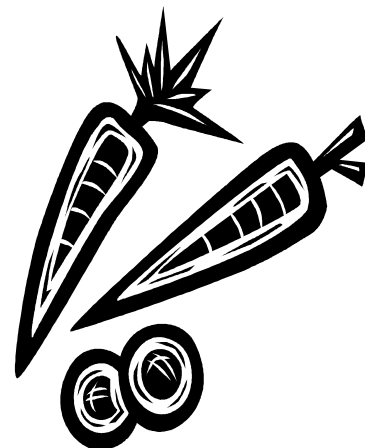
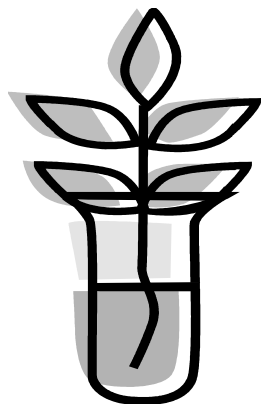
Month	2021		2022		2023		2024		2025		EXTREME TEMPERATURES	
	H	L	H	L	H	L	H	L	H	L	H	Year L Year
January	7.3	-22.3	3.7	-28.4	4.1	-18.5	5.1	-17.3	2.2	-20.3	15.8	2005 2005 -36.0 1977
February	6.4	-24.9	9.3	-19.9	13.0	-27.4	15.0	-18.3	6.5	-25.3	16.7	2017 2017 -33.0 1979
March	21.0	-15.8	19.2	-12.2	11.9	-16.0	18.0	-11.5	20.8	-20.6	26.4	2012 2012 -29.0 1984
April	23.0	-5.5	20.2	-3.9	29.9	-7.7	22.0	-2.9	27.3	-7.4	30.0	1990 1990 -15.3 2016
May	32.2	-0.8	33.7	-0.3	30.5	-3.2	31.0	2.4	30.0	-1.2	34.6	2006 2006 -5.4 2020
June	34.0	4.6	36.1	3.8	31.9	5.5	35.4	6.5	36.3	3.5	36.1	2025 2025 -2.0 1977
July	31.3	7.9	32.9	6.7	33.1	9.6	32.1	9	34.5	7.8	36.3	2011 2011 2.5 1984
August	33.1	7.9	33.6	5.8	29.5	6.6	32.4	7.5	34.4	3.5	36.3	2001 2001 0.5 1982
September	26.7	4.6	31.7	1.5	34.8	1.6	29.7	4.3	27.6	2.9	35.3	2013 2013 -6.5 1991
October	27.0	-0.6	29.2	-3.4	30.6	-3.6	27.4	-4.0	29.3	-5.1	30.6	2023 2023 -9.0 1975
November	19.2	-13.2	24.5	-8	15.8	-9.2	22.6	-6.2	12.7	-5.8	24.5	2022 2022 -25.3 2018
December	16.9	-14.9	11.5	-17.5	12.1	-7.1	10.2	-22.4	7.9	-21.9	20.0	1982 1982 -31.5 1980
<b>Annual High &amp; Low</b>	<b>33.1</b>	<b>-24.9</b>	<b>36.1</b>	<b>-28.4</b>	<b>34.8</b>	<b>-27.4</b>	<b>35.4</b>	<b>-22.4</b>	<b>36.3</b>	<b>-25.3</b>	<b>36.3</b>	<b>-36.0</b>

Extreme Temperatures for U of Guelph, Dept. of Plant Agriculture - Kettleby  
 1125 Woodchoppers Lane, King, ON, L7B 0E9 51 Years (1975-2025)

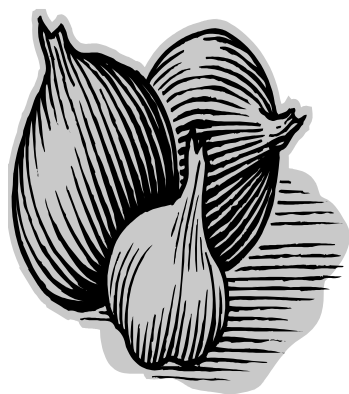
**GROWING DEGREE DAYS (5°C Base)**

<b>Month</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>LTA</b>
January	0	0	1	0	2	0	1	0	0	0	0	0	1
February	0	0	8	8	7	2	0	0	0	3	7	0	1
March	0	1	31	12	0	2	17	41	15	1	23	24	15
April	63	79	56	123	25	19	42	102	62	125	96	92	77
May	271	337	273	220	348	200	220	234	310	226	311	237	245
June	431	390	409	404	410	375	426	483	397	394	427	449	390
July	443	480	528	486	518	535	567	455	470	493	486	544	479
August	438	456	543	431	531	446	483	533	484	432	436	449	445
September	320	419	372	368	375	323	300	324	344	396	376	348	310
October	171	141	188	203	108	142	109	240	141	205	159	161	135
November	30	72	67	20	11	2	80	20	78	19	50	8	33
December	4	22	2	1	2	2	0	10	5	9	1	0	4
<b>Annual</b>	<b>2171</b>	<b>2397</b>	<b>2478</b>	<b>2276</b>	<b>2338</b>	<b>2048</b>	<b>2245</b>	<b>2442</b>	<b>2306</b>	<b>2323</b>	<b>2372</b>	<b>2312</b>	<b>2135</b>

LTA = Long Term Average for U of Guelph, Dept. of Plant Agriculture - Kettleby  
1125 Woodchoppers Lane, King, ON, L7B 0E9 51 Years (1975-2025)



# Research Reports 2025



**CROP:** Carrot (*Daucus carota* subsp. *sativus* (Hoffm.) Arcang.)  
**PEST:** Cavity spot (*Pythium intermedium* de Bary, *Pythium irregulare* Buisman, *Pythium sulcatum* Pratt & Mitchell, *Pythium sylvaticum* W.A. Campbell & J.W. Hendrix, *Pythium ultimum* Trow and *Pythium violae* Chesters & C.J. Hickman) (some of the scientific names have been changed to *Globisporangium*, but the earlier names are used for continuity)

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**TITLE:** **EVALUATION OF CARROT BREEDING LINES FOR SUSCEPTIBILITY TO CAVITY SPOT, 2025**

**MATERIALS:** USDA experimental carrot breeding lines, commercial cultivars Cellobunch, Envy, CV2384 (Seminis Vegetable Seeds), Navedo, Deep Purple, (Bejo Seed Inc.), Maverick, UpperCut (Nunhems USA), Brilliance, Triton (Stokes Seeds), Fortedo (Vilmorin-Mikado), Chantenay (Ontario Seed Company)

**METHODS:** The trial was conducted on organic soil (pH  $\approx$  5.7, organic matter  $\approx$  70.8%) naturally infested with *Pythium* spp. at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario. Carrots were direct seeded ( $\approx$ 70 seeds/m) onto raised beds using a push cone seeder on 2 June. A randomized complete block design with four replicates per treatment was used. Each experimental unit consisted of one row, 6 m in length, spaced 66 cm apart. On 1 August stand was rated on a 0-5 scale where 0 =  $\leq$  9 carrots, 1 = very poor, 2 = poor, 3 = good, 4 = very good, 5 = excellent. On 30 September, plots were visually assessed for: leaf blight, (0-5 scale where 0 = no blight to 5 = leaf/ petiole necrosis), and bolting, (0-3 scale where 3 = more than 50% flowering, 2 = 5 to 49%, 1 =  $<$ 5% and 0 = no flowering). On 4-7 November, 50 carrots from each replicate were harvested and placed into cold storage. Carrots were assessed for cavity spot from 17-24 November. Carrots were washed in a small drum washer, visually examined for cavity spot lesions, and sorted into classes based on the size of the largest lesion. The six classes were: 0 = no disease, 1 = very light ( $<$  1 mm), 2 = light (1-2 mm), 3 = medium (3-5 mm), 4 = heavy (6-10 mm), and 5 = very heavy ( $>$  10 mm). The disease severity index (DSI) was determined using the above classes and the following equation:

$$DSI = \frac{\sum [(class\ no.) (no.\ of\ carrots\ in\ each\ class)]}{(total\ no.\ carrots\ per\ sample) (no.\ classes - 1)} \times 100$$

Data were analyzed using the General Analysis of Variance function of Statistics V.10. Means separation was obtained using Tukey's test with P = 0.05 level of significance. Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C), September (16.6°C) and October (9.9°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C, September 17.0°C and October 9.9°C. Monthly rainfall was below the 10-year average for June (46 mm), August (54 mm) and October (45 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm, September 48 mm and October 58 mm.

**RESULTS:** as presented in Tables 1 and 2.

**CONCLUSIONS:** In 2025, rainfall from August to October was higher than previous years and this contributed to disease development. Overall disease incidence in the trial was higher than previous years. The incidence of cavity spot in cv. Cellobunch was 19.5% in 2025 compared to 15% in 2024. Significant differences in cavity spot incidence were observed among the lines tested, ranging from 0 - 80%. Disease severity was moderate in the trial and ranged from 0 -49. Purple line Deep Purple was highly resistant, as

expected. Lines F7738 and Nbh2306, alone or as parents tended to have the lowest cavity spot. Line F7119 also had very low cavity spot severity. Red carrot R6304 had the highest severity. Overall stand in the trial was lower in 2025 than in previous years. Very little bolting was observed in the trial, only nine carrot lines had carrots with seeders (data not shown).

**Table 1.** Cavity spot incidence and severity index (DSI) and percent forked for carrot breeding lines from the USDA/U of Wisconsin breeding program, grown at the Ontario Crops Research Centre -Bradford, Ontario, 2025.

	Name/Seed source	Pedigree	Incidence (%)	DSI <sup>1</sup>	% Forked
64	Deep Purple		0.0 a <sup>2</sup>	0.0 a	7.1 ab
62	Brillyance		8.2 ab	2.6 ab	1.0 a
10	22'S1380-2	F7738A	12.4 bc	3.3 abc	1.7 a
47	24'B124-2	F7119A	12.7 bc	3.4 abc	1.0 a
9	22'S1380-1	F7738B	13.8 bc	4.3 a-d	3.0 a
46	24'B124-1	F7119B	14.9 bcd	4.8 a-d	0.4 a
29	23'S1361-3	(Nb2159A x U9237) x Nbh2306B	15.8 b-e	7.3 a-f	3.2 a
2	22'B120-1	F7385B	17.2 b-f	7.1 a-e	2.0 a
56	Navedo		17.5 b-g	6.2 a-e	3.0 a
1	21'B123-1	F7738B	17.9 b-g	6.5 a-e	1.0 a
7	22'S1379-1	F7737B	18.0 b-g	6.0 a-e	3.7 a
14	23'B121-1	Nbh2306B	18.4 b-g	4.7 a-d	1.1 a
8	22'S1379-2	F7737A	18.8 b-g	7.5 a-f	3.1
61	Cellobunch		19.5 b-g	7.2 a-f	2.0 a
57	SV 2384		20.5 b-h	6.6 a-e	3.0 a
45	24'B123-2	Y7316A	21.9 b-i	8.8 a-f	1.5 a
27	23'S1361-1	Nbh2306B	22.7 b-j	8.8 a-f	0.0 a
12	23'365-1	F7737B	23.5 b-k	10.3 a-f	1.3 a
48	24'S1380-1	L2575B	24.4 b-k	8.4 a-f	2.4 a
41	24'B121-3	(Nb2159A×Nbh2306B) × U9237	27.1 b-k	9.6 a-f	3.5 a
18	23'B122-4	(Nbh2306A×U7393)×Nb3271	27.4 b-k	9.7 a-f	2.5 a
16	23'B122-1	Nb3271B	28.1 b-l	13.6 a-f	0.7 a
23	23'B124-5	(Nbh2306A×U7393)×F5367	29.2 b-l	11.6 a-f	3.5 a
15	23'B121-2	Nbh2306A	29.4 b-l	9.9 a-f	0.5 a
51	24'S1381-5	(F7737A×F7385B) × Nb9296B	29.6 b-l	14.8 a-g	5.5 a
11	22'S1380-3	(B2144A x F7142B) x F7738B	30.1 b-l	9.3 a-f	2.0 a
28	23'S1361-2	(U8277A x Nb3271B) x Nbh2306B	30.3 b-l	13.1 a-f	1.8 a
21	23'B124-1	F5367B	31.0 b-m	11.6 a-f	2.4 a
44	24'B123-1	Y7316B	31.2 b-m	12.7 a-f	0.0 a
3	22'B120-2	F7385A	32.2 c-m	11.5 a-f	3.5 a
17	23'B122-3	2566A×Nb3271	32.3 c-m	12.9 a-f	1.0 a
63	Chantenay		32.4 c-m	11.5 a-f	6.5 ab
40	24'B121-2	Nb8524A × U9237	32.4 c-m	14.8 a-f	0.5 a
42	24'B121-4	(Nb2159A×F7385B) × U9237	34.1 c-n	14.0 a-f	4.5 a
50	24'S1381-4	(2566A×Nb3271) × Nb9296B	35.8 c-n	13.5 a-f	3.5 a
58	Uppercut		36.2 c-n	15.4 a-g	3.0 a
13	23'365-2	F7737A	36.7 c-o	9.2 a-f	1.7 a
6	22'B121-3	Nbh2306xU7393B	36.7 c-o	14.8 a-g	4.0 a

22	23'B124-3	F5367A	39.2 c-o	15.1 a-g	4.5 a
20	23'B123-3	Nbh2306A×Nb2159	41.1 d-o	15.2 a-g	4.0 a
34	23'S1363-2	L4622A	41.2 d-o	19.1 a-h	3.5 a
65	Envy		42.2 d-o	15.2 a-g	3.0 a
31	23'S1362-1	Nb3271B	43.3 d-o	16.9 a-h	2.0 a
32	24'S1385-1	Y8519B	43.4 d-o	17.1 a-h	2.5 a
30	23'S1361-4	(nNb8524A x F7385B) x Nbh2306B	44.0 d-o	19.0 a-h	2.5 a
39	24'B121-1	U9237	47.0 e-p	24.0 b-i	4.0 a
25	23'K030-3	D2327B	47.8 f-p	21.0 a-i	6.5 ab
5	22'B121-2	U7393A	48.9 f-q	22.2 a-i	5.5 a
33	23'S1363-1	L4622B	49.5 g-q	21.4 a-i	6.0 ab
4	22'B121-1	U7393B	51.8 h-q	26.6 d-j	7.2 ab
19	23'B123-1	Nb2159B	52.6 h-q	23.7 b-i	1.5 a
55	Triton		52.7 i-q	24.6 b-i	2.5 a
24	23'K030-1	D2327A	53.3 i-q	25.8 c- i	12.5 b
60	Fortedo		54.5 j-q	19.5 a-h	0.5 a
36	23'S1364-2	Nb8524A	55.5 k-q	24.1 c-i	3.0 a
43	24'B122-1	R5646B	56.5 k-q	38.9 h-k	1.5 a
59	Maverick		60.0 l-q	27.7 e-k	4.0 a
35	23'S1364-1	Nb8524B	60.2 l-q	29.2 f-k	1.0 a
38	24'B119-2	L9793A	62.9 m-q	27.4 e-k	2.0 a
49	24'S1381-1	Nb9296B	64.7 n-q	36.7 g-k	4.0 a
52	24'S1384-1	R6304	68.5 opq	49.3 k	1.7 a
37	24'B119-1	L9793B	78.9 pq	42.5 ijk	4.0 a
26	23'K208-3	D1131B	80.5 q	49.0 jk	1.5 a

<sup>1</sup> Disease Severity Index (DSI) was determined using the following equation:

$$DSI = \frac{\sum [(class\ no.) (no.\ of\ carrots\ in\ each\ class)]}{(total\ no.\ carrots\ per\ sample) (no.\ classes - 1)} \times 100$$

<sup>2</sup> Numbers in a column followed by the same letter are not significantly different at P= 0.05, Tukey's test

**Table 2.** Stand (1 August) and leaf blight ratings (7 October) of carrot breeding lines from USDA/U of Wisconsin breeding program grown at the Ontario Crops Research Centre -Bradford, Ontario, 2025.

	Name/Seed source	Pedigree	Stand Rating <sup>1</sup>	Leaf Blight Rating <sup>2,3</sup>
57	SV 2384		4.5	1.3
41	24'B121-3	(Nb2159A×Nbh2306B) × U9237	3.8	1.8
61	Cellobunch		3.8	2.3
51	24'S1381-5	(F7737A×F7385B) × Nb9296B	3.5	1.3
64	Deep Purple		3.5	1.5
55	Triton		3.5	1.5
56	Navedo		3.5	1.0
65	Envy		3.5	1.0
24	23'K030-1	D2327A	3.3	1.0
42	24'B121-4	(Nb2159A×F7385B) × U9237	3.3	2.0
49	24'S1381-1	Nb9296B	3.3	1.8
50	24'S1381-4	(2566A×Nb3271) × Nb9296B	3.3	1.3
60	Fortedo		3.3	2.0
6	22'B121-3	Nbh2306xU7393B	3.3	1.3
11	22'S1380-3	(B2144A x F7142B) x F7738B	3.0	2.5
20	23'B123-3	Nbh2306A×Nb2159	3.0	1.0
59	Maverick		3.0	1.0
62	Brillyance		3.0	0.8
3	22'B120-2	F7385A	2.8	3.3
22	23'B124-3	F5367A	2.8	2.3
25	23'K030-3	D2327B	2.8	1.3
26	23'K208-3	D1131B	2.8	2.8
43	24'B122-1	R5646B	2.8	2.8
9	22'S1380-1	F7738B	2.5	3.3
32	24'S1385-1	Y8519B	2.5	2.5
34	23'S1363-2	L4622A	2.5	1.8
35	23'S1364-1	Nb8524B	2.5	0.8
36	23'S1364-2	Nb8524A	2.5	1.5
63	Chantenay		2.5	1.0
15	23'B121-2	Nbh2306A	2.3	1.0
21	23'B124-1	F5367B	2.3	2.5
23	23'B124-5	(Nbh2306A×U7393)×F5367	2.3	1.3
29	23'S1361-3	(Nb2159A x U9237) x Nbh2306B	2.3	1.0
39	24'B121-1	U9237	2.3	1.8
28	23'S1361-2	(U8277A x Nb3271B) x Nbh2306B	2.0	1.0
30	23'S1361-4	(nNb8524A x F7385B) x Nbh2306B	2.0	1.3
31	23'S1362-1	Nb3271B	2.0	1.8
37	24'B119-1	L9793B	2.0	1.0
58	Uppercut		2.0	1.0
1	21'B123-1	F7738B	2.0	2.8
18	23'B122-4	(Nbh2306A×U7393)×Nb3271	2.0	1.0
19	23'B123-1	Nb2159B	2.0	1.0
33	23'S1363-1	L4622B	2.0	1.3
5	22'B121-2	U7393A	1.8	1.3
38	24'B119-2	L9793A	1.8	1.0
40	24'B121-2	Nb8524A × U9237	1.8	1.3
44	24'B123-1	Y7316B	1.8	0.5
45	24'B123-2	Y7316A	1.8	1.3

2	22'B120-1	F7385B	1.5	3.5
10	22'S1380-2	F7738A	1.5	1.3
17	23'B122-3	2566A×Nb3271	1.5	1.0
27	23'S1361-1	Nbh2306B	1.5	1.3
52	24'S1384-1	R6304	1.5	3.0
8	22'S1379-2	F7737A	1.3	2.0
46	24'B124-1	F7119B	1.3	2.5
47	24'B124-2	F7119A	1.3	1.8
48	24'S1380-1	L2575B	1.3	0.8
4	22'B121-1	U7393B	1.0	0.8
7	22'S1379-1	F7737B	1.0	1.5
12	23'365-1	F7737B	1.0	1.8
13	23'365-2	F7737A	1.0	1.0
16	23'B122-1	Nb3271B	1.0	1.0
14	23'B121-1	Nbh2306B	0.8	1.0

<sup>1</sup> Stand (carrot emergence) was rating on 17 July using a 0-5 scale where 0 = <5 carrots, 1 = very poor, 2 = poor, 3 = good, 4 = very good, 5 = excellent.

<sup>2</sup> Leaf blight was rated on a 0-5 scale where 0 = no blight, 1 = 1-10% leaf area blighted, 2 = 11-25% leaf/petiole blighted, 3 = 26-50% leaf/petiole blighted, 4 = >75% leaf/petiole area blighted, 5 = leaf/petiole necrotic.

<sup>3</sup> Leaf blight ratings 2.8 or higher are considered susceptible.

**Funding was provided by the California Fresh Carrot Advisory Board, the Fresh Vegetable Growers of Ontario and the Ontario Agri-Food Innovation Alliance.**



## **Check out the Muck Crops Research Station's Web Page**

<https://bradford-crops.uoguelph.ca/>

### **Grower Field Day & Muck Conference Information**

### **Integrated Pest Management Information**

- IPM Report Updates
- Weather Data
- Insect & Disease Forecasting Data

### **Publications**

- Cultivar Trial Results (1971-2025)
- Research Reports
- Research Documents

**CROP:** Carrot (*Daucus carota* subsp. *sativus* (Hoffm.) Arcang.), cv. Cellobunch

**PESTS:** *Alternaria* leaf blight (*Alternaria dauci* (Kühn) Groves & Skolko)  
*Cercospora* leaf blight (*Cercospora carotae* (Pass.) Solheim))

**AUTHORS:** BLASS D<sup>1</sup>, VANDER KOOI K<sup>2</sup> & MCDONALD MR<sup>1</sup>

<sup>1</sup>University of Guelph, Dept. of Plant Agriculture

<sup>2</sup>University of Guelph, Dept. of Plant Agriculture, Ontario Crops Research Centre  
 - Bradford

**TITLE:** **EFFECTS OF PRE-PLANT NITROGEN AND NITROGEN-FIXING  
 ENDOPHYTIC BACTERIA ON CARROT YIELD AND SUSCEPTIBILITY  
 TO ALTERNARIA AND CERCOSPOA LEAF BLIGHT, 2025**

**MATERIALS:** ENVITA (*Gluconacetobacter diazotrophicus*, 1 x 10<sup>7</sup> CFU/L), UTRISHA-N (3% *Methylobacterium symbioticum* SB23, 3 x 10<sup>7</sup> CFU/g), QUADRIS TOP (azoxystrobin 200g/L, difenoconazole, 125 g/L), CABRIO EG (pyraclostrobin)

**METHODS:** The trial was conducted on mineral soil (pH ≈ 7.7, organic matter ≈ 5.8%) near the Ontario Crops Research Centre - Bradford, Ontario. Carrots, cv. Cellobunch, were direct seeded (82 seeds/m) into raised beds using a Stanhay precision seeder on 11 June. Emergence was uneven across the trial, resulting in reduced and variable plant stands among plots, and no re-seeding was performed. A randomized complete block design with four replicates per treatment was used. Each experimental unit consisted of two beds of four hills, with hills spaced 86 cm apart and 5 m in length. Treatments were: pre-plant nitrogen fertilizer at a rate of 0, 35, and 70 Kg/ha, and pre-plant nitrogen fertilizer with additional treatments: ENVITA™ sprayed as an in-furrow application, and ENVITA™ or Utrisha-N® sprayed as foliar applications. Pre-plant fertilizer was applied as 21-0-0 (AXAN), 0-46-0 (Triple Superphosphate, Holmes Agro), and 0-0-58 (Aspire), with all treatments receiving pre-plant phosphorus and potassium at 100 Kg/ha to meet recommended phosphorus and potassium guidelines for carrot production on mineral soil as outlined in OMAFA publication 839. On 11 June, ENVITA™ was applied at 0.23L/ha in-furrow. On 30 July, ENVITA and UTRISHA-N® were applied at 0.73 L/ha and 333 g/ha, respectively. Both products were applied using a tractor-mounted sprayer fitted with D-3 hollow-cone nozzles at 620 kPa to deliver 500 L/ha. The fungicides QUADRIS TOP and CABRIO were applied on 25 August and 5 September, respectively. QUADRIS TOP was applied at a rate of 1.0 L/ha and CABRIO was applied at 840 g/ha. Both products were applied using a tractor-mounted sprayer fitted with D-3 hollow-cone nozzles at 620 kPa to deliver 500 L/ha.

On 22 August, the youngest fully mature leaf was sampled from 10 carrot plants from the center hills of both beds per experimental unit to confirm the establishment of the applied endophytes and to verify the absence of cross-contamination in non-treated plots. Portions of the sampled leaves were cut and weighed to obtain a 5 g sample for testing endophyte establishment. Leaves were washed in de-ionized water to remove dirt and debris and then surface-sterilized by soaking in 70% ethanol for 2 minutes. Sterilized leaves were then washed

with sterile de-ionized water to remove residual ethanol and then homogenized in sterile 10 mL of PBS solution. The homogenate was then serially diluted ( $10^{-1}$ – $10^{-5}$ ), and 100  $\mu$ L of each dilution was spread onto selective media specific to each organism (LGI medium for *Gluconacetobacter diazotrophicus* and AMS medium for *Methylobacterium symbioticum*). Plates were incubated at 30°C for 2–5 days and monitored for colony development. Endophyte establishment was confirmed by the presence of colonies with expected morphology (cream-coloured for *Gluconacetobacter* and pink for *Methylobacterium*) in treated samples, and absence in non-treated controls.

*Alternaria* and *Cercospora* leaf blight severity was assessed in each plot on 27 Sept, and 11, 23 October. The leaves of 10 plants per plot (5 plants from the middle hills of each bed) were rated and placed into classes based on a 0-10 scale for percentage of the leaflet and petiole area featuring symptoms of each disease where 0 = no lesions, 1 = 1–10% of leaflet area and 0 % of petiole area, 2 = 11–25% leaflet area and 0% of petiole area, 3 = 26–50% leaflet area and 1-10% of petiole area, 4 = 51 - 75% leaflet area and 11-25% of petiole area, 5 = >75% of leaflet area and 26-50% petiole area, 6 = >75% leaflet area and >50% of petiole area, 7 = 1-25% leaf dieback, 8 = 26-50% leaf dieback, 9 = 51-75% leaf dieback and 10 = 76-100% leaf dieback. Total *Alternaria* and *Cercospora* leaf blight severity of each plant was calculated as the average rating for all leaves assessed. A disease severity index (DSI) was calculated for each plot using the following formula:

$$DSI = \frac{\sum[(\text{class no.})(\text{no. of leaves in each class})]}{(\text{total no. of leaves assessed})(\text{no. of classes} - 1)} \times 100$$

The area under the disease progress curve (AUDPC) was calculated with the following formula:

$$AUDPC = \sum_{j=1}^{N_j-1} \left( \frac{y_j + y_{j+1}}{2} \right) (t_{j+1} - t_j)$$

where  $j$  is the order index for the assessments over time,  $n_j$  is the number assessments,  $y_j$  is the average rating at day  $t_j$ ,  $y_{j+1}$  is the average rating day  $t_{j+1}$  and  $(t_{j+1}-t_j)$  is the number of days between the assessments.

On 7, 22 September the youngest, fully expanded leaf was collected from 10 plants per bed from the two center hills of each bed, for a total of 20 leaves. Leaves were sent to SGS Laboratory (Guelph, ON) for tissue analysis, with results received five days later. Nutrient assessments included nitrogen (N as is, not adjusted for water content), phosphorus (P%), potassium (K%), magnesium (Mg%), calcium (Ca%), zinc (Zn, ppm), manganese (Mn, ppm), copper (Cu, ppm), boron (B, ppm), and sulfur (S as is). Results were compared to sufficiency ranges from the OMAFA Vegetable Guide 839, adapted from Hochmuth et al. (2018), Plant

Tissue Analysis and Interpretation for Vegetable Crops in Florida (University of Florida IFAS Extension, HS964).

On 7 November carrots from two 1.16 m sections of the inner rows of each experimental unit were harvested. The green leaves of all plants were removed and rated for leaf blight severity based on the 0-10 scale outlined above. DSI at harvest for the combined impact of *Alternaria* and *Cercospora* leaf blight (symptoms not differentiated) was calculated based on this assessment using the equation outlined above. After rating, these leaves were immediately sent to SGS Laboratory (Guelph, ON) for tissue analysis to determine nutritional status of carrot at harvest. Harvested carrots were placed in storage until 19 November, when they were weighed to determine yield and graded for size (jumbo: > 4.4 cm, medium: 1.9 – 4.4 cm, cull: < 1.9 cm). Split and forked carrots were included in the culls.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C), September (16.6°C) and October (9.9°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C, September 17.0°C and October 9.9°C.

Monthly rainfall was below the 10-year average for June (46 mm), August (54 mm) and October (45 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm, September 48 mm and October 58 mm.

Data were analyzed in RStudio (version 2025.09.1). Foliar nutrient content and disease severity index (DSI) were measured repeatedly throughout the growing season and therefore were analyzed using a linear mixed-effects model with repeated measures, with replication treated as a random effect. Yield, disease incidence and severity at harvest were analyzed using linear mixed-effects models with replication as a random effect. In all cases, mean separation was conducted using Tukey's HSD test at  $P = 0.05$ . Relationships between foliar nitrogen contents measured by SGS Laboratory, total and marketable yield, and DSI at harvest were analyzed using Pearson's correlations.

**RESULTS:** As shown in Tables 1- 8.

**CONCLUSION:** There were no significant differences among treatments in total yield, marketable yield, or in the size distribution of carrots at harvest (Table 4.), which indicated that 0 kg ha<sup>-1</sup> of preplant N was sufficient. Similarly, there were no significant differences among treatments with respect to foliar nitrogen content, as measured by SGS laboratory tissue analysis, at each sampling date. All treatments had foliar nitrogen content either within or above the sufficiency range published in OMAFA Vegetable Guide 839 for carrot (Tables 5 -7). This is consistent with no differences in yield. These results indicate that nitrogen availability at the site was adequate to meet carrot nitrogen requirements despite low pre-plant fertilization. This could reflect high mineralization rates in the soil, the presence of residual nitrogen, or a combination of both factors. Uneven crop emergence and resulting variability

in plant stand density may have further contributed to variability in yield and reduced the ability to detect treatment effects. Foliar nutrient concentrations were generally not influenced by treatment effects. However, carrots treated with 45 kg N ha<sup>-1</sup> + foliar UTRISHA-N had significantly higher foliar Mg content than carrots treated with 0 kg N ha<sup>-1</sup>, 45 kg N ha<sup>-1</sup> + in-furrow ENVITA, or 70 kg N ha<sup>-1</sup> at harvest. Concentrations for all nutrients were generally within or above sufficiency ranges published within OMAFA Vegetable Guide 839 for optimal yield, except for Ca on 7, 22 September, P and Mg on 7 November (harvest), and Mn at all sampling dates (Table 5-7).

There were no significant differences among treatments in the severity of ALB or CLB across the season (Tables 1-2). While there was no significant difference among treatments in CLB AUDPC, there was a significant difference in AUDPC for ALB; carrots treated with 35 Kg N ha<sup>-1</sup> + foliar Envita having a significantly lower AUDPC than carrots that did not receive pre-plant nitrogen (Table 1). At harvest, there was no significant difference among treatments with respect to the combined incidence and severity of both leaf blights (Table 3). Since there were no nutrient deficiencies, it was not possible to determine if N deficiency or sufficiency affected susceptibility to ALB or CLB.

Endophyte establishment was confirmed through leaf sampling, with target organisms recovered from treated plots and no evidence of cross-contamination detected in non-treated plots. Despite successful establishment, there is only limited evidence that endophyte applications significantly affected leaf blight severity (ALB AUDPC) and no evidence of a significant effect on yield parameters, most likely because there was adequate N in the plants. These bacteria are generally most effective in N-deficient plants. Foliar nitrogen content was not significantly correlated with leaf blight DSI at carrot harvest, or with total or marketable yield. Again, this may be because the tissue tests did not detect any deficiencies.

**Table 1.** Effect of pre-plant nitrogen and N-fixing endophytic bacteria on the severity (disease severity index, DSI) of *Alternaria* leaf blight and area under the disease progress curve (AUDPC) in carrots, cv. Cellobunch, grown on mineral soil near the Ontario Crops Research Centre - Bradford Ontario, 2025.

N rate (kg ha <sup>-1</sup> )	DSI			AUDPC <sup>1</sup>
	27 September	11 October	23 October	
0	2.7 ns <sup>2</sup>	7.9 ns	20.0 ns	436.5 a <sup>3</sup>
35	2.5	4.3	14.7	285.5 ab
35 + in-furrow ENVITA	3.7	4.3	15.8	289.1 ab
35 + foliar Envita	0.6	3.9	16.1	254.9 b
35 + foliar UTRISHA-N	1.7	4.6	17.7	313.3 ab
70 Kg/ha N	1.9	3.5	17.7	292.1 ab

<sup>1</sup>AUDPC was calculated based on the DSI assessed on 27 September and 11, 23 October.

<sup>2</sup>ns = no significant differences among the treatments at P = 0.05.

<sup>3</sup>Means in a column followed by the same letter do not differ at P = 0.05 ,Tukey's HSD

**Table 2.** Effect of pre-plant nitrogen and N-fixing endophytic bacteria on the severity (disease severity index, DSI) of *Cercospora* leaf blight and area under the disease progress curve (AUDPC) in carrots, cv. Cellobunch, grown on mineral soil near the Ontario Crops Research Centre - Bradford Ontario, 2025.

N rate (kg ha <sup>-1</sup> )	DSI			AUDPC <sup>1</sup>
	27 September	11 October	23 October	
0	1.2 ns <sup>2</sup>	5.2 ns	17.2 ns	332.1 ns
35	1.8	2.9	13.3	243.7
35 + in-furrow ENVITA	2.7	2.7	12.4	235.0
35 + foliar Envita	0.0	2.6	13.1	222.8
35 + foliar UTRISHA-N	0.4	2.7	15.4	258.0
70 Kg/ha N	0.6	3.8	17.0	300.4

<sup>1</sup>AUDPC was calculated based on the DSI assessed on 27 September and 11, 23 October.

<sup>2</sup>ns = no significant differences among the treatments.

**Table 3.** Harvest assessment of the effect of pre-plant nitrogen and N-fixing endophytic bacteria on the combined incidence and severity (disease severity index, DSI) of *Alternaria* and *Cercospora* leaf blight in carrots, cv. Cellobunch, grown on mineral soil near the Ontario Crops Research Centre – Bradford Ontario, 2025.

N rate (kg ha <sup>-1</sup> )	Dead Leaves (%)	Leaf Blight Incidence	DSI
0	24.4 ns <sup>1</sup>	73.8 ns	40.3 ns
35	25.4	62.5	30.0
35 + in-furrow ENVITA	17.1	62.9	31.2
35 + foliar Envita	14.9	61.4	25.8
35 + foliar UTRISHA-N	22.8	68.4	34.4
70 Kg/ha N	24.0	73.2	37.2

<sup>1</sup> ns = no significant differences among the treatments.

**Table 4.** Effect of pre-plant nitrogen and N-fixing endophytic bacteria on yield of carrots, cv. Cellobunch, grown on mineral soil near the Ontario Crops Research Centre – Bradford Ontario, 2025.

N rate (kg ha <sup>-1</sup> )	Yield (t/ha)	% Marketable Yield	Size Distribution <sup>1</sup>		
			% Jumbo (>4.4 cm)	% Medium (2.0 – 4.4 cm)	% Culls <sup>2</sup> (<2.0 cm)
0	62.6 ns <sup>3</sup>	61.5 ns	9.5 ns	51.9 ns	38.5 ns
35	51.8	74.0	15.6	58.4	26.0
35 + in-furrow ENVITA	50.4	76.7	18.9	57.8	23.3
35 + foliar Envita	56.8	67.0	19.8	47.2	33.0
35 + foliar UTRISHA-N	61.8	73.4	26.4	47.0	26.6
70	60.7	77.4	18.9	58.5	22.6

<sup>1</sup> Percentage values were determined using weight

<sup>2</sup> Cull carrots include forked & split carrots of any size

<sup>3</sup> ns = no significant differences at P = 0.05

**Table 5.** Effect of pre-plant nitrogen and N-fixing endophytic bacteria on foliar nutrient contents as determined by SGS laboratory analysis on 7 September in carrots, cv. Cellobunch, grown near the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

N rate (kg ha <sup>-1</sup> )	N <sup>1</sup>	P (%)	K (%)	Mg (%)	Ca (%)	Zn (ppm)	Mn (ppm)	Cu (ppm)	B (ppm)	S <sup>1</sup>
0	3.15 ns <sup>2</sup>	0.27 ns	3.21 ns	0.27 ns	1.22 ns	26.93 ns	14.75 ns	8.12 ns	28.5 ns	0.51 ns
35	3.59	0.27	2.94	0.31	1.40	26.30	16.05	8.17	29.53	0.56
35 + in-furrow ENVITA	3.50	0.27	3.38	0.30	1.30	28.01	16.09	8.46	28.60	0.54
35 + foliar Envita	3.39	0.27	3.10	0.29	1.30	26.46	14.83	8.26	29.10	0.54
35 + foliar UTRISHA-N	3.40	0.27	2.94	0.30	1.30	27.70	15.15	7.90	29.41	0.55
70	3.29	0.26	2.94	0.28	1.30	26.72	16.54	7.95	27.89	0.53
Sufficiency Ranges 60 Days After Seeding <sup>3</sup>	1.8-2.5	0.2-0.4	2-4	0.2-0.5	2 -3.5	20-60	30-60	4-10	20-40	-

<sup>1</sup> The nutrient was reported "as is" without any adjustments for moisture.

<sup>2</sup> ns = no significant differences at P = 0.05

<sup>3</sup> As reported in OMAFA publication 839

**Table 6.** Effect of pre-plant nitrogen and N-fixing endophytic bacteria on foliar nutrient contents as determined by SGS laboratory analysis on 22 September in carrots, cv. Cellobunch, grown near the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

N rate (kg ha <sup>-1</sup> )	N <sup>1</sup>	P (%)	K (%)	Mg (%)	Ca (%)	Zn (ppm)	Mn (ppm)	Cu (ppm)	B (ppm)	S <sup>1</sup>
0	2.90 ns <sup>2</sup>	0.23 ns	3.17 ns	0.24 ns	1.53 ns	27.57 ns	16.41 ns	6.46 ns	30.18 ns	0.56 ns
35	3.01	0.22	2.75	0.26	1.55	28.25	16.18	6.83	28.33	0.56
35 + in-furrow ENVITA	3.20	0.25	3.11	0.29	1.46	31.35	16.01	7.57	28.48	0.56
35 + foliar Envita	2.97	0.23	3.05	0.28	1.62	28.40	15.93	7.44	32.57	0.54
35 + foliar UTRISHA-N	3.12	0.24	2.71	0.29	1.62	29.07	16.68	6.76	29.18	0.59
70	2.91	0.22	2.66	0.27	1.65	26.45	17.45	6.60	31.46	0.54
Sufficiency Ranges 60 Days After Seeding <sup>3</sup>	1.8-2.5	0.2-0.4	2-4	0.2-0.5	2 -3.5	20-60	30-60	4-10	20-40	-

<sup>1</sup> The nutrient was reported "as is" without any adjustments for moisture.

<sup>2</sup> ns = no significant differences at P = 0.05

<sup>3</sup> As reported in OMAFA publication 839

**Table 7.** Effect of pre-plant nitrogen and N-fixing endophytic bacteria on foliar nutrient contents as determined by SGS laboratory analysis on 7 November in carrots, cv. Cellobunch, grown near the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

N rate (kg ha <sup>-1</sup> )	N <sup>1</sup>	P (%)	K (%)	Mg (%)	Ca (%)	Zn (ppm)	Mn (ppm)	Cu (ppm)	B (ppm)	S <sup>1</sup>
0	2.39 ns <sup>2</sup>	0.19 ns	2.39 ns	0.29 a <sup>3</sup>	2.35 ns	26.89 ns	26.28 ns	5.83 ns	29.77 ns	0.44 ns
35	2.50	0.19	1.89	0.33 ab	2.18	24.92	24.93	6.25	28.06	0.52
35 + in-furrow ENVITA	2.75	0.19	2.18	0.29 a	1.89	27.32	24.70	6.11	26.63	0.50
35 + foliar Envita	2.52	0.19	1.93	0.34 ab	2.12	24.62	21.21	5.80	28.93	0.55
35 + foliar UTRISHA-N	2.63	0.20	1.70	0.38 b	2.33	27.00	22.60	6.02	28.94	0.57
70	2.62	0.18	1.86	0.29 a	2.11	25.04	23.60	5.90	26.65	0.54
Sufficiency Ranges at Harvest <sup>4</sup>	1.5-2.5	0.2-0.4	1.4-4	0.4-0.5	1 -1.5	20-60	30-60	4-10	20-40	-

<sup>1</sup> The nutrient was reported "as is" without any adjustments for moisture.

<sup>2</sup> ns = no significant differences at P = 0.05

<sup>3</sup> Means in a column followed by the same letter do not differ P = 0.05, Tukey HSD

<sup>4</sup> As reported in OMAFA publication 839

**Table 8.** Correlation coefficients and P-values between nitrogen foliar contents as determined by SGS laboratory tissue nutrient analysis and *Alternaria* leaf blight disease severity (DSI), total yield, and marketable yield in carrots, cv. Cellobunch, grown under different pre-plant nitrogen rates with and without N-fixing endophytic bacteria application at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025

Variable	7 September	22 September	7 November
DSI	0.09 <sup>1</sup> (0.70) <sup>2</sup>	-0.03 (0.90)	-0.14 (0.51)
Total Yield	-0.35 (0.09)	-0.34 (0.11)	-0.33 (0.12)
Marketable Yield	-0.19 (0.37)	-0.08 (0.72)	-0.05 (0.83)

<sup>1</sup> Pearson correlation coefficient (r).

<sup>2</sup> Associated P-value.

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**CROP:** Carrot (*Daucus carota* subsp. *sativus* (Hoffm.) Arcang), cv. Cellobunch  
**PEST:** Carrot weevil (*Listronotus oregonensis* (LeConte))

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**TITLE:** EVALUATION OF INSECTICIDES FOR CARROT WEEVIL CONTROL, 2025

**MATERIALS:** CIMEGRA (broflanilide 100 g/L), RIMON 10 EC (novaluron 100 g/L), EXIREL (cyantraniliprole 100 g/L)

**METHODS:** Carrots (cv. Cellobunch) were direct seeded (70 seed/m) into muck soil (organic matter  $\approx$  67.3%, pH  $\approx$  7.3) on raised beds using a Stanhay Precision seeder on 28 May. A randomized complete block arrangement with six replications per treatment was used. Each plot consisted of two rows, 86 cm apart and 5 m in length. The treatments were the foliar insecticides CIMEGRA at 0.125 L/ha, RIMON 10 EC at 0.82 L/ha and EXIREL at 1 L/ha. An untreated check was also included. The treatments were applied on 27 June and 3 July using a CO<sub>2</sub> backpack sprayer equipped with four TeeJet 8002 fan nozzles calibrated to deliver 375 L/ha at 275 kPa. Two assessment plots 1.16 m in length were staked out in the middle of the two rows of each replicate. The staked sections were assessed for carrots showing visible signs of necrosis due to carrot weevil damage on 25 July. Carrots from two 1 m sections in each plot were removed and examined for weevil damage on 25 August. Carrots were harvested from the staked sections on 29 October. The carrot samples were washed in a small drum washer and visually inspected for carrot weevil damage, recording the number and weight of damaged and marketable carrots, which were categorized by size. Marketable was defined as carrots with no insect damage. Data were analyzed using the General Analysis of Variance function of Statistics V.10. Means separation was obtained using Fisher's Protected LSD test with  $P = 0.05$  level of significance.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C), September (16.6°C) and October (9.9°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C, September 17.0°C and October 9.9°C.

Monthly rainfall was below the 10-year average for June (46 mm), August (54 mm) and October (45 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm, September 48 mm and October 58 mm.

**RESULTS:** As presented in Tables 1-2.

**CONCLUSIONS:** Carrot weevil damage was low throughout the growing season, with only 16% of carrots damaged in the check by harvest. There was more damage in the check than all plots treated with foliar insecticides. There were also lower percentage marketability and percentage of medium carrots in the check than any of the insecticide treatments. RIMON, CIMEGRA and EXIREL were all effective at reducing carrot weevil damage.

**Table 1.** Effect of foliar insecticide applications on carrot weevil damage in a trial at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

Treatment	Rate (L/ha)	Carrot Weevil Damage (%)	
		25 July	25 August
EXIREL	1.0	0 ns <sup>1</sup>	0.5 ns
RIMON	0.82	0.1	0.6
CIMEGRA	0.125	0.3	0.2
CHECK	-	0.8	1.4

<sup>1</sup> ns = not significant at  $P = 0.05$ .

**Table 2.** Effect of foliar insecticide applications on carrot weevil damage in a trial at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

Treatment	Rate (L/ha)	Weevil Damage (%)	Mkb Yield (t/ha)	% Mkb	Distribution (%) <sup>1</sup>		
					Jumbo (> 44 mm)	Medium (19-44 mm)	Unmkb
RIMON	0.82	4 a <sup>2</sup>	78 ns <sup>3</sup>	96 a	19 ns	78 a	3 a
CIMEGRA	0.125	5 a	79	95 a	21	75 ab	4 a
EXIREL	1.0	9 a	79	91 a	24	68 ab	8 a
CHECK	-	16 b	72	84 b	21	65 b	14 b

<sup>1</sup> Percentage values were determined using weight.

<sup>2</sup> Numbers in a column followed by the same letter are not significantly different at  $P = 0.05$ , Fisher's protected LSD test.

<sup>3</sup> ns = not significant at  $P = 0.05$ .

**CROP:** Carrot (*Daucus carota* subsp. *sativus* (Hoffm.) Arcang.), cvs. Belgrado, Nevado, Orange Slice

**PEST:** Yellow nutsedge (*Cyperus esculentus* L.)

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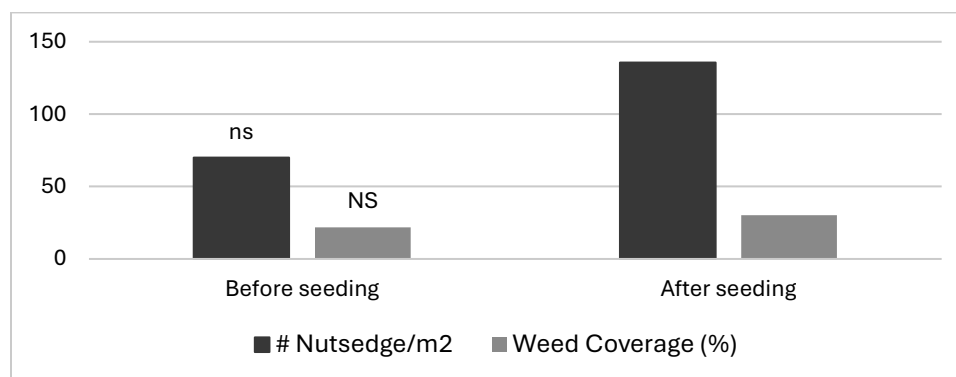
**TITLE:** **APPLICATION OF NIMITZ 480 EC TO SUPPRESS YELLOW NUTSEEDGE IN CARROTS, 2025**

**MATERIALS:** Nimitz 480 EC (fluensulfone 480 g/L)

**METHODS:** Carrots were direct seeded (25 seeds per foot) on 2 June into muck soil (North and South Jane sites) near the Ontario Crops Research Centre - Bradford. A mineral soil site (Bajar) was seeded on 3 June. All sites were known to have yellow nutsedge pressure. A randomized complete block design with two (North Jane), four (South Jane) and three (Bajar) replicates per treatment were used. Replicates consisted of 8 raised hills seeded spaced 85 cm apart and varied in length. Nimitz herbicide treatments were applied to the soil surface at 8 L/ha either before or after seeding using a tractor mounted sprayer fitted with TeeJet 800-VS flat fan nozzles and a water application rate of 500 L/ha. An untreated check was included in the Bajar trial only. Carrots were grown using best agronomic practices for nutrients and pest management. Number and coverage of nutsedge were assessed from six 0.25 m<sup>2</sup> plots within each treatment on 7 July (North and South Jane trials) and 8 July (Bajar trial). Photos of each 0.25 m<sup>2</sup> plot were taken and used to determine nutsedge coverage through the Canopeo<sup>®</sup> App. Data from the Bajar trial were analyzed using the General Analysis of Variance function of Statistix V.10. Means separation was obtained using Tukey's HSD test with  $P = 0.05$  level of significance. Data from the North and South Jane trials were analyzed using the Two-Sample T Test function of Statistix V.10.

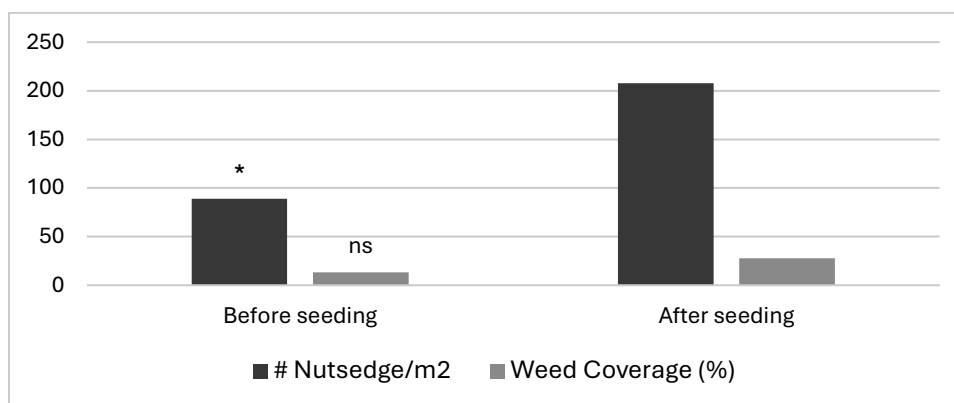
**RESULTS:** Data are presented in Figures 1-3.

**CONCLUSIONS:** The only significant difference was found in the South Jane trial where the number of yellow nutsedge plants per square meter were significantly fewer when Nimitz was applied before carrot seeding. For all other assessments in all the trials, the number of yellow nutsedge plants per square meter and percent coverage were numerically lower when Nimitz was applied before seeding. This may be due to the fact that when Nimitz is sprayed before seeding it is worked into the soil and mixed throughout the carrot hill during hill formation and seeding, whereas Nimitz applications after seeding remain on the surface of carrot hills. Future studies should investigate different water application rates when applying Nimitz for nutsedge suppression.

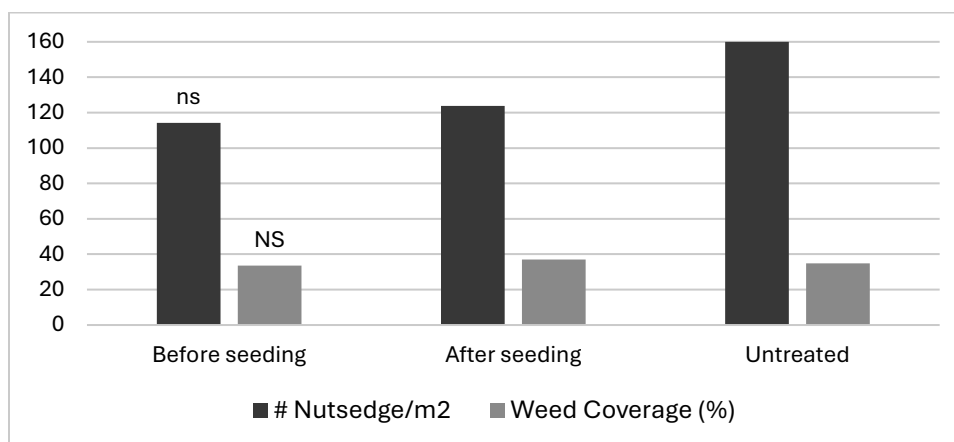


**Figure 1.** Yellow nutsedge establishment after Nimitz 480 EC application before and after carrot seeding

at the North Jane trial. ns indicates no significant differences were found among the treatments, Two-Sample T Test,  $P = 0.05$ .



**Figure 2.** Yellow nutsedge establishment after Nimitz 480 EC application before and after carrot seeding at the South Jane trial. \* indicates means are significantly different, Two-Sample T Test,  $P = 0.05$ . ns indicates no significant differences were found among the treatments, Two-Sample T Test,  $P = 0.05$ .



**Figure 3.** Yellow nutsedge establishment after Nimitz 480 EC application before and after carrot seeding at the Bajar trial. ns indicates no significant differences were found among the treatments, Two-Sample T Test,  $P = 0.05$ .

**Funding for this project was provided by the Bradford Co-operative.**

**CROPS:** Carrot (*Daucus carota* subsp. sativus, cv. 2384),

**AUTHORS:** EZEH IN, WATT J, VANDER KOOI K and MCDONALD MR  
University of Guelph, Department of Plant Agriculture

**TITLE:** **ASSESSMENT OF NAI0 ORIO SPRAYING EFFICIENCY IN CARROT ON MINERAL SOIL, 2025**

**MATERIALS:** LIBERTY 200 SN (glufosinate ammonium, group 10), ASSIST OC (paraffin-based mineral oil-83%, surfactant blend-17%), S-tine cultivator, 3-D hooded sprayer.

**METHODS:** The trial was conducted at a mineral soil site on the edge of the Holland Marsh in 2025. Carrots were direct-seeded on 03 June on raised beds spaced 1.73 m center-to-center and 175 m long. A tractor constructed the raised beds while carrying the RTK GPS receiver from the Orio, temporarily mounted on the tractor. For weed management, the carrots were first cultivated with a tractor-mounted S-tine cultivator. Subsequently, the Naïo Orio autonomous tool carrier robot (Escalquens, France) was used. This operated with two 55-gallon tanks, spraying at 275 kPa and a flow rate of 200 L/ha, while applying LIBERTY 200 SN herbicide (glufosinate ammonium, group 10) with a band sprayer equipped with 3D-printed cones covering TeeJet XR (extended range) 11002-VS flat fan nozzles (0.2 GPM at 40 PSI). This was controlled by a Raven Industries field computer. The cones were mounted on a 3.65 m boom, suspended at 75 cm, and spaced approximately 90 cm apart, with the bases positioned 35 cm above the soil surface and tilted at 20-25° to optimize spray coverage between rows and minimize crop damage. The herbicide was applied on 21 August, when carrots had nine or more true leaves (BBCH 19, Feller et al., 1995 classifications) and were entering the root bulking stage (BBCH 41-43). The plants were 30-55 cm tall, with well-developed canopies.

Weed counts and vegetative cover were assessed before herbicide application from six quadrat throws (0.25 m<sup>2</sup>) spaced approximately 60 m apart. These baseline measurements provided an estimate of initial weed pressure across the treated area but were not linked to specific quadrats used after spraying. The spray boom was designed to treat four raised beds per pass. Operational constraints during application required adjustments to the robot settings. The robot initially operated in automatic spraying mode at 2 km h<sup>-1</sup>. During operation, a repeated “No Flow Detected” alarm interrupted spraying approximately every 20 to 25 seconds, despite full spray lines and adequate tank volume. To troubleshoot and complete the trial, the system was restarted after each stop, and the speed was increased to 3 km h<sup>-1</sup> after approximately 60 m of travel. The last segment was completed in manual delivery mode at 3 km h<sup>-1</sup>. These operating conditions created three combinations of travel mode and speed, applied sequentially across eight raised beds.

Post-application evaluation of each treatment combination included three quadrat throws as subsamples. Due to the sequential nature of the application (strips) and lack of randomization, these quadrats were treated as observational units rather than true experimental replicates. Weed counts, vegetative cover, and herbicide damage were taken on 26 August 2025. Weeds were classified as dead when necrotic, partially damaged when leaves were absent, but stems or petioles remained viable, and alive when tissues were turgid. Carrot injury was assessed visually and with Canopeo imaging. Visual observations showed necrosis along canopy edges where herbicide dripped from cones. Quadrat images were analyzed to determine the percentage of damaged and intact canopy cover. Relative carrot foliage damage was calculated as:

$$\text{Relative damage (\%)} = \frac{\text{Intact canopy cover} - \text{Damaged canopy cover}}{\text{Intact canopy cover}} \times 100$$

The trial was a single-factor, non-replicated strip assessment, where the three operational modes were applied sequentially over approximately 60 m each. Carrots were harvested 125 days after seeding on 7 October 2025 from a 1.16 m section of raised bed within the spots where weed indices and crop injury were measured. Roots were classified as jumbo (> 4.4 cm), medium (1.9 to 4.4 cm), or cull (< 1.9 cm; stunted, forked, or split) on 14 October 2025.

Statistical analyses based on plot-to-plot variation were not possible, and all results are presented as an exploratory case study using descriptive statistics. Weed indices, relative carrot canopy injury, and yield data were summarized using PROC MEANS to calculate means and standard deviations for the pre-application baseline and each post-treatment strip. Correlations between weed density and yield were assessed using PROC CORR.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C), September (16.6°C) and October (9.9°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C, September 17.0°C and October 9.9°C. Monthly rainfall was below the 10-year average for June (46 mm), August (54 mm), and October (45 mm), and above average for May (112 mm), July (84 mm), and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm, September 48 mm and October 58 mm.

**RESULTS:** as presented in Tables 1 to 3.

**CONCLUSIONS:** Early-season weed control carried out with the tractor resulted in relatively low weed pressure. Herbicide effects on weed indices and carrot canopy injury were low and variable across spray modes and speeds. Weed density and cover were also highly variable across treatments. The automatic delivery mode at 3 km h<sup>-1</sup> showed the numerically highest weed density, comparable to the pre-treatment field mean. The automatic delivery at 2 km h<sup>-1</sup> and manual delivery at 3 km h<sup>-1</sup> had lower numerical weed densities. The relative crop canopy injury was numerically highest in the automatic mode at 2 km h<sup>-1</sup>. Herbicide was observed dripping from the cones onto the canopy in this treatment.

Carrot yield was also highly variable. The manual delivery mode at 3 km h<sup>-1</sup> produced the numerically highest total and marketable yields compared to the automatic modes, and comparable to the nontreated range. The automatic delivery mode at 2 km h<sup>-1</sup> produced the lowest yields. Root size distribution showed variation across treatments. The nontreated range had a greater proportion of jumbo roots than all Orio treatments. The proportion of stunted, forked, or split roots was greatest under automatic herbicide delivery at 2 km h<sup>-1</sup>. There was no correlation between weed density and total or marketable yield (Table 3). Consistent connectivity is needed for the Orio to apply herbicide at the correct speed and rate.

Table 1. Effect of Naïo Orio robot herbicide application on the weed indices and carrot canopy on the mineral soil, 2025

Spraying mode	Speed (km h <sup>-1</sup> )	Weed density (plant m <sup>-2</sup> )		Weed vegetative cover (%)		Relative crop canopy injury (%)	
		Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Pre-herbicide		40	13.1	3.0	2.75	-	
Post-herbicide							
Automatic	2	13	16.2	0.3	0.49	22	14.29
Automatic	3	40	4.0	1.9	1.26	16	0.59
Manual	3	15	10.1	1.3	0.27	6	4.62

Table 2. Effect of Naïo Orio robot herbicide application on carrot yield, 2025

Spraying mode	Speed (km h <sup>-1</sup> )	Yield (t ha <sup>-1</sup> )				Size distribution by weight (%)		
		Total		Marketable		Jumbo (> 4.4 cm)	Medium (1.9 – 4.4cm)	Stunted, forked or split (< 1.9 cm)
		Mean	Standard Deviation	Mean	Standard Deviation			
Nontreated range		41.1	3.9	35.0	6.9	23	62	15
Automatic	2	22.3	4.8	15.5	5.1	0	69	31
Automatic	3	30.3	5.9	25.0	5.2	10	72	18
Manual	3	49.0	5.4	42.1	6.0	4	82	15

Table 3. Weed density and carrot yield correlations in 2025

Soil type	Yield (t ha <sup>-1</sup> )	Weed density	
		Pearson correlation (r)	p-value
Mineral	Total	0.19	0.54
	Marketable	0.19	0.55

**Funding for this project was provided by the Fresh Vegetable Growers of Ontario, Haggerty AgRobotics Inc., the Ontario Agri-Food Innovation Alliance, and Innovation Farms powered by AgExpert.**



## **Check out the Muck Crops Research Station's You Tube Account**

The Muck Crops Research Station launched a YouTube channel in 2021. The account communicates brief videos of the Station's IPM program, variety trial results, past Muck Conferences and other information to our growers, industry reps and academic personnel. We hope the information will be helpful to our followers. So take some time, check out our channel and stay informed.

Simply type in:

“Muck Crops IPM” on YouTube to find us we're the first result.

or follow this link [www.youtube.com/@muckcrops](https://www.youtube.com/@muckcrops)

**CROP:** Yellow cooking onions (*Allium cepa* L.), cv. Catskill  
**PEST:** Onion downy mildew (*Peronospora destructor* (Berk.) Casp. in Berk.)

**AUTHORS:** VANDER KOOI K, SCICLUNA J & MCDONALD MR  
 U of Guelph, Dept. of Plant Agriculture, Ontario Crops Research Centre - Bradford

**TITLE:** **EVALUATION OF FUNGICIDES FOR CONTROL OF DOWNY MILDEW ON DRY BULB ONION, 2025**

**MATERIALS:** ORONDIS ULTRA (mandipropamid 250 g/L, oxathiapiprolin 30 g/L), ZAMPRO (ametoctradin 300 g/L, dimethomorph 225 g/L), XIVANA (fluoxapiprolin 20 g/L)

#### **METHODS:**

Onions, cv. Catskill, were direct seeded ( $\approx 35$  seeds/m) on 5 May into organic soil (organic matter  $\approx 70.0\%$ , pH  $\approx 5.6$ ) at the Ontario Crops Research Centre - Bradford, Ontario. A randomized complete block arrangement with four replicates per treatment was used. Each replicate consisted of four rows spaced 40 cm apart, and 5 m in length. Fungicide sprays were applied on 25 July, and 1 and 8 August, after sporangia were identified in the field, using a CO<sub>2</sub> backpack sprayer equipped with four TeeJet 8002 fan nozzles calibrated to deliver 500 L/ha at 275 kPa. Fungicide treatments were: ORONDIS ULTRA at a rate of 400 mL/ha, ZAMPRO at a rate of 1.0 L/ha, XIVANA at a rate of 1.0 L/ha, XIVANA at a rate of 750 mL/ha and ZAMPRO at a rate of 400 mL/ha alternated with ORONDIS ULTRA at a rate of 1.0 L/ha. An untreated check was also included. Downy mildew incidence was assessed in each plot on 5 and 11 August. On 2 September, the onions in two 2.32 m sections of row were pulled from the inner rows for a yield sample. Onions were weighed and graded for size on 22 October to determine yield. Data were analyzed using the General Analysis of Variance function of Statistix V.10. Means separation was obtained by using Fisher's Protected LSD test at  $P = 0.05$  level of significance.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C) and September (16.6°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C.

Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

**RESULTS:** As presented in Tables 1-2.

**CONCLUSIONS:** The weather in 2025 was not conducive to the development of downy mildew in onions and no lesions were detected during the trial, so there were no differences in disease among treatments (Table 1). No significant differences in yield or size distribution were observed among the treatments (Table 2).

**Table 1.** Downy mildew incidence for onions, cv. Catskill, treated with fungicides and grown at the Ontario Crops Research Centre – Bradford, Holland Marsh, Ontario, 2025.

Treatment	Rate (L/ha)	DM Lesions/plot <sup>1</sup>		Total Lesions
		5 August	11 August	
ORONDIS ULTRA	0.4	0 ns <sup>2</sup>	0 ns	0 ns
ZAMPRO	1.0	0	0	0
XIVANA	1.0	0	0	0
XIVANA	0.75	0	0	0
ZAMPRO alt/w ORONDIS ULTRA <sup>3</sup>	0.4 / 1.0	0	0	0
CHECK	-	0	0	0

<sup>1</sup>The entire plot was visually examined for DM lesions and numbers recorded.

<sup>2</sup>ns = not significant at  $P = 0.05$ .

<sup>3</sup>ZAMPRO was applied on 25 July and 8 August. ORONDIS ULTRA was applied on 1 August.

**Table 2.** Yield of onions, cv. Catskill, sprayed with various fungicides at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

Treatment	Rate (L/ha)	Yield (t/ha)	% Mkb	Size distribution (%) <sup>1</sup>			
				Jumbo (> 76 mm)	Large (76-64 mm)	Medium (64-45 mm)	Cull (< 45 mm)
XIVANA	0.75	62 ns <sup>2</sup>	87 ns	1 ns	28 ns	66 ns	5 ns
ZAMPRO	1.0	62	87	1	26	69	5
ZAMPRO alt/w ORONDIS ULTRA <sup>3</sup>	0.4 / 1.0	60	85	2	31	62	6
XIVANA	1.0	57	86	1	28	65	6
ORONDIS ULTRA	0.4	56	87	4	28	63	5
CHECK	-	55	87	3	25	67	5

<sup>1</sup>Percentage values were determined using weight.

<sup>2</sup>ns = not significant at  $P = 0.05$ .

<sup>3</sup>ZAMPRO was applied on 25 July and 8 August. ORONDIS ULTRA was applied on 1 August.

**Funding for this project was provided by the Fresh Vegetable Growers of Ontario, the California Garlic and Onion Research Advisory Board and Bayer Crop Science.**

**CROP:** Yellow cooking onions (*Allium cepa* L.), cv. Catskill  
**PEST:** Onion downy mildew (*Peronospora destructor* (Berk.) Casp. in Berk.)

**AUTHORS:** VANDER KOOI K, SCICLUNA J & MCDONALD MR  
 U of Guelph, Dept. of Plant Agriculture, Ontario Crops Research Centre - Bradford

**TITLE:** **EVALUATION OF FUNGICIDES FOR CONTROL OF DOWNY MILDEW ON DRY BULB ONIONS, 2025**

**MATERIALS:** A24367 (exp), A24580 (exp), LI700 (surfactant blend 80%), AG SURF II (Alcohol ethoxylate 92%), MASTERLOCK (surfactant blend 100%)

#### **METHODS:**

Onions, cv. Catskill, were direct seeded ( $\approx 35$  seeds/m) on 5 May into organic soil (organic matter  $\approx 70.0\%$ , pH  $\approx 5.6$ ) at the Ontario Crops Research Centre - Bradford, Ontario. A randomized complete block arrangement with four replicates per treatment was used. Each replicate consisted of four rows spaced 40 cm apart, and 5 m in length. Fungicide sprays were applied on 22, 29 July and 5 August, after sporangia were identified in the field, using a CO<sub>2</sub> backpack sprayer equipped with four TeeJet 8002 fan nozzles calibrated to deliver 500 L/ha at 275 kPA. Fungicide treatments were: A24367 at a rate of 1.54 L/ha, A24367 at a rate of 1.54 L/ha + LI700 at 0.5% v/v, A24367 at a rate of 1.54 L/ha + AG SURF II at 0.5% v/v, A24367 at a rate of 1.54 L/ha + MASTERLOCK at 0.5% v/v and A24580 at a rate of 1 L/ha + LI700 at 0.5% v/v. An untreated check was also included. Downy mildew incidence and severity were assessed in each plot on 24, 31 July and 7 August. Phytotoxicity was assessed on a scale from 0-100, where zero indicates no phytotoxicity and 100 indicates all the plants in the plot are dead, on 24, 31 July and 7 August. On 2 September, the onions in two 2.32 m sections of row were pulled from the inner rows for a yield sample. Onions were weighed and graded for size on 17 October to determine yield. Data were analyzed using the General Analysis of Variance function of Statistix V.10. Means separation was obtained by using Fisher's Protected LSD test at  $P = 0.05$  level of significance.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C) and September (16.6°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C.

Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

**RESULTS:** As presented in Tables 1-3.

**CONCLUSIONS:** The weather in 2025 was not conducive to the development of downy mildew in onions and no lesions were detected during the trial, so there were no differences in disease among treatments (Table 1). No significant differences in yield were observed among the treatments (Table 2). There were fewer large bulbs and more medium bulbs in the experimental product with AG SURF II than the check and the experimental product alone. While there were no visible symptoms of phytotoxicity (Table 3), more research is warranted to see if some surfactants have a small negative effect on onion growth and yield.

**Table 1.** Downy mildew incidence for onions, cv. Catskill, treated with fungicides and grown at the Ontario Crops Research Centre – Bradford, Holland Marsh, Ontario, 2025.

Treatment	Rate (/ha)	DM Lesions/plot <sup>1</sup>			Total Lesions
		24 July	31 July	7 Aug	
A24367	1.54	0 ns <sup>2</sup>	0 ns	0 ns	0 ns
A24367 + LI700	1.54 + 0.5% v/v	0	0	0	0
A24367 + AG SURF II	1.54 + 0.5% v/v	0	0	0	0
A24367 + MASTERLOCK	1.54 + 0.5% v/v	0	0	0	0
A24580 + LI700	1.0 + 0.5% v/v	0	0	0	0
CHECK	-	0	0	0	0

<sup>1</sup>The entire plot was visually examined for DM lesions and numbers recorded.

<sup>2</sup>ns = not significant at  $P = 0.05$ .

**Table 2.** Yield of onions, cv. Catskill, sprayed with various fungicides at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

Treatment	Rate (/ha)	Yield (t/ha)	% Mkb	Size distribution (%) <sup>1</sup>			
				Jumbo (> 76 mm)	Large (76-64 mm)	Medium (64-45 mm)	Cull (< 45 mm)
A24367 + LI700	1.54 + 0.5% v/v	58 ns <sup>2</sup>	86 ns	2 ns	31 ab <sup>3</sup>	62 ab	5 ns
A24367	1.54	56	85	4	34 a	57 a	6
A24580 + LI700	1.0 + 0.5% v/v	56	84	1	33 ab	60 ab	6
A24367 + MASTERLOCK	1.54 + 0.5% v/v	55	86	0	30 ab	64 ab	5
A24367 + AG SURF II	1.54 + 0.5% v/v	50	84	1	20 b	73 b	7
CHECK	-	59	88	2	34 a	59 a	4

<sup>1</sup>Percentage values were determined using weight.

<sup>2</sup>ns = not significant at  $P = 0.05$ .

<sup>3</sup>Numbers in a column followed by the same letter are not significantly different at  $P = 0.05$ , Fisher's Protected LSD.

**Table 3.** Phytotoxicity (%) ratings for onion, cv. Catskill, treated with various fungicides and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Rate (L/ha)	Phytotoxicity plot ratings <sup>1,2</sup>		
		24 July	31 July	7 Aug
A24367	1.54	0	0	0
A24367 + LI700	1.54 + 0.5% v/v	0	0	0
A24367 + AG SURF II	1.54 + 0.5% v/v	0	0	0
A24367 + MASTERLOCK	1.54 + 0.5% v/v	0	0	0
A24580 + LI700	1.0 + 0.5% v/v	0	0	0
CHECK	-	0	0	0

<sup>1</sup> Phytotoxicity rating 0-10, where 0 = no toxicity, 1 = 1-10% crop injury, 2 = 11-20% crop injury, 3 = 21-30% crop injury, 4 = 31-40% crop injury, 5 = 41-50% crop injury, 6 = 51-60% crop injury, 7 = 61-70% crop injury, 8 = 71-80% crop injury, 9 = 81-90% crop injury, 10 = 91-100% crop injury

<sup>2</sup> Data set consists of zeros, and therefore was not statistically analyzed.

**Funding for this project was provided by Syngenta Crop Protection.**

**CROP:** Yellow cooking onions (*Allium cepa* L.), cv. LaSalle  
**PEST:** Onion downy mildew (*Peronospora destructor* (Berk.) Casp. in Berk.)

**AUTHORS:** VANDER KOOI K, SCICLUNA J & MCDONALD MR  
 U of Guelph, Dept. of Plant Agriculture, Ontario Crops Research Centre - Bradford

**TITLE:** **EVALUATION OF FUNGICIDES FOR CONTROL OF DOWNY MILDEW ON DRY BULB ONION, 2025**

**MATERIALS:** A24367 (exp), A24580 (exp), LI700 (surfactant blend 80%), AG SURF II (Alcohol ethoxylate 92%), MASTERLOCK (surfactant blend 100%)

#### **METHODS:**

Onions, cv. LaSalle, were direct seeded ( $\approx 35$  seeds/m) on 5 May into organic soil (organic matter  $\approx 45.0\%$ , pH  $\approx 7.2$ ) at the Ontario Crops Research Centre - Bradford, Ontario. A randomized complete block arrangement with four replicates per treatment was used. Each replicate consisted of four rows spaced 40 cm apart, and 5 m in length. Fungicide sprays were applied on 22, 29 July and 5 August, after sporangia were identified in the field, using a CO<sub>2</sub> backpack sprayer equipped with four TeeJet 8002 fan nozzles calibrated to deliver 500 L/ha at 275 kPA. Fungicide treatments were: A24367 at a rate of 1.54 L/ha, A24367 at a rate of 1.54 L/ha + LI700 at 0.5% v/v, A24367 at a rate of 1.54 L/ha + AG SURF II at 0.5% v/v, A24367 at a rate of 1.54 L/ha + MASTERLOCK at 0.5% v/v and A24580 at a rate of 1 L/ha + LI700 at 0.5% v/v. An untreated check was also included. Downy mildew incidence and severity were assessed in each plot on 24, 31 July and 7 August. Phytotoxicity was assessed on a scale from 0-100, where zero indicates no phytotoxicity and 100 indicates all the plants in the plot are dead, on 24, 31 July and 7 August. On 2 September, the onions in two 2.32 m sections of row were pulled from the inner rows for a yield sample. Onions were weighed and graded for size on 3 October to determine yield. Data were analyzed using the General Analysis of Variance function of Statistix V.10. Means separation was obtained by using Fisher's Protected LSD test at  $P = 0.05$  level of significance.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C) and September (16.6°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C.

Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

**RESULTS:** As presented in Tables 1-3.

**CONCLUSIONS:** The weather in 2025 was not conducive to the development of downy mildew in onions and no lesions were detected during the trial, and thus there were no differences in disease among treatments in the trial (Table 1). No significant differences in yield were observed among the treatments (Table 2). There was a small but significantly higher percentage of jumbo onions in the nontreated check, compared to the fungicide treatments. Similarly, the nontreated check had a higher percentage of large onions and lower percentage of medium onions than the experimental product with AG SURF II. While there were no visible symptoms of phytotoxicity (Table 3), more research is warranted to see if some surfactants have a small negative effect on onion growth and yield.

**Table 1.** Downy mildew incidence for onions, cv. LaSalle, treated with fungicides and grown at the Ontario Crops Research Centre – Bradford, Holland Marsh, Ontario, 2025.

Treatment	Rate (/ha)	DM Lesions/plot <sup>1</sup>			Total Lesions
		24 July	31 July	7 Aug	
A24367	1.54	0 ns <sup>2</sup>	0 ns	0 ns	0 ns
A24367 + LI700	1.54 + 0.5% v/v	0	0	0	0
A24367 + AG SURF II	1.54 + 0.5% v/v	0	0	0	0
A24367 + MASTERLOCK	1.54 + 0.5% v/v	0	0	0	0
A24580 + LI700	1.0 + 0.5% v/v	0	0	0	0
CHECK	-	0	0	0	0

<sup>1</sup>The entire plot was visually examined for DM lesions and numbers recorded.

<sup>2</sup>ns = not significant at  $P = 0.05$ .

**Table 2.** Yield of onions, cv. LaSalle, sprayed with various fungicides at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

Treatment	Rate (/ha)	Yield (t/ha)	% Mkb	Size distribution (%) <sup>1</sup>			
				Jumbo (> 76 mm)	Large (76-64 mm)	Medium (64-45 mm)	Cull (< 45 mm)
A24367 + MASTERLOCK	1.54 + 0.5% v/v	44 ns <sup>2</sup>	83 ns	1 b <sup>2</sup>	29 abc	63 ab	7 ns
A24367	1.54	43	77	2 b	31 ab	56 ab	11
A24367 + AG SURF II	1.54 + 0.5% v/v	38	71	0 b	17 c	69 b	13
A24367 + LI700	1.54 + 0.5% v/v	36	68	2 b	24 bc	54 ab	21
A24580 + LI700	1.0 + 0.5% v/v	31	61	2 b	21 bc	56 ab	22
CHECK	-	43	86	6 a	39 a	50 a	5

<sup>1</sup>Percentage values were determined using weight.

<sup>2</sup>ns = not significant at  $P = 0.05$ .

<sup>3</sup>Numbers in a column followed by the same letter are not significantly different at  $P = 0.05$ , Fisher's Protected LSD.

**Table 3.** Phytotoxicity (%) ratings for onion, cv. LaSalle, treated with various fungicides and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Rate (L/ha)	Phytotoxicity plot ratings <sup>1,2</sup>		
		24 July	31 July	7 Aug
A24367	1.54	0	0	0
A24367 + LI700	1.54 + 0.5% v/v	0	0	0
A24367 + AG SURF II	1.54 + 0.5% v/v	0	0	0
A24367 + MASTERLOCK	1.54 + 0.5% v/v	0	0	0
A24580 + LI700	1.0 + 0.5% v/v	0	0	0
CHECK	-	0	0	0

<sup>1</sup> Phytotoxicity rating 0-10, where 0 = no toxicity, 1 = 1-10% crop injury, 2 = 11-20% crop injury, 3 = 21-30% crop injury, 4 = 31-40% crop injury, 5 = 41-50% crop injury, 6 = 51-60% crop injury, 7 = 61-70% crop injury, 8 = 71-80% crop injury, 9 = 81-90% crop injury, 10 = 91-100% crop injury

<sup>2</sup> Data set consists of zeros, and therefore was not statistically analyzed.

**Funding for this project was provided by Syngenta Crop Protection.**

**CROP:** Yellow cooking onions (*Allium cepa* L.), cv. Catskill  
**PEST:** Stemphylium leaf blight (*Stemphylium vesicarium* (Wallr.))

**AUTHORS:** VANDER KOOI K, SCICLUNA J & MCDONALD MR  
 U of Guelph, Dept. of Plant Agriculture, Ontario Crops Research Centre - Bradford

**TITLE:** EVALUATION OF FUNGICIDES FOR CONTROL OF STEMPHYLIUM LEAF BLIGHT ON ONION, 2025

**MATERIALS:** ALLEGRO (fluazinam 40.0%), MIRAVIS DUO (pydiflumetofen 75 g/L, difenoconazole 125 g/L), MIRAVIS PRIME (pydiflumetofen 150 g/L, fludioxonil 250 g/L), SCHOLAR (fludioxonil 230 g/L), FOLPAN (80.0% folpet)

#### METHODS:

Onions, cv. Catskill, were direct seeded ( $\approx 35$  seeds/m) on 5 May into organic soil (organic matter  $\approx 56.0\%$ , pH  $\approx 6.7$ ) at the Ontario Crops Research Centre - Bradford, Ontario. A randomized complete block arrangement with four replicates per treatment was used. Each replicate consisted of eight rows spaced 40 cm apart, and 5 m in length. Fungicide sprays were applied on 4, 11, 21, 28 July and 6 August using a tractor-mounted sprayer fitted with D-3 hollow-cone nozzles at 620 kPa calibrated to deliver 500 L/ha. Fungicide treatments were: ALLEGRO at 1.16 L/ha, MIRAVIS DUO at 1.0 L/ha, MIRAVIS PRIME at 0.8 L/ha, SCHOLAR at 0.87 L/ha and FOLPAN at 2.0 L/ha. An untreated check was also included. Stemphylium leaf blight (SLB) severity was assessed in each plot on 10, 15, 25 and 31 July. The three oldest green leaves of 20 plants per plot (10 plant from the middle rows of each bed) were rated based on a 0-4 scale for percentage leaf dieback where 0 = no symptoms, 1 = 1-10% dieback, 2 = 11-25% dieback, 3 = 26-50% dieback and 4 > 50% dieback. Total SLB severity out of 12 was calculated for each plant by adding the rating of each of the three leaves. A disease severity index (DSI) was calculated with the following formula:

$$\text{DSI} = \frac{\sum [(\text{class no.}) (\text{no. of leaves in each class})]}{(\text{total no. of leaves assessed}) (\text{no. of classes} - 1)} \times 100$$

The area under the disease progress curve (AUDPC) was calculated with the following formula:

$$\text{AUDPC} = \sum_{j=1}^{n_j-1} \left( \frac{y_j + y_{j+1}}{2} \right) (t_{j+1} - t_j)$$

where  $j$  is the order index for the assessments over time,  $n_j$  is the number of assessments,  $y_j$  is the average rating at day  $t_j$ ,  $y_{j+1}$  is the average rating at day  $t_{j+1}$  and  $(t_{j+1}-t_j)$  is the number of days between the assessments.

On 11 August, 20 onions randomly chosen from the inner rows of every replicate were pulled for a destructive assessment of disease severity. All leaves were removed and green leaves sorted into seven classes based on the percentage of the leaf area with symptoms of infection with *S.vesicarium*. The seven classes were: 0 = no disease, 1 = 1-4%, 2 = 5-10%, 3 = 11-25%, 4 = 26-50%, 5 = 51-75%, 6 > 75% with symptoms of SLB. DSI was calculated based on this assessment.

On 29 August, the onions in two 2.32 m sections of row were pulled from the inner rows for a yield sample and allowed to dry. Onions were weighed and graded for size on 20 October to determine yield. Data were analyzed using the General Analysis of Variance function of Statistix V.10. Means separation was obtained by using Fisher's Protected LSD test at P = 0.05 level of significance.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C) and September (16.6°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C.

Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

**RESULTS:** As presented in Tables 1-3.

**CONCLUSIONS:** SLB severity was low in 2025 with a DSI of 46 in the check in the destructive sampling assessment. There were no differences observed among treatments for DSI or AUDPC from the in-field assessments, except on 15 July FOLPAN had a slightly lower DSI than ALLEGRO, but not the check (Table 1). There were also no differences in incidence or severity in the destructive assessment (Table 2). No significant differences in marketable yield or percent marketable were found among the treatments (Table 3).

**Table 1.** *Stemphylium* leaf blight (SLB) severity and area under the disease progress curve (AUDPC) for onions, cv. Catskill, sprayed with various fungicides at the Ontario Crops Research Centre – Bradford, Holland Marsh, Ontario, 2025.

Treatment	DSI				AUDPC <sup>3</sup>
	10 July	15 July	25 July	31 July	
FOLPAN	17 ns <sup>1</sup>	30 a <sup>2</sup>	37 ns	42 ns	688 ns
MIRAVIS PRIME	20	32 ab	39	41	721
MIRAVIS DUO	22	33 ab	39	42	735
SCHOLAR	20	35 ab	40	44	771
ALLEGRO	22	39 b	39	39	774
CHECK	18	32 ab	40	42	729

<sup>1</sup> ns = not significant at  $P = 0.05$ .

<sup>2</sup> Numbers in a column followed by the same letter are not significantly different at  $P = 0.05$ , Fisher's Protected LSD test.

<sup>3</sup> AUDPC calculated based on the DSI for 10, 15, 25 and 31 July.

**Table 2.** *Stemphylium* leaf blight (SLB) incidence and severity for onions, cv. Catskill, sprayed with various fungicides and destructively sampled on 13 August, at the Ontario Crops Research Centre – Bradford, Holland Marsh, Ontario, 2025.

Treatment	SLB Incidence <sup>1</sup>	% Leaves Rated	DSI	Green
		0 or 1		leaves/plant
FOLPAN	85 ns <sup>2</sup>	30 ns	43 ns	5.7 ab <sup>3</sup>
MIRAVIS DUO	90	20	48	5.7 ab
MIRAVIS PRIME	91	22	51	5.5 ab
ALLEGRO	91	21	50	5.2 ab
SCHOLAR	93	17	52	5.1 b
CHECK	88	23	46	5.9 a

<sup>1</sup> On 13 August the leaves of 20 plants were sorted into classes: 0= no disease, 1 = 1-4%, 2 = 5-10%, 3 = 11-25%, 4 = 26-50%, 5 = 51-75%, 6 > 75% based on the percentage of leaf area infected with *Stemphylium*.

<sup>2</sup> ns = not significant at  $P = 0.05$ .

<sup>3</sup> Numbers in a column followed by the same letter are not significantly different at  $P = 0.05$ , Fisher's Protected LSD test.

**Table 3.** Yield of onions, cv. Catskill, sprayed with various fungicides at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

Treatment	Yield (t/ha)	% Mkb	Size distribution (%) <sup>1</sup>			
			Jumbo (> 76 mm)	Large (76-64 mm)	Medium (64-45 mm)	Cull (< 45 mm)
SCHOLAR	43 ns <sup>2</sup>	74 ns	0 ns	21 ns	68 ns	11 ns
MIRAVIS PRIME	42	76	1	19	69	11
ALLEGRO	41	76	0	19	70	11
MIRAVIS DUO	32	76	3	21	60	16
FOLPAN	32	67	1	9	75	15
CHECK	36	68	0	19	66	16

<sup>1</sup>Percentage values were determined using weight.

<sup>2</sup>ns = not significant at  $P = 0.05$ .

**Funding for this project was provided by the Fresh Vegetable Growers of Ontario, the California Garlic and Onion Research Advisory Board and Syngenta Crop Protection.**

**CROP:** Yellow cooking onions (*Allium cepa* L.), cv. LaSalle  
**PEST:** Stemphylium leaf blight (*Stemphylium vesicarium* (Wallr.))

**AUTHORS:** VANDER KOOI K, SCICLUNA J & MCDONALD MR  
 U of Guelph, Dept. of Plant Agriculture, Ontario Crops Research Centre - Bradford

**TITLE:** EVALUATION OF FUNGICIDES FOR CONTROL OF STEMPHYLIUM LEAF BLIGHT ON ONION, 2025

**MATERIALS:** SERIFEL 10 WP (*Bacillus amyloliquefaciens* strain MBI 600), SERENADE OPTI (*Bacillus subtilis* strain QST 713), MERIVON (pyraclostrobin 250 g/L, fluxapyroxad 250 g/L), ALLEGRO 500 F (fluazinam 40.0%)

#### METHODS:

Onions, cv. LaSalle, were direct seeded ( $\approx 35$  seeds/m) on 5 May into organic soil (organic matter  $\approx 45.1\%$ , pH  $\approx 7.2$ ) at the Ontario Crops Research Centre - Bradford, Ontario. A randomized complete block arrangement with four replicates per treatment was used. Each replicate consisted of four rows spaced 40 cm apart, and 6 m in length. Fungicide sprays were applied on 9, 16, 23 July and 1, 8 August using a CO<sub>2</sub> backpack sprayer equipped with four TeeJet 8002 fan nozzles calibrated to deliver 400 L/ha at 275 kPa. Fungicide treatments were: SERIFEL at 0.25 kg/ha, SERIFEL at 0.5 kg/ha, SERIFEL at 1.0 kg/ha, SERENADE OPTI at 2.5 kg/ha, SERIFEL at 0.25 kg/ha + MEIVON at 0.6 L/ha and ALLEGRO at 1.16 L/ha. An untreated check was also included. Stemphylium leaf blight (SLB) severity was assessed in each plot on 14, 21, 31 July and 7 August. The untreated check only was also assessed before the first fungicide application on 9 July. The three oldest green leaves of 20 plants per plot (10 plant from the middle rows of each bed) were rated based on a 0-4 scale for percentage leaf dieback where 0 = no symptoms, 1 = 1-10% dieback, 2 = 11-25% dieback, 3 = 26-50% dieback and 4 > 50% dieback. Total SLB severity out of 12 was calculated for each plant by adding the rating of each of the three leaves. A disease severity index (DSI) was calculated with the following formula:

$$DSI = \frac{\sum [(\text{class no.}) (\text{no. of leaves in each class})]}{(\text{total no. of leaves assessed}) (\text{no. of classes} - 1)} \times 100$$

The area under the disease progress curve (AUDPC) was calculated with the following formula:

$$AUDPC = \sum_{j=1}^{N_j-1} \left( \frac{y_j + y_{j+1}}{2} \right) (t_{j+1} - t_j)$$

where  $j$  is the order index for the assessments over time,  $n_j$  is the number of assessments,  $y_j$  is the average rating at day  $t_j$ ,  $y_{j+1}$  is the average rating at day  $t_{j+1}$  and  $(t_{j+1} - t_j)$  is the number of days between the assessments.

Phytotoxicity was assessed on a scale from 0-100, where zero indicates no phytotoxicity and 100 indicates all the plants in the plot are dead, on 14, 21, 31 July and 7, 12 August. On 13 August, 20 onions randomly chosen from the inner rows of every replicate were pulled. Leaves were removed and green leaves sorted into seven classes based on the percentage of the leaf area infected with Stemphylium. The seven classes were: 0 = no disease, 1 = 1-4%, 2 = 5-10%, 3 = 11-25%, 4 = 26-50%, 5 = 51-75%, 6 > 75% with symptoms of SLB. DSI was calculated based on this assessment.

On 3 September, the onions in two 2.32 m sections of row were pulled from the inner rows for a yield sample. Onions were weighed and graded for size on 24 October to determine yield. Data were analyzed

using the General Analysis of Variance function of Statistix V.10. Means separation was obtained by using Fisher's Protected LSD test at  $P = 0.05$  level of significance.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C) and September (16.6°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C. Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

**RESULTS:** As presented in Tables 1-4.

**CONCLUSIONS:** SLB severity was low in 2025 with a DSI of 47 in the check. There were no differences observed among treatments for DSI or AUDPC from the in-field assessments (Table 1) or for incidence and severity in the destructive assessment. ALLEGRO had slightly fewer green leaves per plant than SERIFEL at 0.5 kg/ha, but this did not differ from the check (Table 2). ALLEGRO had significantly lower yield than the check, SERIFEL at a rate of 0.25 kg/ha and SERENADE OPTI, but the trial experienced poor growth in some areas of the field, which likely impacted these results more than *Stemphylium* severity (Table 3). No phytotoxicity was observed in the trial (Table 4).

**Table 1.** *Stemphylium* leaf blight (SLB) severity and area under the disease progress curve (AUDPC) for onions, cv. LaSalle, sprayed with various fungicides at the Ontario Crops Research Centre – Bradford, Holland Marsh, Ontario, 2025.

Treatment	Rate (/ha)	DSI				AUDPC <sup>2</sup>
		14 July	21 July	31 July	7 Aug	
SERIFEL	0.5	28 ns <sup>1</sup>	38 ns	37 ns	49 ns	911 ns
SERIFEL	0.25 kg	31	35	38	52	913
ALLEGRO	1.16 L	29	38	37	52	924
SERIFEL + MERIVON	0.25 kg / 0.6 L	29	41	36	54	938
SERIFEL	1.0 kg	29	38	40	50	940
SERENADE OPTI	2.5 kg	34	36	41	49	944
CHECK	-	28	37	34	51	877

<sup>1</sup> ns = not significant at  $P = 0.05$ .

<sup>2</sup> AUDPC calculated based on the DSI for 14, 21, 31 July and 7 August.

**Table 2.** Stemphylium leaf blight (SLB) incidence and severity for onions, cv. LaSalle, sprayed with various fungicides and destructively sampled on 13 August, at the Ontario Crops Research Centre – Bradford, Holland Marsh, Ontario, 2025.

Treatment	Rate (/ha)	SLB Incidence <sup>1</sup>	% Leaves Rated 0 or 1	DSI	Green leaves/plant
SERIFEL	0.5 kg	79 ns <sup>2</sup>	34 ns	43 ns	6 a <sup>3</sup>
ALLEGRO	1.16 L	79	31	43	5 b
SERIFEL	1.0 kg	83	27	50	6 ab
SERIFEL + MERIVON	0.25 kg / 0.6 L	87	24	50	6 ab
SERENADE OPTI	2.5 kg	88	28	46	6 ab
SERIFEL	0.25 kg	88	23	50	6 ab
CHECK	-	82	29	47	6 ab

<sup>1</sup> On 13 August the leaves of 20 plants were sorted into classes: 0 = no disease, 1 = 1-4%, 2 = 5-10%, 3 = 11-25%, 4 = 26-50%, 5 = 51-75%, 6 > 75% based on the percentage of leaf area infected with Stemphylium.

<sup>2</sup> ns = not significant at  $P = 0.05$ .

<sup>3</sup> Numbers in a column followed by the same letter are not significantly different at  $P = 0.05$ , Fisher's Protected LSD test.

**Table 3.** Yield of onions, cv. LaSalle, sprayed with various fungicides at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

Treatment	Rate (/ha)	Yield (t/ha)	% Mkb	Size distribution (%) <sup>1</sup>			
				Jumbo (> 76 mm)	Large (76-64 mm)	Medium (64-45 mm)	Cull (< 45 mm)
SERIFEL	0.25	39 a <sup>2</sup>	83 a	1 ns <sup>3</sup>	27 ab	66 ab	6 a
SERENADE OPTI	2.5	38 a	83 a	3	33 a	57 ab	8 a
SERIFEL	0.5	34 ab	78 a	2	33 a	54 b	11 a
SERIFEL + MERIVON	0.25 kg / 0.6 L	33 ab	77 a	3	20 ab	67 ab	10 a
SERIFEL	1.0	27 ab	63 ab	0	18 ab	61 ab	21 ab
ALLEGRO	1.16 L	12 b	46 b	0	7 b	61 ab	32 b
CHECK	-	43 a	82 a	0	17 ab	74 a	9 a

<sup>1</sup> Percentage values were determined using weight.

<sup>2</sup> Numbers in a column followed by the same letter are not significantly different at  $P = 0.05$ , Fisher's Protected LSD test.

<sup>3</sup> ns = not significant at  $P = 0.05$ .

**Table 4.** Phytotoxicity (%) ratings for onion, cv. LaSalle, treated with various fungicides and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Rate (/ha)	Phytotoxicity plot ratings <sup>1,2</sup>				
		14 July	21 July	31 July	7 Aug	12 Aug
SERIFEL	1.0	0	0	0	0	0
SERENADE OPTI	2.5	0	0	0	0	0
SERIFEL	0.5	0	0	0	0	0
ALLEGRO	1.16 L	0	0	0	0	0
SERIFEL	0.25	0	0	0	0	0
SERIFEL + MERIVON	0.25 kg / 0.6 L	0	0	0	0	0
CHECK	-	0	0	0	0	0

<sup>1</sup>Phytotoxicity rating 0-10, where 0 = no toxicity, 1 = 1-10% crop injury, 2 = 11-20% crop injury, 3 = 21-30% crop injury, 4 = 31-40% crop injury, 5 = 41-50% crop injury, 6 = 51-60% crop injury, 7 = 61-70% crop injury, 8 = 71-80% crop injury, 9 = 81-90% crop injury, 10 = 91-100% crop injury

<sup>2</sup>Data set consists of zeros, and therefore was not statistically analyzed.

**Funding for this project was provided by BASF.**

**CROP:** Yellow cooking onions (*Allium cepa* L.), cv. Catskill  
**PEST:** Stemphylium leaf blight (*Stemphylium vesicarium* (Wallr.))

**AUTHORS:** VANDER KOOI K, SCICLUNA J & MCDONALD MR  
 U of Guelph, Dept. of Plant Agriculture, Ontario Crops Research Centre - Bradford

**TITLE:** EVALUATION OF FUNGICIDES FOR CONTROL OF STEMPHYLIUM LEAF BLIGHT ON ONION, 2025

**MATERIALS:** SERIFEL 10 WP (*Bacillus amyloliquefaciens* strain MBI 600), SERENADE OPTI (*Bacillus subtilis* strain QST 713), MERIVON (pyraclostrobin 250 g/L, fluxapyroxad 250 g/L), ALLEGRO 500 F (fluazinam 40.0%)

#### METHODS:

Onions, cv. Catskill, were direct seeded ( $\approx 35$  seeds/m) on 5 May into organic soil (organic matter  $\approx 62.9\%$ , pH  $\approx 6.6$ ) at the Ontario Crops Research Centre - Bradford, Ontario. A randomized complete block arrangement with four replicates per treatment was used. Each replicate consisted of four rows spaced 40 cm apart, and 6 m in length. Fungicide sprays were applied on 9, 16, 23 July and 1, 8 August using a CO<sub>2</sub> backpack sprayer equipped with four TeeJet 8002 fan nozzles calibrated to deliver 400 L/ha at 275 kPa. Fungicide treatments were: SERIFEL at 0.25 kg/ha, SERIFEL at 0.5 kg/ha, SERIFEL at 1.0 kg/ha, SERENADE OPTI at 2.5 kg/ha, SERIFEL at 0.25 kg/ha + MEIVON at 0.6 L/ha and ALLEGRO at 1.16 L/ha. An untreated check was also included. Stemphylium leaf blight (SLB) severity was assessed in each plot on 14, 21, 31 July and 7 August. The untreated check only was also assessed before the first fungicide application on 9 July. The three oldest green leaves of 20 plants per plot (10 plant from the middle rows of each bed) were rated based on a 0-4 scale for percentage leaf dieback where 0 = no symptoms, 1 = 1-10% dieback, 2 = 11-25% dieback, 3 = 26-50% dieback and 4 > 50% dieback. Total SLB severity out of 12 was calculated for each plant by adding the rating of each of the three leaves. A disease severity index (DSI) was calculated with the following formula:

$$DSI = \frac{\sum [(class\ no.) (no.\ of\ leaves\ in\ each\ class)]}{(total\ no.\ of\ leaves\ assessed) (no.\ of\ classes - 1)} \times 100$$

The area under the disease progress curve (AUDPC) was calculated with the following formula:

$$AUDPC = \sum_{j=1}^{N_j-1} \left( \frac{y_j + y_{j+1}}{2} \right) (t_{j+1} - t_j)$$

where  $j$  is the order index for the assessments over time,  $n_j$  is the number of assessments,  $y_j$  is the average rating at day  $t_j$ ,  $y_{j+1}$  is the average rating at day  $t_{j+1}$  and  $(t_{j+1}-t_j)$  is the number of days between the assessments.

Phytotoxicity was assessed on a scale from 0-100, where zero indicates no phytotoxicity and 100 indicates all the plants in the plot are dead, on 14, 21, 31 July and 7, 12 August. On 13 August, 20 onions randomly chosen from the inner rows of every replicate were pulled. Leaves were removed and green leaves sorted into seven classes based on the percentage of the leaf area infected with Stemphylium. The seven classes were: 0 = no disease, 1 = 1-4%, 2 = 5-10%, 3 = 11-25%, 4 = 26-50%, 5 = 51-75%, 6 > 75% with symptoms of SLB. DSI was calculated based on this assessment.

On 8 September, the onions in two 2.32 m sections of row were pulled from the inner rows for a yield sample. Onions were weighed and graded for size on 1 October to determine yield. Data were analyzed

using the General Analysis of Variance function of Statistix V.10. Means separation was obtained by using Fisher's Protected LSD test at  $P = 0.05$  level of significance.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C) and September (16.6°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C. Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

**RESULTS:** As presented in Tables 1-4.

**CONCLUSIONS:** SLB severity was low in 2025 with a DSI of 38 in the check. There were no differences observed among treatments for DSI or AUDPC from the in-field assessments (Table 1). There were also no differences in incidence or severity in the destructive assessment (Table 2). No significant differences in yield or percent marketable were found among the treatments (Table 3). No phytotoxicity was observed in the trial (Table 4).

**Table 1.** *Stemphylium* leaf blight (SLB) severity and area under the disease progress curve (AUDPC) for onions, cv. Catskill, sprayed with various fungicides at the Ontario Crops Research Centre – Bradford, Holland Marsh, Ontario, 2025.

Treatment	Rate (/ha)	DSI				AUDPC <sup>2</sup>
		14 July	21 July	31 July	7 Aug	
SERIFEL	1.0 kg	18 ns <sup>1</sup>	25 ns	28 ns	44 ns	668 ns
ALLEGRO	1.16 L	15	26	30	43	680
SERIFEL	0.25 kg	16	28	30	41	688
SERENADE OPTI	2.5 kg	19	25	30	45	694
SERIFEL + MERIVON	0.25 kg / 0.6 L	20	26	30	43	697
SERIFEL	0.5 kg	17	30	30	43	719
CHECK	-	21	26	32	47	734

<sup>1</sup>ns = not significant at  $P = 0.05$ .

<sup>2</sup>AUDPC calculated based on the DSI for 14, 21, 31 July and 7 August.

**Table 2.** *Stemphylium* leaf blight (SLB) incidence and severity for onions, cv. Catskill, sprayed with various fungicides and destructively sampled on 13 August, at the Ontario Crops Research Centre – Bradford, Holland Marsh, Ontario, 2025.

Treatment	Rate (/ha)	SLB	% Leaves	DSI	Green
		Incidence <sup>1</sup>	Rated 0 or 1		
SERIFEL	1.0 kg	70 ns <sup>2</sup>	50 ns	31 ns	6 ns
SERENADE OPTI	2.5 kg	70	48	32	6
ALLEGRO	1.16 L	71	48	32	6
SERIFEL	0.25 kg	71	44	35	6
SERIFEL + MERIVON	0.25 kg / 0.6 L	78	38	38	6
SERIFEL	0.5 kg	82	37	39	6
CHECK	-	76	41	38	6

<sup>1</sup>On 13 August the leaves of 20 plants were sorted into classes: 0 = no disease, 1 = 1-4%, 2 = 5-10%, 3 = 11-25%, 4 = 26-50%, 5 = 51-75%, 6 > 75% based on the percentage of leaf area infected with *Stemphylium*.

<sup>2</sup>ns = not significant at  $P = 0.05$ .

**Table 3.** Yield of onions, cv. Catskill, sprayed with various fungicides at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

Treatment	Rate (/ha)	Yield (t/ha)	% Mkb	Size distribution (%) <sup>1</sup>			
				Jumbo (> 76 mm)	Large (76-64 mm)	Medium (64-45 mm)	Cull (< 45 mm)
SERIFEL	1.0 kg	78 ns <sup>2</sup>	94 ns	4 ns	47 ns	47 ns	2 ns
SERENADE OPTI	2.5 kg	77	95	5	48	45	2
SERIFEL	0.5 kg	76	92	3	49	46	2
ALLEGRO	1.16 L	73	92	6	40	51	3
SERIFEL	0.25 kg	72	94	6	44	48	2
SERIFEL + MERIVON	0.25 kg / 0.6 L	71	93	5	43	49	3
CHECK	-	76	96	4	42	52	1

<sup>1</sup> Percentage values were determined using weight.

<sup>2</sup> ns = not significant at  $P = 0.05$ .

**Table 4.** Phytotoxicity (%) ratings for onion, cv. Catskill, treated with various fungicides and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Rate (/ha)	Phytotoxicity plot ratings <sup>1,2</sup>				
		14 July	21 July	31 July	7 Aug	12 Aug
SERIFEL	1.0 kg	0	0	0	0	0
SERENADE OPTI	2.5 kg	0	0	0	0	0
SERIFEL	0.5 kg	0	0	0	0	0
ALLEGRO	1.16 L	0	0	0	0	0
SERIFEL	0.25 kg	0	0	0	0	0
SERIFEL + MERIVON	0.25 kg / 0.6 L	0	0	0	0	0
CHECK	-	0	0	0	0	0

<sup>1</sup> Phytotoxicity rating 0-10, where 0 = no toxicity, 1 = 1-10% crop injury, 2 = 11-20% crop injury, 3 = 21-30% crop injury, 4 = 31-40% crop injury, 5 = 41-50% crop injury, 6 = 51-60% crop injury, 7 = 61-70% crop injury, 8 = 71-80% crop injury, 9 = 81-90% crop injury, 10 = 91-100% crop injury

<sup>2</sup> Data set consists of zeros, and therefore was not statistically analyzed.

**Funding for this project was provided by BASF.**

**CROP:** Yellow cooking onions (*Allium cepa* L.), cv. Catskill  
**PEST:** Stemphylium leaf blight (*Stemphylium vesicarium* (Wallr.))

**AUTHORS:** SCICLUNA J<sup>1</sup>, VANDER KOOI K<sup>1</sup>, GOSSEN BD<sup>2</sup> & MCDONALD MR<sup>1</sup>  
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**TITLE:** **EVALUATION OF DISEASE FORECASTING MODELS FOR MANAGEMENT OF STEMPHYLIUM LEAF BLIGHT ON ONION, 2025**

**MATERIALS:** ALLEGRO 500 F (fluazinam 40.0%), MIRAVIS DUO (pydiflumetofen 75 g/L, difenoconazole 125 g/L)

#### **METHODS:**

Onions, cv. Catskill, were direct seeded ( $\approx 35$  seeds/m) on 5 May into organic soil (organic matter  $\approx 70.0\%$ , pH  $\approx 5.6$ ) at the Ontario Crops Research Centre - Bradford, Ontario. A randomized complete block arrangement with four replicates per treatment was used. Each replicate consisted of eight rows spaced 40 cm apart, and 5 m in length. Fungicide sprays were applied on 27 June, 4, 11, 21, 28 July and 6 August using a tractor-mounted sprayer fitted with D-3 hollow-cone nozzles at 620 kPa calibrated to deliver 500 L/ha. The forecasting models were: a calendar spray (fungicides applied every 7-10 days starting at the 3<sup>rd</sup>-4<sup>th</sup> true leaf stage), TOMcast with a threshold of 15 disease severity values (DSVs) and STEMcast 3.0 with a threshold of 15 DSVs. A nontreated check was also included. The plots were sprayed with ALLEGRO at 1.16 L/ha alternated with MIRAVIS DUO at 1.0 L/ha when forecasting models called for applications. Stemphylium leaf blight (SLB) severity was assessed in each plot on 7, 15, 25 and 31 July. The three oldest green leaves of 20 plants per plot (10 plant from the middle rows of each bed) were rated based on a 0-4 scale for percentage leaf dieback where 0 = no symptoms, 1 = 1-10% dieback, 2 = 11-25% dieback, 3 = 26-50% dieback and 4 > 50% dieback. Total SLB severity out of 12 was calculated for each plant by adding the rating of each of the three leaves. A disease severity index (DSI) was calculated with the following formula:

$$DSI = \frac{\sum [(\text{class no.}) (\text{no. of leaves in each class})]}{(\text{total no. of leaves assessed}) (\text{no. of classes} - 1)} \times 100$$

The area under the disease progress curve (AUDPC) was calculated with the following formula:

$$AUDPC = \sum_{j=1}^{n_j-1} \left( \frac{y_j + y_{j+1}}{2} \right) (t_{j+1} - t_j)$$

where  $j$  is the order index for the assessments over time,  $n_j$  is the number of assessments,  $y_j$  is the average rating at day  $t_j$ ,  $y_{j+1}$  is the average rating at day  $t_{j+1}$  and  $(t_{j+1}-t_j)$  is the number of days between the assessments.

On 8 August, 20 onions randomly chosen from the inner rows of every replicate were pulled. Leaves were removed and green leaves sorted into seven classes based on the percentage of the leaf area infected with Stemphylium. The seven classes were: 0 = no disease, 1 = 1-4%, 2 = 5-10%, 3 = 11-25%, 4 = 26-50%, 5 = 51-75%, 6 > 75% with symptoms of SLB. DSI was calculated based on this assessment.

On 29 August, the onions in two 2.32 m sections of row were pulled from the inner rows for a yield sample. Onions were weighed and graded for size on 24 October to determine yield. Data were analyzed using the

General Analysis of Variance function of Statistix V.10. Means separation was obtained by using Fisher's Protected LSD test at  $P = 0.05$  level of significance.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C) and September (16.6°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C.

Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

**RESULTS:** As presented in Tables 3-5.

**CONCLUSIONS:** SLB severity was low in 2025 with a DSI of 35 in the check. There were no differences observed among treatments for DSI or AUDPC from the in-field assessments (Table 1). There were also no differences in incidence or severity in the destructive assessment (Table 2). No significant differences in yield or percent marketable were found among the treatments (Table 3). This indicates that fungicide applications are not needed to manage SLB when disease severity is this low. The STEMcast 3.0 model may be useful for forecasting SLB in low disease pressure years because it did not trigger any fungicide applications in this low disease year.

**Table 1.** Temperature and leaf wetness combinations required to accumulate disease severity values (DSVs) with the STEMcast 3.0 model.

Temperature (°C)	Leaf wetness duration (hr)				
13–15	0–16	17–20	21+		
16–17	0–12	13–16	17–20	21+	
18–20	0–11	12–14	15–16	17+	
21–25	0–9	10–11	12–15	16–20	21+
<b>DSV Scale</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>

**Table 2.** Dates of application of the fungicides ALLEGRO and MIRAVIS DUO for each treatment in an onion trial at the Ontario Crops Research Centre – Bradford in 2025.

Treatment	27 June	4 July	11 July	21 July	28 July	6 Aug
Calendar	ALLEGRO	MIRAVIS DUO	ALLEGRO	MIRAVIS DUO	ALLEGRO	MIRAVIS DUO
TOMcast 15	-	ALLEGRO	-	MIRAVIS DUO	-	ALLEGRO
STEMcast 3.0 15	-	-	-	-	-	-
Check	-	-	-	-	-	-

**Table 3.** Stemphylium leaf blight (SLB) severity and area under the disease progress curve (AUDPC) for onions, cv. Catskill, sprayed with fungicides timed according to forecasting models at the Ontario Crops Research Centre – Bradford, Holland Marsh, Ontario, 2025.

Treatment	# Sprays	DSI				AUDPC <sup>2</sup>
		7 July	15 July	25 July	31 July	
STEMcast 3.0 15	0	26 ns <sup>1</sup>	29 ns	49 ns	42 ns	885 ns
Calendar	6	28	30	51	46	932
TOMcast 15	3	27	33	50	44	933
Check	0	27	30	50	43	904

<sup>1</sup> ns = not significant at  $P = 0.05$ .

<sup>2</sup> AUDPC calculated based on the DSI for 7, 15, 25, 31 July.

**Table 4.** Stemphylium leaf blight (SLB) incidence and severity for onions, cv. Catskill, sprayed with fungicides timed according to forecasting models and destructively sampled on 8 August, at the Ontario Crops Research Centre – Bradford, Holland Marsh, Ontario, 2025.

Treatment	# Sprays	SLB Incidence <sup>1</sup>	% Leaves	DSI	Green
			Rated 0 or 1		
TOMcast 15	3	88 ns <sup>2</sup>	39 ns	36 ns	6 ns
STEMcast 3.0 15	0	89	39	37	5
Calendar	6	90	33	38	6
Check	0	89	44	35	6

<sup>1</sup> On 8 August the leaves of 20 plants were sorted into classes: 0 = no disease, 1 = 1-4%, 2 = 5-10%, 3 = 11-25%, 4 = 26-50%, 5 = 51-75%, 6 > 75% based on the percentage of leaf area infected with Stemphylium.

<sup>2</sup> ns = not significant at  $P = 0.05$ .

**Table 5.** Yield of onions, cv. Catskill, sprayed with fungicides timed according to forecasting models at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

Treatment	# Sprays	Yield (t/ha)	% Mkb	Size distribution (%) <sup>1</sup>			
				Jumbo (> 76 mm)	Large (76-64 mm)	Medium (64-45 mm)	Cull (< 45 mm)
TOMcast 15	3	56 ns <sup>2</sup>	87 ns	1 ns	25 ns	69 ns	5 ns
STEMcast 3.0 15	0	54	84	3	29	63	6
Calendar	6	53	88	3	33	60	4
Check	0	59	89	3	28	64	4

<sup>1</sup> Percentage values were determined using weight.

<sup>2</sup> ns = not significant at  $P = 0.05$ .

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**CROP:** Yellow cooking onions (*Allium cepa* L.) cv. Catskill

**AUTHORS:** EZEH IN, VANDER KOOI K, and MCDONALD MR  
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**TITLE:** **EFFECT OF PRE-PLANT AND FOLIAR FERTILIZER ON NUTRIENT STATUS AND STEMPHYLIUM LEAF BLIGHT SEVERITY ON ONIONS, 2025**

**METHODS:** A field trial was conducted on a muck soil site at the Ontario Crops Research Centre-Bradford (organic matter 71.4%, pH 5.8). Onions were direct-seeded on 14 May 2025 in double lines at 36 to 40 seeds per meter. Each experimental unit consisted of two adjacent 7 m beds, each 3.5 m wide, with four onion rows spaced 40 cm apart. The experiment was a two-factor factorial in a randomized complete block design with four replications.

Factor one was preplant fertilizer: (1) no preplant fertilizer or (2) recommended preplant fertilizer based on soil tests and OMAFA recommendations for nitrogen. Preplant nitrogen recommendations for onions on muck soils are based on crop requirements rather than soil tests, as soil nitrate (NO<sub>3</sub>) levels are highly variable and often unreliable due to rapid mineralization and soil mobility. In 2025, preplant applications included AXAN (ammonium nitrate) and MESZ (MicroEssentials SZ) to provide 90 kg/ha N and 50 kg/ha P; potassium was omitted as soil tests showed sufficient levels. Preplant fertilizer was broadcast and incorporated on 6 May. Factor two was foliar fertilizer with three levels: (1) no foliar fertilizer; (2) manganese sulphate (MnSO<sub>4</sub>) only; or (3) a complete foliar program (Table 3.2). Foliar treatments were applied five times between 10 June and 1 August using air-induction nozzles at 414 kPa, delivering 200 L/ha.

Onion leaf nutritional status was assessed using the most recently mature leaf from five plants per row in the two center rows. Samples were collected on 3, 15, and 29 July. Leaves were scanned using Picketa Leaf Evaluated Nutrient System (LENS) technology and then sent to the SGS Laboratory (Guelph) for analysis of 11 nutrients. Results were compared to the OMAFA Vegetable Guide 839 sufficiency ranges. Nutrient concentrations were reported for nitrogen (N), phosphorus (P), potassium (K), magnesium (Mg), zinc (Zn), manganese (Mn), and sulphur (S).

Visual ratings for Stemphylium leaf blight (SLB) occurred weekly from 4 July to 5 August. Twenty plants per replicate were assessed on the three oldest leaves using a 0 to 4 scale (0 = no disease, 4 = >50% dieback). On 12 August, leaves were harvested and sorted into seven classes (0 to 6) based on the percent leaf area affected to determine the disease severity index (DSI). These classes were used to determine the disease severity index (DSI) using the following formula:

$$DSI = \frac{\sum[(\text{class no.})(\text{no. of leaves in each class})]}{(\text{Total no. of leaves assessed})(\text{no. classes} - 1)} \times 100$$

The area under the disease progress curve (AUDPC) was calculated for each plot using the trapezoid method based on SLB severity ratings collected on six dates (4 July to 12 August) with the following formula:

$$AUDPC = \sum_{j=1}^{N_j-1} \left( \frac{y_j + y_{j+1}}{2} \right) (t_{j+1} - t_j)$$

where  $j$  is the order index for the assessments over time,  $N_j$  is the number of assessments,  $y_j$  is the average rating at day  $t_j$ ,  $y_{j+1}$  is the average rating at day  $t_{j+1}$  and  $(t_{j+1}-t_j)$  is the number of days between the assessments.

Yield samples were harvested on 9 September from 2.32 m sections of the two middle rows. Onions were graded on 23 September into jumbo (>76 mm), large (76 to 64 mm), medium (64 to 45 mm), and cull (<45 mm). Marketable yield included jumbo, large, and medium grades.

All statistical analyses were conducted using PROC GLIMMIX in SAS 9.4 (SAS Institute, Cary, USA). Type III tests of fixed effects were used, and least-squares means were separated using the Tukey–Kramer adjustment. For the fertilizer trial, preplant fertilizer and foliar fertilizer programs were treated as fixed effects, and replicate was included as a random effect. For tissue nutrient concentrations, the model included preplant fertilizer, foliar fertilizer, method of assessment (LENS vs. laboratory), and sampling date as fixed effects, with replicate as the random effect. Relationships among tissue nutrient concentrations, *Stemphylium* leaf blight (SLB) severity, and yield were evaluated using Pearson correlation coefficients (PROC CORR).

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C) and September (16.6°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C. Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm), and above average for May (112 mm), July (84 mm), and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

**RESULTS:** as presented in Tables 3 to 8 and Figure 1.

**CONCLUSIONS:** Tissue nutrient analysis across both LENS and laboratory testing indicated that onion nutrient concentrations were generally within or above sufficiency ranges throughout the season. Differences existed between the two diagnostic methods: the LENS consistently reported higher absolute values for K, Mg, Zn, and Mn compared to laboratory analysis. The laboratory results showed a seasonal decline in nitrogen (N) and phosphorus (P), but LENS values remained relatively stable. Laboratory analysis specifically detected elevated Zn and Mn concentrations in plots receiving the OCRC foliar program by mid July. In contrast, the LENS was less sensitive to these foliar micronutrient fluctuations, showing no increases in Zn and only a small increase in Mn.

There were no interactions between preplant and foliar fertilizer treatments for any parameter. SLB severity increased progressively from early July through August. The main effect of preplant fertilizer was observed early in the season, resulting in a transient increase in *Stemphylium* leaf blight (SLB) severity on 15 July compared to the no-preplant control. This effect did not persist, and by the final destructive assessment on 12 August, there were no differences in disease severity among fertilizer treatments. No significant correlations between SLB and yield were found at any assessment dates in 2025.

There were no effects of preplant fertilizer treatments on yield. However, correlation analysis identified a significant positive relationship between LENS-measured N on 15 July and marketable yield. The laboratory-measured N did not correlate with yield on the same date.

**Table 1:** Soil nutrient test report and interpretations based on OMAFA guidelines

Nutrient	Soil test Level (ppm)	Interpretation	OMAFa recommendation
Nitrogen (NO <sub>3</sub> -N)	Not reported	Not routinely measured on muck soils.	Apply 90 kg/ha preplant.
Phosphorus (P)	39.0	Medium	Apply 50 kg/ha P <sub>2</sub> O <sub>5</sub>
Potassium (K)	328.0	Very High	None required
Calcium (Ca)	4880.0	High	None required
Magnesium (Mg)	447.0	High	None required
Zinc (Zn)	11.3	Adequate	None required
Manganese (Mn)	4.0	Soil Mn is not reliable	Foliar application required
Copper (Cu)	18.0	High	None required
Boron (B)	6.5	Unreliable soil test	Apply only if the tissue test shows a deficiency

**Table 2:** Summary of fertilizer types, recommended rate and application amount

Category	Product	OMAFRA recommended rate (kg ha <sup>-1</sup> )	Application rate used	Estimated nutrients supplied (kg ha <sup>-1</sup> ) <sup>3</sup>	Amount applied per plot (kg) <sup>4</sup>	Dates
Pre-plant fertilizer	Nitrogen (AXAN 27-0-0)	90 <sup>1</sup>	278 kg ha <sup>-1</sup>	75 N	0.68	May 6
	Phosphorus MESZ (40% P <sub>2</sub> O <sub>5</sub> , 12% N)	50	125 kg ha <sup>-1</sup>	50 P <sub>2</sub> O <sub>5</sub> , 15 N	0.31	May 6
OCRC foliar program	Mag Max		3.0 L ha <sup>-1</sup>	0.3 Mg		10, 21
	Calcimax		3.0 L ha <sup>-1</sup>	0.75 Ca		June, 01,
	Zinc Max		3.0 L ha <sup>-1</sup>	0.9 Zn		12 July and
	Alexin		3.0 L ha <sup>-1</sup>	-		01 August
	Manganese Sulfate		2.0 kg ha <sup>-1</sup>	3.2 Mn		
	Copper Max		1.0 L ha <sup>-1</sup>	0.25 Cu		
	Nutri Bor		1.0 L ha <sup>-1</sup>	0.5 B		
	Suprafeed 20-20-20		3.0 kg ha <sup>-1</sup> 2.0 kg ha <sup>-1</sup>	- 2.0 each of N, P <sub>2</sub> O <sub>5</sub> , K <sub>2</sub> O		
Manganese foliar fertilizer	Manganese sulphate (MnSO <sub>4</sub> )	10 <sup>2</sup>	2.0 kg ha <sup>-1</sup> in 500 L ha <sup>-1</sup> of water	3.2 Mn		5, 11, 21, 28 July and 06 August

<sup>1</sup> Target rate of 90 kg N ha<sup>-1</sup> was achieved through a combination of AXAN (75 kg N) and MESZ (15 kg N).

<sup>2</sup> Recommended rate is based on 2.0 kg ha<sup>-1</sup> applied across 5 sprays.

<sup>3</sup> Total estimated nutrient supplied for all foliar programs

<sup>4</sup> The area of the treatment plot was 24.5 m<sup>2</sup>. Product amounts per plot were calculated from the application rate (per ha) and the plot area.

**Table 3:** Nutrient status in onion leaves and sufficiency range on 3 July 2025

Sampling method	Treatments	N <sup>1</sup> (%)	P (%)	K (%)	Mg (%)	Zn (ppm)	Mn (ppm)	S <sup>2</sup> (%)
LENS	Preplant + No foliar	3.3 b <sup>3</sup>	0.37 ab	11 a	0.3 a	47 a	37 a	0.9 ns <sup>4</sup>
	Preplant + Mn foliar	3.5 b	0.38 a	12 a	0.3 a	48 a	36 a	0.9
	No preplant + No foliar	3.5 b	0.37 ab	12 a	0.3 a	47 a	36 a	0.9
	No preplant + Mn foliar	3.8 ab	0.38 a	15 a	0.3 a	49 a	37 a	0.9
Lab	Preplant + No foliar	4.2 a	0.33 bc	5 b	0.2 b	29 b	25 b	0.8
	Preplant + Mn foliar	4.2 a	0.30 d	5 b	0.2 b	27 b	20 bc	0.7
	No preplant + No foliar	4.2 a	0.31 cd	5 b	0.2 b	28 b	18 c	0.7
	No preplant + Mn foliar	4.2 a	0.31 cd	5 b	0.2 b	30 b	19 bc	0.9
Sufficiency range		2-3	0.2–0.5	1.5 – 3	0.15 – 0.3	15 – 20	10 – 20	0.2 – 0.6
SGS Critical range		3.5	0.35	4	0.2	30	20	0.35

<sup>1,2</sup> Lab nutrients are reported “as is” (no moisture adjustment); LENS values are reported as percentages.

<sup>3</sup> Means with the same letter in a column are not significantly different (Tukey–Kramer,  $p > 0.05$ ).

<sup>4</sup> ns = no significant differences among treatments.

**Table 4:** Nutrient status in onion leaves and sufficiency range on 15 July 2025

Sampling method	Treatment	N <sup>1</sup> (%)	P (%)	K (%)	Mg (%)	Zn (ppm)	Mn (ppm)	S <sup>2</sup> (%)
LENS	Preplant fertilizer + No foliar	3.3 ns <sup>3</sup>	0.4 a <sup>4</sup>	12 a	0.23 ab	48 b	36 b	1.0 a
	Preplant fertilizer + OCRC foliar program	3.5	0.4 a	13 a	0.24 a	49 b	35 b	1.0 a
	Preplant fertilizer + Mn foliar	3.3	0.4 a	11 a	0.22 ab	48 b	35 b	1.0 a
	No preplant fertilizer + No foliar	3.4	0.4 a	12 a	0.24 a	48 b	36 b	1.0 a
	No preplant fertilizer + OCRC foliar program	3.3	0.4 a	11 a	0.22 ab	48 b	36 b	1.0 a
	No preplant fertilizer + Mn foliar	3.4	0.4 a	12 a	0.24 a	48 b	35 b	1.0 a
	Lab	Preplant fertilizer + No foliar	3.6	0.3 b	4 b	0.18 b	23 c	25 b
Preplant fertilizer + OCRC foliar program		3.7	0.3 b	4 b	0.18 b	76 a	130 a	0.7 b
Preplant fertilizer + Mn foliar		3.7	0.3 b	4 b	0.19 ab	24 c	34 b	0.7 b
No preplant fertilizer + No foliar		3.6	0.3 b	4 b	0.19 ab	28 c	30 b	0.7 b
No preplant fertilizer + OCRC foliar program		3.6	0.3 b	4 b	0.18 b	70 a	120 a	0.7 b
No preplant fertilizer + Mn foliar		3.7	0.3 b	4 b	0.18 b	23 c	29 b	0.7 b
Sufficiency range			2-3	0.2– 0.5	1.5 – 3	0.15 – 0.3	15 – 20	10 – 20
SGS Critical range		3.5	0.35	4	0.2	30	20	0.35

<sup>1,2</sup> Lab nutrients are reported “as is” (no moisture adjustment); LENS values are reported as percentages.

<sup>3</sup> ns = no significant differences among treatments.

<sup>4</sup> Means with the same letter in a column are not significantly different (Tukey–Kramer,  $p > 0.05$ ).

**Table 5:** Nutrient status in onion leaves and sufficiency range on 29 July 2025

Sampling method	Treatment	N <sup>1</sup> (%)	P (%)	K (%)	Mg (%)	Zn (ppm)	Mn (ppm)	S <sup>2</sup> (%)
LENS	Preplant fertilizer + No foliar	3.0 ns <sup>3</sup>	0.4 a <sup>4</sup>	7 a	0.21 ns	45 a	37 bc	1.0 a
	Preplant fertilizer + OCRC foliar program	3.0	0.4 a	8 a	0.21	46 a	37 bc	1.0 a
	Preplant fertilizer + Mn foliar	3.1	0.4 a	7 a	0.22	46 a	38 abc	1.0 a
	No preplant fertilizer + No foliar	3.0	0.4 a	7 a	0.21	45 a	37 bc	1.0 a
	No preplant fertilizer + OCRC foliar program	3.0	0.4 a	5 ab	0.20	43 a	38 abc	1.0 a
	No preplant fertilizer + Mn foliar	3.0	0.4 a	7 a	0.21	44 a	38 abc	1.0 a
	Lab	Preplant fertilizer + No foliar	3.0	0.2 b	4 b	0.19	17 b	37 bc
Preplant fertilizer + OCRC foliar program		3.0	0.2 b	4 b	0.19	41 a	74 a	0.6 b
Preplant fertilizer + Mn foliar		3.0	0.2 b	4 b	0.19	18 b	39 abc	0.6 b
No preplant fertilizer + No foliar		3.1	0.2 b	4 b	0.19	15 b	20 c	0.6 b
No preplant fertilizer + OCRC foliar program		3.0	0.2 b	4 b	0.19	37 a	60 ab	0.6 b
No preplant fertilizer + Mn foliar		3.0	0.2 b	4 b	0.20	18 b	59 ab	0.6 b
Sufficiency range			2-3	0.2– 0.5	1.5 – 3	0.15 – 0.3	15 – 20	10 – 20
SGS Critical range		3.5	0.35	4	0.2	30	20	0.35

<sup>1,2</sup> Lab nutrients are reported “as is” (no moisture adjustment); LENS values are reported as percentages.

<sup>3</sup> ns = no significant difference among treatments.

<sup>4</sup> Means with the same letter in a column are not significantly different (Tukey–Kramer,  $p > 0.05$ ).

**Table 6.** Main effects of pre-plant and foliar fertilizer treatments on yield and size distribution of onions 2025

Treatment	Total yield (t ha <sup>-1</sup> )	Marketable yield (t ha <sup>-1</sup> )	Size distribution (%) <sup>1</sup>			
			Jumbo (>76 mm)	Large (76-64 mm)	Medium (64-45 mm)	Cull (<45 mm)
<b>Pre-plant fertilizer</b>						
Yes	58.6 ns <sup>2</sup>	56.8 ns	8.0 ns	40.2 ns	48.8 ns	3.0 ns
No	56.3	54.9	8.7	42.9	45.8	2.6
<b>Foliar fertilizer</b>						
OCRC foliar program	60.2 ns	58.4 ns	8.0 ns	41.5 ns	47.5 ns	3.0 ns
No foliar	56.9	55.4	10.0	41.8	45.5	2.7
Mn foliar	55.2	53.7	7.1	41.2	48.9	2.8

<sup>1</sup> Percentage values were determined using weight.

<sup>2</sup> ns = no significant difference among treatments within a fertilizer group

**Table 7.** Main effects of fertilizer applications on the disease severity index (DSI) of *Stemphylium* leaf blight at the Ontario Crops Research Centre-Bradford, 2025.

Treatment	4 July	15 July	22 July	29 July	5 August	12 August
<b>Pre-plant fertilizer</b>						
Yes	5 ns <sup>1</sup>	48 a <sup>2</sup>	50 ns	61 ns	67 ns	42 ns
No	5	43 b	51	59	66	40
<b>Foliar fertilizer</b>						
Mn foliar	5 ns	47 ns	51 ns	59 ns	66 ns	41 ns
OCRC foliar program	5	45	50	61	68	42
No foliar	5	44	50	60	65	40

<sup>1</sup> ns=no significant difference among treatments within a fertilizer group

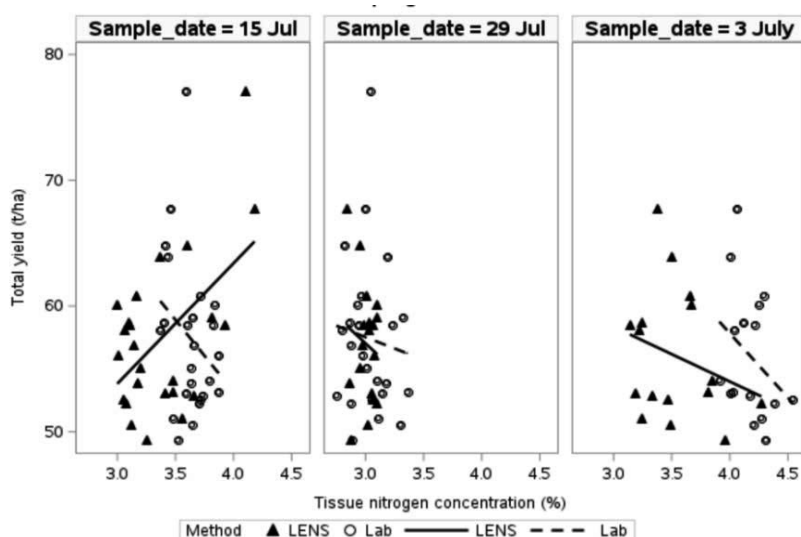
<sup>2</sup> Means within a fertilizer group followed by the same letter do not differ at  $p > 0.05$  (Tukey-Kramer).

**Table 8.** Correlation coefficients between *Stemphylium* leaf blight disease severity index and onion yield

Yield (t ha <sup>-1</sup> )	Pearson correlation	4 July	15 July	22 July	29 July	5 August	12 August
Marketable	r	0.08	-0.37	-0.27	-0.07	-0.08	0.11
	p-value	0.71	0.07	0.20	0.73	0.72	0.62
Total	r	0.06	-0.38	-0.28	-0.07	-0.08	0.09
	p-value	0.77	0.07	0.18	0.75	0.70	0.67

**Table 9.** Correlation coefficients between nitrogen concentrations and onion yield

Yield (t ha <sup>-1</sup> )	Pearson correlation	LENS concentrations			SGS laboratory concentrations		
		3 July	15 July	29 July	3 July	15 July	29 July
Marketable	r	-0.29	<b>0.52</b>	-0.13	-0.29	-0.31	-0.14
	p-value	0.28	<b>0.009</b>	0.61	0.28	0.14	0.50
Total	r	-0.27	<b>0.54</b>	-0.15	-0.33	-0.28	-0.10
	p-value	0.32	<b>0.007</b>	0.55	0.22	0.19	0.64



**Fig. 1** Relationship between tissue nitrogen concentration and total onion yield across sampling dates

Funding for this project was provided by the Fresh Vegetable Growers of Ontario, Picketa Systems Inc., Corteva Agriscience, the Ontario Agri-Food Innovation Alliance and Innovation Farms powered by AgExpert.

**CROP:** Yellow cooking onions (*Allium cepa* L.), cv. Catskill

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**TITLE:** EFFECTS OF PRE-PLANT NITROGEN, NITROGEN SIDEDRESS, AND NITROGEN-FIXING ENDOPHYTIC BACTERIA ON ONION YIELD AND SUSCEPTIBILITY TO STEMPHYLIUM LEAF BLIGHT, 2025

**MATERIALS:** ENVITA (*Gluconacetobacter diazotrophicus*, 1 x 10<sup>7</sup> CFU/L), UTRISHA N (3% *Methylobacterium symbioticum* SB23, 3 x 10<sup>7</sup> CFU/g), MIRAVIS DUO (pydiflumetofen 75 g/L, difenoconazole 125 g/L)

**METHODS:** Onions, cv. Catskill, were seeded 7 May into organic soil (pH ≈ 5.8, organic matter ≈ 71.4%) at the Ontario Crops Research Centre - Bradford, Ontario. Treatments were arranged in a randomized complete block design with four replicates per treatment. Each experimental unit consisted of two beds of onions, each containing four double rows 7 meters in length. Treatments: pre-plant nitrogen fertilizer at a rate of 15, 45, or 90 kg/ha, and pre-plant nitrogen fertilizer with additional treatments: side-dressing of nitrogen fertilizer applied 25 July at a rate of 15 Kg/ha at the initiation of bulbing, ENVITA<sup>TM</sup> was sprayed 18 June and 4 July as a foliar application beginning at the 2<sup>nd</sup> – 3<sup>rd</sup> leaf stage, and Utrisha-N<sup>®</sup> was sprayed 27 June and 4 July as a foliar application beginning at the 3<sup>rd</sup> – 4<sup>th</sup> leaf stage. Pre-plant nitrogen fertilizer was applied as a combination of 21-0-0 (AXAN) and 10-40-0 (MESZ) to achieve the appropriate rates of N while also ensuring all treatments received phosphorus at a rate of 50 kg/ha, to meet recommended phosphorus requirements for onion production as outlined in OMAFA publication 839 guidelines. No pre-plant potassium was applied as soil testing conducted prior to seeding indicated sufficient levels within the trial area. ENVITA<sup>TM</sup> was applied at 0.73 L/ha and UTRISHA-N<sup>®</sup> was applied at a rate of 333 g/ha using a tractor-mounted sprayer fitted with D-3 hollow-cone nozzles at 620 kPa to deliver 500 L/ha. The fungicide MIRAVIS DUO was applied on 11, 21, 28 July and 6, 14 August at a rate of 1.0 L/ha using a tractor-mounted sprayer fitted with D-3 hollow-cone nozzles at 620 kPa to deliver 500 L/ha.

On 23 July, the youngest fully mature leaf was sampled from 10 onion plants from the center rows of both beds per experimental unit to confirm establishment of the applied endophytes and to verify the absence of cross-contamination in non-treated plots. Portions of the sampled leaves were cut and weighed to obtain a 5 g sample for testing endophyte establishment. Leaves were washed in de-ionized water to remove dirt and debris and then surface-sterilized by soaking in 70% ethanol for 2 minutes. Sterilized leaves were then washed with sterile de-ionized water to remove residual ethanol and then homogenized in sterile 10 mL of PBS solution. The homogenate was then serially diluted (10<sup>-1</sup>–10<sup>-5</sup>), and 100 µL of each dilution

was spread onto selective media specific to each organism (LGI medium for *Gluconacetobacter diazotrophicus* and AMS medium for *Methylobacterium symbioticum*). Plates were incubated at 30°C for 2–5 days and monitored for colony development. Endophyte establishment was confirmed by the presence of colonies with expected morphology (cream-coloured for *Gluconacetobacter* and pink for *Methylobacterium*) in treated samples, and absence in non-treated controls.

Stemphylium leaf blight (SLB) severity was assessed in each plot on 11, 25 July and 8, 23 August. The three oldest green leaves of 20 plants per plot (10 plants from the middle rows of each bed) were rated and placed into classes based on a 0-4 scale for percentage leaf dieback where 0= no symptoms, 1 = 1–10% dieback, 2 = 11–25% dieback, 3 = 26–50% dieback and 4 > 50% dieback. Total SLB severity out of 12 was calculated for each plant by adding the rating of each of the three leaves. A disease severity index (DSI) was calculated for each plot using the following formula:

$$DSI = \frac{\sum[(class\ no.)(no.\ of\ leaves\ in\ each\ class)]}{(total\ no.\ of\ leaves\ assessed)(no.\ of\ classes - 1)} \times 100$$

The area under the disease progress curve (AUDPC) was calculated with the following formula:

$$AUDPC = \sum_{j=1}^{n_j-1} \left( \frac{y_j + y_{j+1}}{2} \right) (t_{j+1} - t_j)$$

where  $j$  is the order index for the assessments over time,  $n_j$  is the number of assessments,  $y_j$  is the average rating at day  $t_j$ ,  $y_{j+1}$  is the average rating at day  $t_{j+1}$  and  $(t_{j+1}-t_j)$  is the number of days between the assessments.

On 18 July and 1, 22 August the youngest, fully expanded leaf (typically the third from the center) was collected from 10 plants per row in the two center rows of each bed, for a total of 20 leaves. Leaves were scanned using the Picketa Leaf Evaluated Nutrient System (LENS), with results immediately available via the cloud-based Picketa ‘Fieldbook.’ The same leaves were sent to SGS Laboratory (Guelph, ON) for tissue analysis, with results received five days later. Nutrient assessments included nitrogen (N as is, not adjusted for water content), phosphorus (P%), potassium (K%), magnesium (Mg%), calcium (Ca%), zinc (Zn, ppm), manganese (Mn, ppm), copper (Cu, ppm), boron (B, ppm), and sulfur (S as is). Results were compared to sufficiency ranges from the OMAFA Vegetable Guide 839, adapted from Hochmuth et al. (2018), Plant Tissue Analysis and Interpretation for Vegetable Crops in Florida (University of Florida IFAS Extension, HS964).

On 28 August, 10 consecutive plants within a row from the two inner rows of each bed (total of 20) were pulled. The green leaves of all 20 plants were removed, rated for percentage leaf

dieback and placed into a class based on a 0-6 scale where 0= no symptoms, 1 = 1–4% dieback, 2 = 5–10% dieback, 3 = 11–25% dieback, 4 = 26–50% dieback, 5 = 51–75% dieback and 6 > 75% dieback. DSI was calculated based on this assessment. Yield was estimated by removing the onion plants from a 2.3-m-long section of two inner rows of each plot on 11 September. The onion bulbs were left to dry in the field. On 3 October, the bulbs were sorted into classes: jumbo (> 76 mm), large (76–64 mm), medium (64–45 mm) and culls (< 45 mm) and weighed to calculate marketable yield.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C) and September (16.6°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C.

Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

Data were analyzed in RStudio (version 2025.09.1). Disease severity index (DSI) was measured repeatedly throughout the growing season and therefore were analyzed using a linear mixed-effects model with repeated measures, with replication treated as a random effect. Similarly, foliar nutrient contents were analyzed using a linear mixed-effects model with repeated measures in a factorial design, with treatment, assessment method, and sampling date as fixed effects, and replication as a random effect. Disease incidence and severity at maturity, as well as yield parameters at harvest, were analyzed using linear mixed-effects models with replication as a random effect. In all cases, mean separation was conducted using Tukey's HSD test at  $P = 0.05$ . Pearson's correlation was used to examine the relationships between foliar nutrient contents as measured by SGS Laboratory and Picketa LENS, and also the relationships between foliar nitrogen contents measured by either lab and total yield, marketable yield, and DSI at maturity.

**RESULTS:** as presented in Tables 1 to 8.

**CONCLUSIONS:** There were no significant differences among treatments in total yield, marketable yield, or in the size distribution of onions at harvest, which indicated that 15 kg ha<sup>-1</sup> of preplant N was sufficient. Similarly, there were no significant differences among treatments with respect to foliar nitrogen content, as measured by either SGS laboratory or Picketa LENS tissue analysis, at each sampling date. All treatments had foliar nitrogen contents above the sufficiency range published within OMAFA Vegetable Guide 839 for optimal onion yield. This is consistent with no differences in yield. This suggests that mineralization rates of muck soil at the trial site were sufficient to meet the nitrogen requirements of onions, even when grown under low pre-plant nitrogen fertilization. There was no benefit of sidedress N. Foliar nutrient concentrations were not significantly influenced by treatment effects. However, assessment method significantly affected reported values, with

consistent differences observed between Picketa LENS and SGS laboratory analyses. Agreement between methods was limited, with similar foliar nutrient contents observed for P, Mg, Zn, Cu, and B on 18 July, and for Ca on 22 August only. Concentrations for all nutrients were generally within sufficiency ranges published within OMAFA Vegetable Guide 839 for optimal yield, except for Mg on 1 and 22 August.

The severity of SLB was moderate in this trial, possibly because of the application of fungicide, although fungicide resistance is widespread in the pathogen. There were no significant differences among treatments in the severity of SLB across the season, AUDPC or disease severity at crop maturity. Since there were no nutrient deficiencies, it was not possible to determine if N deficiency or sufficiency affected susceptibility to SLB.

Endophyte establishment was confirmed through leaf sampling, with target organisms recovered from treated plots and no evidence of cross-contamination detected in non-treated plots. Despite successful establishment, endophyte applications did not significantly affect *Stemphylium* leaf blight severity (DSI or AUDPC) or yield parameters. These results suggest that, under the conditions of this study, the applied endophytes did not provide measurable disease suppression or yield benefits. However, the endophytes are expected to be most beneficial under nitrogen-deficient conditions, which were not found in this trial

Across sampling dates, the measurements of foliar nutrient content by SGS Laboratory and Picketa LENS tissue analysis were rarely correlated. Only calcium measurements taken on 8 August and magnesium and manganese measurements taken on 22 August were correlated. Foliar nitrogen content, as measured by SGS laboratory nutrient analysis, was not significantly correlated with DSI at onion maturity, or with total yield, but was significantly correlated with marketable yield. There were no correlations of foliar nitrogen content, as measured by the Picketa *LENS*, with DSI, total yield or marketable yield at onion maturity or harvest, respectively.

**Table 1.** Effect of pre-plant nitrogen, sidedress nitrogen and N-fixing endophytic bacteria on the severity (disease severity index, DSI) of *Stemphylium* leaf blight and area under the disease progress curve (AUDPC) in onions, cv. Catskill, grown at the Ontario Crops Research Centre - Bradford Ontario, 2025

N rate (kg ha <sup>-1</sup> )	DSI				AUDPC <sup>1</sup>
	11 July	25 July	8 August	23 August	
15	0.2 ns <sup>2</sup>	27.2 ns	50.3 ns	72.8 ns	1658 ns
45	0.5	22.2	46.7	79.2	1585
45 + Side-dress	1.2	28.4	51.9	83.1	1782
45 + ENVITA	0.9	28.3	43.8	69.3	1557
45 + UTRISHA-N	0.8	25.5	46.1	70.1	1558
90	0.5	29.9	47.6	70.2	1639

<sup>1</sup> AUDPC was calculated based on the DSI assessed on 11, 25 July and 8, 23 August.

<sup>2</sup> ns = no significant differences among the treatments at P = 0.05.

**Table 2.** Effect of pre-plant nitrogen, sidedress nitrogen and N-fixing endophytic bacteria on *Stemphylium* leaf blight incidence and severity (disease severity index, DSI) on onion, cv. Catskill, at maturity at the Ontario Crops Research Centre – Bradford Ontario, 2025

N rate (kg ha <sup>-1</sup> )	SLB incidence	DSI	% Leaves rated 0 or 1 <sup>1</sup>	Green leaves/plant
15 Kg N ha <sup>-1</sup>	94.7 ns <sup>2</sup>	56.1 ns	8.6 ns	6.3 ns
15	97.6	58.8	7.1	6.6
45	95.5	63.0	6.2	5.8
45 + Side-dress	96.5	57.3	8.3	6.2
45 + ENVITA	95.9	60.0	7.5	6.3
90	95.9	63.9	7.2	6.1

<sup>1</sup> On 10 September the leaves of 20 plants were sorted into classes: 0= no disease, 1 = 1-4%, 2 = 5-10%, 3 = 11-25%, 4 = 26-50%, 5 = 51-75%, 6 > 75% based on the percentage of leaf area with symptoms of SLB

<sup>2</sup> Numbers in a column followed by the same letter are not significantly different at P = 0.05, Tukey's HSD

**Table 3** Effect of pre-plant nitrogen, sidedress nitrogen and N-fixing endophytic bacteria on yield of onions, cv. Catskill, grown at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

Treatment	Yield (t/ha)	Mkb Yield (t/ha)	Size distribution (%) <sup>1</sup>			
			Jumbo (>76 mm)	Large (64-76 mm)	Medium (45-64mm)	Cull (<45 mm)
Edit as above						
15 Kg N ha <sup>-1</sup>	33.6 ns <sup>2</sup>	27.0 ns	2.8 ns	17.4 ns	59.6 ns	20.2 ns
15	40.7	36.2	3.0	23.3	58.8	15.0
45	41.8	37.3	3.8	25.4	58.0	12.8
45 + Side-dress	43.6	39.2	3.6	27.7	58.0	11.1
45 + ENVITA	42.2	38.5	8.2	28.3	54.3	9.2
90	41.7	37.6	3.3	25.3	60.4	11.0

<sup>1</sup>Percentage values were determined using weight

<sup>2</sup>ns = no significant differences among the treatments at P = 0.05.

**Table 4.** Effect of pre-plant nitrogen, sidedress nitrogen and N-fixing endophytic bacteria on foliar nutrient contents as determined by SGS laboratory and Picketa LENS tissue nutrient analysis on 18 July in onions, cv. Catskill, grown at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

Nutrient assessment method	N rate (kg ha <sup>-1</sup> )	N <sup>1,2</sup>	P (%)	K (%)	Mg (%)	Ca (%)	Zn (ppm)	Mn (ppm)	Cu (ppm)	B (ppm)	S
Picketa LENS	15	4.22 ab <sup>3</sup>	0.42 ns <sup>4</sup>	2.42 b	0.19 ns	1.49 ab	34.00 ns	48.25 b	7.00 ns	30.25 ns	0.98 b
	45	3.96 ab	0.41	2.38 b	0.19	1.37 ab	32.00	50.75 b	7.00	30.50	0.99 b
	45 + Side-dress	4.02 ab	0.42	2.18 b	0.18	1.39 ab	32.75	52.00 b	7.00	29.75	0.93 ab
	45 + ENVITA	3.99 ab	0.42	2.16 b	0.18	1.44 ab	32.50	50.75 b	7.00	29.00	0.93 ab
	45 + UTRISHA-N	4.00 ab	0.42	2.21 b	0.19	1.40 ab	32.75	50.50 b	7.00	30.00	0.98 b
SGS Labs	90	3.87 b	0.42	2.37 b	0.18	1.54 b	34.25	50.50 b	7.00	29.00	0.95 ab
	15	4.39 a	0.39	3.68 a	0.17	1.31 ab	35.16	19.63 a	6.83	28.03	0.89 ab
	45	4.25 ab	0.37	3.78 a	0.18	1.34 ab	32.47	19.24 a	6.36	30.87	0.85 a
	45 + Side-dress	4.30 ab	0.39	3.66 a	0.17	1.23 a	34.80	24.27 a	7.71	29.47	0.88 ab
	45 + ENVITA	4.29 ab	0.40	3.78 a	0.17	1.31 ab	35.63	22.32 a	7.44	30.01	0.87 a
Sufficiency ranges <sup>3</sup>	45 + UTRISHA-N	4.20 ab	0.39	3.63 a	0.17	1.21 a	32.63	22.46 a	6.65	29.77	0.96 ab
	90	4.16 ab	0.37	3.68 a	0.17	1.26 ab	30.48	22.91 a	6.99	30.47	0.86 a
		2-3	0.2-0.5	1.5-3	0.15-0.3	0.6-0.8	15-12	10-20	5-10	10-25	0.2-0.6

<sup>1</sup> The nutrient was reported in 'percentage' for the Picket LENS measurements.

<sup>2</sup> The nutrient was reported "as is" without any adjustments for moisture.

<sup>3</sup> Means in a column followed by the same letter do not differ at P = 0.05 based on Tukey's HSD

<sup>4</sup> ns = no significant differences at P = 0.05

**Table 5.** Effect of pre-plant nitrogen, sidedress nitrogen and N-fixing endophytic bacteria on foliar nutrient contents as determined by SGS laboratory and Picketa LENS tissue nutrient analysis on 1 August in onions, cv. Catskill, grown at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

Nutrient assessment method	N rate (kg ha <sup>-1</sup> )	N <sup>1,2</sup>	P (%)	K (%)	Mg (%)	Ca (%)	Zn (ppm)	Mn (ppm)	Cu (ppm)	B (ppm)	S
Picketa LENS	15	3.70 ab <sup>3</sup>	0.42 b	2.31 b	0.19 b	1.31 d	33.25 d	50.75 b	7.00 b	30.00 c	0.95 b
	45	3.51 ab	0.41 b	2.20 b	0.18 b	1.21 cd	31.75 bcd	51.00 b	7.00 b	30.25 c	0.95 b
	45 + Side-dress	3.84 b	0.42 b	2.15 b	0.18 b	1.31 d	32.00 bcd	51.25 b	7.00 b	29.25 bc	0.92 b
	45 + ENVITA	3.65 ab	0.41 b	2.33 ab	0.18 b	1.21 bcd	31.75 cd	51.00 b	7.00 b	29.75 bc	0.92 b
	45 + UTRISHA-N	3.73 ab	0.41 b	2.25 b	0.18 b	1.30 d	32.25 bcd	50.75 b	7.00 b	30.00 c	0.91 b
	90	3.72 ab	0.41 b	2.27 b	0.19 b	1.34 d	33.00 cd	51.00 b	7.00 b	29.75 bc	0.95 b
SGS Labs	15	3.36 a	0.28 a	2.65 ab	0.11 a	0.88 a	25.71 abc	13.10 a	11.21 ab	22.23 a	0.68 a
	45	3.39 a	0.31 a	2.87 a	0.13 a	0.96 abc	25.89 abcd	14.39 a	12.11 a	24.35 ab	0.77 a
	45 + Side-dress	3.31 a	0.28 a	2.61 ab	0.12 a	0.91 ab	24.16 a	15.85 a	11.82 a	24.06 a	0.74 a
	45 + ENVITA	3.40 ab	0.27 a	2.36 ab	0.11 a	0.77 a	24.86 ab	11.70 a	10.57 ab	20.96 a	0.75 a
	45 + UTRISHA-N	3.43 ab	0.29 a	2.57 ab	0.12 a	0.88 a	27.30 abcd	14.00 a	12.84 a	23.62 a	0.75 a
	90	3.35 a	0.25 a	2.49 ab	0.11 a	0.88 a	22.68 a	15.37 a	10.56 ab	22.16 a	0.70 a
Sufficiency ranges		2-3	0.2-0.5	1.5-3	0.15-0.3	0.6-0.8	15-12	10-20	5-10	10-25	0.2-0.6

<sup>1</sup> The nutrient was reported in 'percentage' for the Picket LENS measurements.

<sup>2</sup> The nutrient was reported "as is" without any adjustments for moisture.

<sup>3</sup> Means in a column followed by the same letter do not differ at P = 0.05 based on Tukey's HSD

**Table 6.** Effect of pre-plant nitrogen, sidedress nitrogen and N-fixing endophytic bacteria on foliar nutrient contents as determined by SGS laboratory and Picketa LENS tissue nutrient analysis on 22 August in onions, cv. Catskill, grown at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

Nutrient assessment method	N rate (kg ha <sup>-1</sup> )	N <sup>1,2</sup>	P (%)	K (%)	Mg (%)	Ca (%)	Zn (ppm)	Mn (ppm)	Cu (ppm)	B (ppm)	S
Picketa LENS	15	4.28 b <sup>3</sup>	0.22 a	1.99 b	0.19 b	1.43 ns <sup>4</sup>	31.02 b	52.00 b	7.00 ab	30.42 bde	0.98 b
	45	4.15 b	0.25 a	2.17 b	0.19 b	1.48	32.90 b	50.75 b	7.00 ab	30.94 e	0.96 b
	45 + Side-dress	4.13 b	0.25 a	2.07 b	0.19 b	1.43	31.75 b	51.50 b	7.00 ab	29.49 abcde	0.94 b
	45 + ENVITA	4.17 b	0.23 a	1.98 b	0.18 b	1.40	31.10 b	51.00 b	7.00 ab	29.87 abcde	0.94 b
	45 + UTRISHA-N	4.16 b	0.23 a	2.23 b	0.19 b	1.44	32.68 b	51.25 b	7.00 ab	29.11 cde	0.91 b
SGS Labs	90	4.19 b	0.23 a	2.08 b	0.19 b	1.47	32.53 b	51.00 b	7.00 b	29.18 abcde	0.95 b
	15	3.31 a	0.41 b	3.09 a	0.15 a	1.37	16.83 a	18.57 a	6.48 ab	23.80 ac	0.64 a
	45	3.36 a	0.41 b	3.10 a	0.14 a	1.25	19.04 a	23.32 a	7.18 ab	24.54 abcd	0.72 a
	45 + Side-dress	3.38 a	0.41 b	3.03 a	0.15 a	1.25	18.38 a	22.70 a	6.45 ab	25.80 abcde	0.67 a
	45 + ENVITA	3.33 a	0.40 b	2.96 a	0.14 a	1.36	16.55 a	17.75 a	6.45 ab	24.87 abcde	0.74 a
Sufficiency ranges	45 + UTRISHA-N	3.33 a	0.40 b	3.04 a	0.14 a	1.32	17.63 a	17.91 a	6.11 ab	23.94 ab	0.66 a
	90	3.42 a	0.41 b	2.96 a	0.15 a	1.36	20.03 a	45.19 ab	11.75 a	24.90 abcde	0.70 a
		2-3	0.2-0.5	1.5-3	0.15-0.3	0.6-0.8	15-12	10-20	5-10	10-25	0.2-0.6

<sup>1</sup> The nutrient was reported in 'percentage' for the Picket LENS measurements.

<sup>2</sup> The nutrient was reported "as is" without any adjustments for moisture.

<sup>3</sup> Means in a column followed by the same letter do not differ at P = 0.05 based on Tukey's HSD.

<sup>4</sup> ns = no significant differences at P = 0.05

**Table 7.** Correlation coefficients and p-values between tissue test values determined by SGS laboratory and Picketa LENS for onions, cv. Catskill, grown under different pre-plant nitrogen rates with and without amendments of nitrogen sidedress or N-fixing foliarly applied endophytic bacteria at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025

Nutrient	18 July	1 August	22 August
Nitrogen	0.15 <sup>1</sup> (0.50) <sup>2</sup>	0.33 (0.11)	0.38 (0.07)
Phosphorus	-0.26 (0.22)	-0.05 (0.82)	0.18 (0.40)
Potassium	-0.01 (0.95)	0.00 (0.10)	-0.07 (0.73)
Magnesium	0.01 (0.96)	-0.09 (0.68)	<b>-0.43 (0.04)</b>
Calcium	0.00 (0.10)	<b>0.47 (0.02)</b>	-0.22 (0.32)
Zinc	-0.18 (0.40)	0.21 (0.33)	-0.02 (0.91)
Manganese	0.00 (0.98)	-0.33 (0.13)	<b>0.53 (0.01)</b>
Boron	0.06 (0.77)	0.06 (0.79)	-0.06 (0.77)
Sulphur	-0.16 (0.48)	0.00 (0.10)	0.18 (0.41)

<sup>1</sup> Pearson correlation coefficient (r).

<sup>2</sup> Associated P-value. Bolded P-values indicate significant Pearson correlations

**Table 8.** Correlation coefficients and p-values between nitrogen foliar contents as determined by SGS laboratory or Picketa LENS tissue nutrient analysis and *Stemphylium* leaf blight disease severity (DSI) and Yield in onions, cv. Catskill, grown under different pre-plant nitrogen rates with and without amendments of nitrogen sidedress or N-fixing foliarly applied endophytic bacteria at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025

Nutrient assessment method	Variable	18 July	1 August	22 August
Picketa LENS	DSI	-0.24 <sup>1</sup> (0.27) <sup>2</sup>	0.14 (0.51)	-0.37 (0.08)
	Total Yield	0.14 (0.51)	0.11 (0.60)	0.10 (0.65)
	Marketable Yield	0.16 (0.46)	0.13 (0.57)	0.10 (0.64)
SGS Labs	DSI	-0.27 (0.20)	-0.05 (0.83)	-0.28 (0.19)
	Total Yield	0.23 (0.28)	0.24 (0.27)	0.40 (0.06)
	Marketable Yield	0.25 (0.25)	0.23 (0.28)	<b>0.42 (0.04)</b>

<sup>1</sup> Pearson correlation coefficient (r).

<sup>2</sup> Associated P-value. Bolded P-values indicate significant Pearson correlations between Picketa Lens and SGS Laboratory tissue nutrient analysis for the corresponding nutrient at the specific sampling date.

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**CROP:** Yellow cooking onions (*Allium cepa* L.), cv. Braddock  
**PEST:** Onion maggot (*Delia antiqua* (Meigen))  
 Seed corn maggot (*Delia platura* (Meigen))

**AUTHORS:** VANDER KOOI K, SCICLUNA J & MCDONALD MR  
 U of Guelph, Dept. of Plant Agriculture, Ontario Crops Research Centre - Bradford

**TITLE:** EVALUATION OF VARIOUS INSECTICIDE SEED TREATMENTS FOR CONTROL OF MAGGOTS IN YELLOW COOKING ONIONS, 2025

**MATERIALS:** LUMIVERD (spinosad 80%), CRUISER 70 WS (thiamethoxam 70%), TRIGARD (cyromazine 75%), SEPRESTO 75 WS (clothianidin 56.25%, imidacloprid 18.75%), PLINAZOLIN (experimental), NIPSIT (clothianidin 60%), EVERGOL PRIME (penflufen), FARMORE F300 (APRON XL (metalaxy1-M and S-iomer 33.3%)), MAXIM 4 FS (fludioxonil 40.3%), DYNASTY (azoxystrobin 9.6%)

#### **METHODS:**

The trial was conducted on organic soil (pH  $\approx$  6.5, organic matter  $\approx$  62.9%) naturally infested with *Delia antiqua* and *D. platura* pupae at the Ontario Crops Research Centre - Bradford, Ontario. A randomized complete block design with four replicates per treatment was used. Each experimental unit consisted of four rows, spaced 40 cm apart, 6 m in length. Onions cv. Braddock were seeded ( $\approx$  32 seeds/m) on 6 May using a Stanhay precision seeder. Insecticide seed treatments are listed in Table 1. A no-insecticide check was also included. All treatments included EVERGOL PRIME for onion smut control and FARMORE 300 to prevent damping off. Seeds were pelleted by Kamterter. Two randomly chosen 2 m sections of row for damage plots, plus a 2.32 m section for a yield sample, were staked out in each replicate. Emergence counts were conducted within the 2 m staked sections on 26 May and 2 June to determine initial stands. Onions were monitored weekly for visual signs of maggot feeding, onion plants within the 2 m sections were examined for loss due to maggot damage or damage caused by other pests. Damaged onions were counted and removed, with the cause of damage recorded. The remaining onions within the assigned 2 m sections were removed and visually examined for maggot damage on 7 July (first generation damage) and after lodging on 12 September (total season assessment). On 8 September, onions from the 2.32 m yield section of row were pulled, windrowed to dry. On 15 September onions were topped and yield samples were placed in bags. On 3 October, onions were sorted by size and weighed to determine yield. Data were analyzed using the General Analysis of Variance function of Statistix V.10. Means separation was obtained using Fisher's Protected LSD Test at  $P = 0.05$  level of significance.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C) and September (16.6°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C.

Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

**RESULTS:** As presented in Tables 2-3.

**CONCLUSIONS:** Onion maggot damage was very low in the trial. CRUISER had more first-generation damage than all treatments except TRIGARD + CRUISER. Over the total season,

TRIGARD + CRUISER, LUMIVERD + SEPRESTO, LUMIVERD, TRIGARD, NIPSLT, TRIGARD + SEPRESTO, TRIGARD + NIPSIT had less damage than the check and SEPRESTO (Table 2). However, it is difficult to assess the efficacy of the products when maggot damage is only 3.2% in the check. Combinations of insecticides were not more effective than single products alone, except for first generation damage with SEPRESTO. Combinations may be useful to slow the development of insecticide resistance. None of the treatments had higher yield than the check, but TRIGARD had higher yield than LUMIVERD + CRUISER, TRIGARD + LUMIVERD, LUMIVERD + NIPSIT and CRUISER. There were also differences in the size distribution of bulbs among treatments. The check had a higher percentage of jumbo onions than all treatments except NIPSIT, PLINAZOLIN, LUMIVERD + SEPRESTO, LUMIVERD and TRIGARD (Table 3). This may have occurred because there were fewer onions in the check by the end of the season due to some onions dying early due to maggot damage, allowing more space for the remaining onions to grow (Table 2). There was a moderate negative correlation between final damage and yield ( $r = -0.40$ ,  $P < 0.01$ ) and a moderate positive correlation between final stand count and yield ( $r = 0.45$ ,  $P < 0.01$ ). There was no correlation between first generation damage and yield.

**Table 1.** Seed treatments label rates for onion seed, cv. Braddock, pelleted by Kamterter and grown at the grown at the Ontario Crops Research Centre - Bradford, Ontario, 2025.

Treatment	Active ingredients and (rates (mg ai/seed))
No insecticide	N/A
TRIGARD 75WP	Cyromazine (0.225)
LUMIVERD	Spinosad (0.2)
NIPSIT	Clothianidin (0.18)
CRUISER 5 FS	Thiamethoxam (0.2)
SEPRESTO 75WS	Clothianidin/Imidacloprid (0.32)
PLINAZOLIN	Isocycloseram (0.0909)
TRIGARD + CRUISER	Cyromazine (0.225) + Thiamethoxam (0.2)
TRIGARD + SEPRESTO	Cyromazine (0.225) + Clothianidin/Imidacloprid (0.32)
TRIGARD + NIPSIT	Cyromazine (0.225) + Clothianidin (0.18)
TRIGARD + LUMIVERD	Cyromazine (0.225) + Spinosad (0.2)
LUMIVERD +NIPSIT	Spinosad (0.2) + Clothianidin (0.18)
LUMIVERD + CRUISER	Spinosad (0.2) + Thiamethoxam (0.2)

NOTE: All seed was treated with penflufen (EverGol Prime) and FarMore F300 (mefenoxam, Apron XL® seed treatment fungicide; fludioxonil, Maxim® 4FS seed treatment fungicide; and azoxystrobin, Dynasty® seed treatment fungicide).

**Table 2.** Percentage of onions, cv. Braddock lost due to maggot damage, treated with various insecticides, and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	First generation damage (%)	Total damage (%)	Final stand count
TRIGARD + CRUISER	1.1 ab <sup>1</sup>	0 a	54 ab
LUMIVERD + SEPRESTO	0 a	0 a	58 a
LUMIVERD	0.5 a	0 a	54 ab
TRIGARD 75 WP	0 a	0.4 a	56 ab
NIPSIT	0 a	0.5 a	58 ab
TRIGARD + SEPRESTO	0.6 a	0.5 a	57 ab
TRIGARD + NIPSIT	0.5 a	0.6 a	56 ab
LUMIVERD + NIPSIT	0.5 a	1.0 ab	56 ab
PLINAZOLIN	0.5 a	1.0 ab	49 ab
CRUISER 5 FS	2.7 b	1.1 ab	56 ab
TRIGARD + LUMIVERD	0 a	1.4 ab	53 ab
LUMIVERD + CRUISER	1.0 a	1.7 ab	56 ab
SEPRESTO 75 WS	0.5 a	3.2 b	58 a
Check	0 a	3.2 b	49 b

<sup>1</sup>Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's protected LSD test

**Table 3.** Yield and size distribution for onions, cv. Braddock, treated with various insecticides, and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Yield (t/ha)	% Mkb	Size distribution (%) <sup>1</sup>			
			Jumbo (>76mm)	Large (76-64mm)	Medium (64-45mm)	Cull (<45mm)
TRIGARD 75 WP	88 a <sup>2</sup>	99 ab	12 abc	59 ab	28 de	0 a
NIPSIT	84 ab	98 ab	16 abc	49 a-e	35 b-e	0 a
LUMIVERD	83 abc	97 abc	12 abc	64 a	24 e	1 a
LUMIVERD + SEPRESTO	82 abc	97 abc	12 abc	48 a-f	39 b-e	1 a
TRIGARD + NIPSIT	81 a-d	99 a	10 bc	54 a-d	35 b-e	0 a
PLINAZOLIN	80 a-d	97 abc	19 ab	60 ab	20 e	1 a
TRIGARD + SEPRESTO	80 a-d	98 ab	7 bc	58 abc	34 b-e	0 a
TRIGARD + CRUISER	76 a-d	96 abc	10 bc	55 a-d	33 cde	1 abc
SEPRESTO	70 a-d	95 abc	6 bc	43 c-f	50 abc	1 abc
TRIGARD + LUMIVERD	69 bcd	95 abc	8 bc	54 a-d	37 b-e	2 abc
LUMIVERD + CRUISER	68 bcd	94 bc	6 bc	38 ef	54 ab	2 abc
CRUISER	66 cd	93 c	7 bc	42 def	48 a-d	2 bc
LUMIVERD + NIPSIT	63 d	93 c	4 c	33 f	60 a	3 c
Check	75 a-d	96 abc	26 a	46 b-f	27 e	1 ab

<sup>1</sup>Percentage values were determined using weight.

<sup>2</sup>Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's protected LSD test.

**Funding was provided by the California Garlic and Onion Research Advisory Board.**

**CROP:** Yellow cooking onions (*Allium cepa* L.), cv. Patterson  
**PEST:** Onion maggot (*Delia antiqua* (Meigen))  
 Seed corn maggot (*Delia platura* (Meigen))

**AUTHORS:** VANDER KOOI K, SCICLUNA J & MCDONALD MR  
 U of Guelph, Dept. of Plant Agriculture, Ontario Crops Research Centre - Bradford

**TITLE:** EVALUATION OF LUMIVERD INSECTICIDE SEED TREATMENTS FOR CONTROL OF MAGGOTS IN YELLOW COOKING ONIONS, 2025

**MATERIALS:** LUMIVERD (Spinosad 80.0%), SEPRESTO 75 WS (clothianidin 56.25%, imidacloprid 18.75%)

#### **METHODS:**

The trial was conducted on organic soil (pH  $\approx$  5.6, organic matter  $\approx$  70.0%) naturally infested with *Delia antiqua* and *D. platura* pupae at the Ontario Crops Research Centre - Bradford, Ontario. A randomized complete block design with four replicates per treatment was used. Each experimental unit consisted of four rows, spaced 40 cm apart, 6 m in length. Onions cv. Patterson were seeded ( $\approx$  32 seeds/m) on 6 May using a Stanhay precision seeder. A no-insecticide check was also included. Two randomly chosen 2 m sections of row for damage plots, plus a 2.32 m section for a yield sample, were staked out in each replicate. Crop tolerance, vigor, plant emergence ratings and stand counts were conducted within the 2 m staked sections 7, 14, 21 and 28 days after emergence (DAE). Onions were monitored weekly for visual signs of maggot feeding, onion plants within the 2 m sections were examined for loss due to maggot damage or damage caused by other pests. Damaged onions were counted and removed, with the cause of damage recorded. The remaining onions within the assigned 2 m sections were removed and visually examined for maggot damage on 4 July (first generation damage) and after lodging on 12 September (total season assessment). On 5 September, onions from the 2.32 m yield section of row were pulled, windrowed to dry. On 15 September onions were topped and yield samples were placed in bags. On 29 September, onions were sorted by size and weighed to determine yield. Data were analyzed using the General Analysis of Variance function of Statistix V.10. Means separation was obtained using Fisher's Protected LSD Test at P = 0.05 level of significance.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C) and September (16.6°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C.

Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

**RESULTS:** As presented in Tables 1-6.

**CONCLUSIONS:** Maggot damage was low in the trial. There were no significant differences in the percentage of onions lost to maggot damage in the first generation or over the total season (Table 1). LUMIVERD at a rate of 0.3 mg ai/seed and SEPRESTO at a rate of 0.265 mg ai/seed had significantly higher yield and percentage of large onions than the check (Table 2). No phytotoxicity was observed in the trial (Table 3). There were some slight differences in emergence and vigor observed (Table 4, Table 5). However, all treatments were comparable to the commercial standard for vigor and rated above 7 for emergence, which indicates a very good stand.

**Table 1.** Percentage of onions, cv. Patterson lost due to maggot damage, treated with various insecticides, and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Rate (mg ai/seed)	% Onions lost due to maggot damage		Onions/m
		1 <sup>st</sup> Generation	Total season	
LUMIVERD	0.05	0.0 ns <sup>1</sup>	0.5 ns	22 ns
LUMIVERD	0.1	1.1	0.0	23
LUMIVERD	0.2	1.3	2.1	25
SEPRESTO	0.21	1.5	0.9	23
LUMIVERD	0.4	2.1	3.3	23
SEPRESTO	0.265	3.1	2.5	23
LUMIVERD	0.3	3.6	1.7	26
Check	-	3.5	1.7	22

<sup>1</sup> ns = no significant differences were found among treatments.

**Table 2.** Yield and size distribution for onions, cv. Patterson, treated with various insecticides, and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Rate (mg ai/seed)	Yield (t/ha)	% Mkb	Size distribution (%) <sup>1</sup>			
				Jumbo (>76mm)	Large (76-64mm)	Medium (64-45mm)	Cull (<45mm)
LUMIVERD	0.3	72 a <sup>2</sup>	96 ns <sup>3</sup>	5 ns	50 a	43 ab	2 ns
SEPRESTO	0.265	68 ab	95	5	52 a	41 a	2
LUMIVERD	0.1	57 abc	93	2	37 ab	58 abc	3
LUMIVERD	0.2	56 abc	90	1	32 ab	63 bc	3
LUMIVERD	0.4	54 abc	87	1	34 ab	58 abc	6
SEPRESTO	0.21	54 abc	83	2	38 ab	53 abc	7
LUMIVERD	0.05	48 bc	88	2	32 ab	60 abc	5
Check	-	42 c	83	3	18 b	71 c	7

<sup>1</sup> Percentage values were determined using weight.

<sup>2</sup> Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's protected LSD test.

<sup>3</sup> ns = no significant differences were found among treatments.

**Table 3.** Phytotoxicity (%) ratings for onion, cv. Patterson, treated with insecticides and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Rate (mg ai/seed)	Phytotoxicity plot ratings <sup>1,2</sup>			
		7 DAE	14 DAE	21 DAE	28 DAE
LUMIVERD	0.3	0	0	0	0
SEPRESTO	0.265	0	0	0	0
LUMIVERD	0.1	0	0	0	0
LUMIVERD	0.2	0	0	0	0
LUMIVERD	0.4	0	0	0	0
SEPRESTO	0.21	0	0	0	0
LUMIVERD	0.05	0	0	0	0
Check	-	0	0	0	0

<sup>1</sup> Phytotoxicity rating 0-10, where 0 = no toxicity, 1 = 1-10% crop injury, 2 = 11-20% crop injury, 3 = 21-30% crop injury, 4 = 31-40% crop injury, 5 = 41-50% crop injury, 6 = 51-60% crop injury, 7 = 61-70% crop injury, 8 = 71-80% crop injury, 9 = 81-90% crop injury, 10 = 91-100% crop injury

<sup>2</sup> Data set consists of zeros, and therefore was not statistically analyzed.

**Table 4.** Emergence ratings for onion, cv. Patterson, treated with insecticides and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Rate (mg ai/seed)	Emergence plot ratings <sup>1</sup>			
		7 DAE <sup>2</sup>	14 DAE	21 DAE	28 DAE
LUMIVERD	0.05	7.8 ns <sup>3</sup>	8.8 a <sup>4</sup>	8.8 a	7.5 ab
LUMIVERD	0.1	7.5	8.3 ab	7.3 c	7.5 ab
LUMIVERD	0.4	7.5	7.8 bc	8.0 abc	8.0 a
SEPRESTO	0.265	7.5	8.0 bc	8.5 ab	7.8 ab
LUMIVERD	0.3	7.3	8.3 ab	7.8 bc	8.0 a
SEPRESTO	0.21	7.3	7.5 c	8.5 ab	8.0 a
LUMIVERD	0.2	7.0	8.3 ab	8.0 abc	7.5 ab
Check	-	7.8	8.0 bc	7.5 c	7.3 b

<sup>1</sup> Visual rating of stand emergence, using a 1-9 scale, compared to the commercial standard Scale

- 9 Nearly perfect stand.
- 8 Excellent stand, at most a couple small gaps.
- 7 Very good stand, some small gaps evident.
- 6 Less than 5% plot area missing plants.
- 5 Thin stand with up to 10% missing plants.
- 4 11-25% missing plants.
- 3 26-50% missing plants.
- 2 51-75% missing plants.
- 1 Greater than 75% missing plants

<sup>2</sup> DAE = Days after emergence

<sup>3</sup> ns = no significant differences were found among the treatments

<sup>4</sup> Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's protected LSD test.

**Table 5.** Vigor ratings for onion, cv. Patterson, treated with insecticides and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Rate (mg ai/seed)	Vigor plot ratings <sup>1</sup>			
		7 DAE <sup>2</sup>	14 DAE	21 DAE	28 DAE
LUMIVERD	0.05	5.0 a <sup>3</sup>	4.5 ab	5.0 ns <sup>4</sup>	5.0 ns
LUMIVERD	0.4	5.0 a	5.0 a	4.5	5.0
SEPRESTO	0.21	5.0 a	5.0 a	4.0	5.0
SEPRESTO	0.265	5.0 a	5.0 a	5.0	5.0
LUMIVERD	0.1	4.5 ab	5.0 a	4.5	5.0
LUMIVERD	0.3	4.5 ab	5.0 a	4.0	5.5
LUMIVERD	0.2	4.0 b	4.5 ab	4.5	5.5
Check	-	4.0 b	4.0 b	5.0	5.0

<sup>1</sup> Seedling vigor using a 1-9 scale, compared to the commercial standard, Vigor rating scale

9 Significantly stronger and faster growth compared to commercial standard.

7 Stronger and faster growth compared to commercial standard.

5 commercial standard.

3 Weaker and slower growth compared to commercial standard.

1 Significantly weaker and slower growth compared to commercial standard.

<sup>2</sup> DAE = Days after emergence

<sup>3</sup> Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's protected LSD test.

<sup>4</sup> ns = no significant differences were found among the treatments

**Table 6.** Stand counts of onions cv. Patterson treated with various insecticides and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Rate (mg ai/seed)	Stand Counts <sup>1</sup>					
		OM1			OM3		
		7 DAE <sup>2</sup>	14 DAE	21 DAE	7 DAE	14 DAE	21 DAE
SEPRESTO	0.21	51 a <sup>3</sup>	53 a	51 a	46 ns <sup>4</sup>	47 ns	48 ns
LUMIVERD	0.3	50 a	48 ab	51 a	50	50	48
LUMIVERD	0.4	48 ab	48 b	48 ab	49	49	48
SEPRESTO	0.265	47 ab	48 ab	50 a	46	50	50
LUMIVERD	0.05	47 ab	50 ab	49 ab	50	48	52
LUMIVERD	0.2	47 ab	47 bc	48 ab	46	46	45
LUMIVERD	0.1	43 b	43 c	44 b	48	49	50
Check	-	48 ab	49 ab	50 a	46	49	49

<sup>1</sup> Stand counts taken from a 2 meter section of row

<sup>2</sup> DAE = Days after emergence

<sup>3</sup> Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's protected LSD test.

<sup>4</sup> ns= no significant differences were found at P= 0.05, Fisher's protected LSD test.

**Funding for this project was provided by Corteva Agriscience.**

**CROP:** Yellow cooking onions (*Allium cepa* L.), cv. Patterson  
**PEST:** Onion maggot (*Delia antiqua* (Meigen))  
 Seed corn maggot (*Delia platura* (Meigen))

**AUTHORS:** VANDER KOOI K, SCICLUNA J & MCDONALD MR  
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**TITLE:** **EVALUATION OF LUMIVERD INSECTICIDE SEED TREATMENTS FOR CONTROL OF MAGGOTS IN YELLOW COOKING ONIONS, 2025**

**MATERIALS:** LUMIVERD (Spinosad 80.0%), SEPRESTO 75 WS (clothianidin 56.25%, imidacloprid 18.75%)

#### **METHODS:**

The trial was conducted on organic soil (pH  $\approx$  5.8, organic matter  $\approx$  71.5%) naturally infested with *Delia antiqua* and *D. platura* pupae at the Ontario Crops Research Centre - Bradford, Ontario. A randomized complete block design with four replicates per treatment was used. Each experimental unit consisted of four rows, spaced 40 cm apart, 6 m in length. Onions cv. Patterson were seeded ( $\approx$  32 seeds/m) on 8 May using a Stanhay precision seeder. A no-insecticide check was also included. Two randomly chosen 2 m sections of row for damage plots, plus a 2.32 m section for a yield sample, were staked out in each replicate. Crop tolerance, vigor, plant emergence ratings and stand counts were conducted within the 2 m staked sections 7, 14, 21 and 28 days after emergence (DAE). Onions were monitored weekly for visual signs of maggot feeding, onion plants within the 2 m sections were examined for loss due to maggot damage or damage caused by other pests. Damaged onions were counted and removed, with the cause of damage recorded. The remaining onions within the assigned 2 m sections were removed and visually examined for maggot damage on 4 July (first generation damage) and after lodging on 10 September (total season assessment). On 5 September, onions from the 2.32 m yield section of row were pulled, windrowed to dry. On 15 September, onions were topped and yield samples were placed in bags. On 2 October, onions were sorted by size and weighed to determine yield. Data were analyzed using the General Analysis of Variance function of Statistix V.10. Means separation was obtained using Fisher's Protected LSD Test at  $P = 0.05$  level of significance.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C) and September (16.6°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C.

Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

**RESULTS:** As presented in Tables 1-6.

**CONCLUSIONS:** Maggot damage was low in the trial. There were no significant differences in the percentage of onions lost to maggot damage in the first generation or over the total season (Table 1). There were some differences in yield among treatments (Table 2). However, these differences are unlikely to be caused by onion maggot as damage in the trial was low and yield in the check was not affected. No phytotoxicity was observed in the trial (Table 3). There were some slight differences in emergence and vigor observed (Table 4, Table 5). However, all treatments were at least comparable to the commercial standard for vigor and rated above 7 for emergence, which indicates a very good stand.

**Table 1.** Percentage of onions, cv. Patterson lost due to maggot damage, treated with various insecticides, and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Rate (mg ai/seed)	% Onions lost due to maggot damage		Onions/m
		1 <sup>st</sup> Generation	Total season	
LUMIVERD	0.4	0.9 ns <sup>1</sup>	1.4 ns	24 bc
SEPRESTO	0.265	1.1	2.3	28 ab
LUMIVERD	0.1	1.3	3.5	27 abc
LUMIVERD	0.05	1.4	1.4	27 abc
LUMIVERD	0.3	1.7	1.7	30 a
SEPRESTO	0.21	2.5	2.3	23 c
LUMIVERD	0.2	3.6	0.5	29 ab
Check	-	3.8	2.7	23 c

<sup>1</sup> ns = no significant differences were found among treatments.

**Table 2.** Yield and size distribution for onions, cv. Patterson, treated with various insecticides, and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Rate (mg ai/seed)	Yield (t/ha)	% Mkb	Size distribution (%) <sup>1</sup>			
				Jumbo (>76mm)	Large (76-64mm)	Medium (64-45mm)	Cull (<45mm)
LUMIVERD	0.3	53 a <sup>2</sup>	78 a	0 ns <sup>3</sup>	13 ns	76 a	11 a
LUMIVERD	0.1	44 ab	75 a	2	16	69 ab	12 a
LUMIVERD	0.2	41 abc	71 a	0	7	77 a	15 a
LUMIVERD	0.05	35 bc	65 ab	0	12	67 ab	21 ab
LUMIVERD	0.4	34 bc	68 ab	0	15	69 ab	16 ab
SEPRESTO	0.21	31 bc	67 ab	0	14	68 ab	18 ab
SEPRESTO	0.265	27 c	52 b	0	13	51 b	36 b
Check	-	44 ab	81 a	2	21	69 ab	8 a

<sup>1</sup> Percentage values were determined using weight.

<sup>2</sup> Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's protected LSD test.

<sup>3</sup> ns = no significant differences were found among treatments.

**Table 3.** Phytotoxicity (%) ratings for onion, cv. Patterson, treated with insecticides and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Rate (mg ai/seed)	Phytotoxicity plot ratings <sup>1,2</sup>			
		7 DAE	14 DAE	21 DAE	28 DAE
LUMIVERD	0.3	0	0	0	0
SEPRESTO	0.265	0	0	0	0
LUMIVERD	0.1	0	0	0	0
LUMIVERD	0.2	0	0	0	0
LUMIVERD	0.4	0	0	0	0
SEPRESTO	0.21	0	0	0	0
LUMIVERD	0.05	0	0	0	0
Check	-	0	0	0	0

<sup>1</sup> Phytotoxicity rating 0-10, where 0 = no toxicity, 1 = 1-10% crop injury, 2 = 11-20% crop injury, 3 = 21-30% crop injury, 4 = 31-40% crop injury, 5 = 41-50% crop injury, 6 = 51-60% crop injury, 7 = 61-70% crop injury, 8 = 71-80% crop injury, 9 = 81-90% crop injury, 10 = 91-100% crop injury

<sup>2</sup> Data set consists of zeros, and therefore was not statistically analyzed.

**Table 4.** Emergence ratings for onion, cv. Patterson, treated with insecticides and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Rate (mg ai/seed)	Emergence plot ratings <sup>1</sup>			
		7 DAE <sup>2</sup>	14 DAE	21 DAE	28 DAE
LUMIVERD	0.2	8.3 a <sup>3</sup>	8.0 a	8.5 a	8.3 a
LUMIVERD	0.3	8.3 a	8.0 a	8.3 a	8.0 ab
LUMIVERD	0.05	8.0 ab	8.0 a	8.0 ab	8.0 ab
LUMIVERD	0.4	8.0 ab	7.8 ab	7.3 bc	7.3 bc
LUMIVERD	0.1	7.8 ab	8.0 a	7.8 abc	7.8 abc
SEPRESTO	0.265	7.8 ab	7.5 ab	8.3 a	8.3 a
SEPRESTO	0.21	7.8 ab	7.3 b	7.0 c	7.3 bc
Check	-	7.5 b	7.5 ab	7.0 c	7.0 c

<sup>1</sup> Visual rating of stand emergence, using a 1-9 scale, compared to the commercial standard Scale

- 9 Nearly perfect stand.
- 8 Excellent stand, at most a couple small gaps.
- 7 Very good stand, some small gaps evident.
- 6 Less than 5% plot area missing plants.
- 5 Thin stand with up to 10% missing plants.
- 4 11-25% missing plants.
- 3 26-50% missing plants.
- 2 51-75% missing plants.
- 1 Greater than 75% missing plants

<sup>2</sup> DAE = Days after emergence

<sup>3</sup> Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's protected LSD test.

**Table 5.** Vigor ratings for onion, cv. Patterson, treated with insecticides and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Rate (mg ai/seed)	Vigor plot ratings <sup>1</sup>			
		7 DAE <sup>2</sup>	14 DAE	21 DAE	28 DAE
LUMIVERD	0.2	6.0 a <sup>3</sup>	5.0 c	5.0 ns <sup>4</sup>	6.0 ab
LUMIVERD	0.3	5.5 ab	6.0 ab	5.5	6.5 a
LUMIVERD	0.05	5.0 ab	6.5 a	5.0	6.5 a
LUMIVERD	0.1	5.0 ab	5.0 c	5.0	6.0 ab
LUMIVERD	0.4	5.0 ab	5.0 c	5.0	5.0 b
SEPRESTO	0.265	5.0 ab	5.0 c	5.0	5.0 b
SEPRESTO	0.21	4.5 b	5.5 bc	5.0	5.0 b
Check	-	5.0 ab	5.0 c	5.0	5.5 ab

<sup>1</sup> Seedling vigor using a 1-9 scale, compared to the commercial standard, Vigor rating scale

9 Significantly stronger and faster growth compared to commercial standard.

7 Stronger and faster growth compared to commercial standard.

5 commercial standard.

3 Weaker and slower growth compared to commercial standard.

1 Significantly weaker and slower growth compared to commercial standard.

<sup>2</sup> DAE = Days after emergence

<sup>3</sup> Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's protected LSD test.

<sup>4</sup> ns = no significant differences were found among the treatments

**Table 6.** Stand counts of onions cv. Patterson treated with various insecticides and grown at the Ontario Crops Research Centre – Bradford, 2025.

Treatment	Rate (mg ai/seed)	Stand Counts <sup>1</sup>					
		OM1			OM3		
		7 DAE <sup>2</sup>	14 DAE	21 DAE	7 DAE	14 DAE	21 DAE
LUMIVERD	0.2	61 a <sup>3</sup>	64 a	64 a	59 ab	57 ab	58 ab
LUMIVERD	0.3	60 a	61 ab	60 a	64 a	64 a	66 a
LUMIVERD	0.1	58 a	61 ab	60 a	61 ab	59 a	56 abc
SEPRESTO	0.21	56 ab	54 bc	54 ab	56 ab	55 ab	53 bc
LUMIVERD	0.05	53 ab	56 bc	56 a	57 ab	58 a	57 abc
LUMIVERD	0.4	53 ab	59 ab	60 a	58 ab	59 a	60 ab
SEPRESTO	0.265	53 ab	54 bc	57 a	59 ab	59 a	58 ab
Check	-	47 b	48 c	44 b	52 b	47 b	45 c

<sup>1</sup> Stand counts taken from a 2 meter section of row

<sup>2</sup> DAE = Days after emergence

<sup>3</sup> Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's protected LSD test.

**Funding for this project was provided by Corteva Agriscience.**

**CROP:** Yellow cooking onions (*Allium cepa* L.), cv. Catskill

**AUTHORS:** VANDER KOOI K, SCICLUNA, J & MCDONALD MR  
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**TITLE:** **EVALUATION OF THE BH FRONTIER SOLUTIONS ELECTRIC WEEDER FOR WEED CONTROL IN ONIONS, 2025**

**METHODS:**

Onions, cv. Catskill, were mechanically transplanted on 14 May into organic soil (organic matter  $\approx$  49.9%, pH  $\approx$  7.4) near the Ontario Crops Research Centre - Bradford, Ontario. The plot consisted of eight beds 40 m in length with four rows each spaced 40 cm apart. Eight 1 m sections consisting of four rows were staked out. An initial count of weeds was taken in the staked sections on 23 June. The electric weeder was operated throughout the entire plot on 27 June. The remaining weeds were counted on 10 July, to assess weed survival after the robot went through the plot. Weeds that died after running the electric weeder and onions that appeared damaged were also counted. Data were analyzed using the General Analysis of Variance function of Statistix V.10. Means separation was obtained by using Fisher's Protected LSD test at  $P = 0.05$  level of significance.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C) and September (16.6°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C.

Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

**RESULTS:** As presented in Tables 1-3.

**CONCLUSIONS:** The electric weeder was more successful at controlling some types of weeds than others. The weeder controlled groundsel, marsh cress and common grasses more effectively than pigweed. Groundsel was also better controlled than nutsedge. There was more pigweed remaining after use of the weeder than in the initial count, which is likely due to additional seedlings germinating in the time between the two assessments. The weeder suppressed both broadleaf weeds and grasses, but a considerable number of both weed types remained after the weeder worked through the plot. A small percentage of onion plants experienced damage from the electricity. There was lower yield in the onions weeded with the electric weeder than those weeded using conventional methods. However, the electric robot was only used in the trial once and weed pressure was very high by the end of the season. Improvements to the weeder are needed to provide more effective control of pigweed and nutsedge in onion. More research is needed to continue testing the weeder on onion and other vegetable crops.

**Table 1.** Percentage (%) of different types of weeds remaining after use of the electric weeder in an onion trial at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

Weed	Remaining weeds (%)
Groundsel	6 a <sup>1</sup>
Marsh cress	34 ab
Grasses	51 ab
Nutsedge	77 bc
Pigweed	121 c

<sup>1</sup>Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's protected LSD test.

**Table 2.** Average percentage (%) of dead weeds or onions with damage to the leaves after weeding by the electric weeder at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

Plant	Damage (%)
Broadleaf weeds <sup>1</sup>	60 a <sup>3</sup>
Grassy weeds <sup>2</sup>	40 a
Onion	2 b

<sup>1</sup> Broadleaf weeds included groundsel, marsh cress and pigweed.

<sup>2</sup> Grasses included common grasses and nutsedge.

<sup>3</sup> Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's protected LSD test.

**Funding for this project was provided by BH Frontier Solutions Inc.**

**CROP:** Yellow cooking onions (*Allium cepa* L.), cv. Ridgeline

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**TITLE:** **EVALUATION OF THE FARMDROID FD20 AND NAI ORO SEEDING AND WEEDING IN A COMMERCIAL ONION FIELD, 2025**

**METHODS:** The FarmDroid FD20 was used to seed and weed 7 acres (2.83 ha) of onions in a commercial field. Onions, cv. Ridgeline, were direct seeded on 3-5 May by the FD20 into organic soil in Keswick, Ontario. The FD20 seeded 21 beds ~800 m long, with 4 rows in each bed (onions were seeded in clusters of three, 10.5 cm apart within the row) at 550 meters per hour. The Naio Orio robot was also used to seed 20 beds in a 7 acre field adjacent to the FD20 seeded field. Onions were seeded ( $\approx 32$  seeds/m) on 5-6 May using a 4 row Stanhay precision seeder attached to the Orio. Each bed consisted of four rows spaced 40 cm apart. Following seeding and once the onions emerged, the FD20 was switched into weeding mode, using custom steel knives to remove weeds growing between the rows it had seeded, also at a speed of 900 meters per hour. A standard herbicide program was followed and applied by the grower. Weeds density was assessed prior to and following cultivation by the FD20 in 2 meter sections of beds randomly throughout the seeded area. Yield was compared to onions seeded conventionally by the grower using a Monosem air seeder and onions seeded by the Naio Orio. On 18 September, onions in 2.32 m sections of row were pulled from 5 random locations from each treatment for a yield sample. Onions were weighed, graded for size, and counted on 29 September to determine yield.

Data were analyzed using the General Analysis of Variance function of Statistix V.10. Means separation was obtained by using Fisher's Protected LSD test at  $P = 0.05$  level of significance.

Weather data was recorded in at the Ontario Crops Research Centre-Bradford. Temperature are similar, there may be some differences in rainfall between this site and the Keswick Marsh. Onions in Keswick were irrigated as needed. Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C), September (16.6°C) and October (9.9°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C, September 17.0°C and October 9.9°C.

Monthly rainfall was below the 10-year average for June (46 mm), August (54 mm) and October (45 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm, September 48 mm and October 58 mm.

**RESULTS:** Yield results are presented in Tables 1 and 2.

**CONCLUSIONS:** Stand counts were slightly but significantly lower for the FD20 than the other two treatments (Table 1). The weeding tooling was effective at removing weeds in between the rows of onions, the FD20 was more effective following 2 passes (Table 1). Field conditions can affect the efficacy of the tooling. The yield of onions seeded by the FD20 was significantly lower than the onions seeded by the Orio robot. However, the FD20 had similar yields to the conventional seeded onions (Table 2). More work needs to be done to improve weeding tooling and further optimize seeding speed and efficacy to suit commercialization.

**Table 1.** Stand and weed counts for onions seeded and weeded by the FarmDroid FD20 compared to conventional methods in a grower field located in the Keswick Marsh, Ontario, 2025.

Treatment	Stand Counts Onion/meter	Weeds/plot		
		4 June	11 June	13 June
FD20	26.1 b	167.5	20.5	4.8 a
Conventional	28.3 a <sup>1</sup>	80.5 ns <sup>2</sup>	70.8 ns	71.3 b
Orio	29.0 a	na	na	na

<sup>1</sup> Numbers in a column followed by the same letter are not significantly different at  $P = 0.05$ , Fisher's Protected LSD test.

<sup>2</sup> ns= no significant differences were found at  $P = 0.05$ , Fisher's Protected LSD test.

**Table 2.** Yield and size distribution for onions seeded by the FarmDroid FD20 and Naio Orio compared to conventional methods in a grower field located in the Keswick Marsh, Ontario, 2025.

Treatment	Yield (t/ha)	# Bulbs/meter	Size Distribution (%) <sup>1</sup>			
			Jumbo (>76 mm)	Large (76-64 mm)	Medium (64-45 mm)	Cull (<45 mm)
Orio	75.7a <sup>2</sup>	23.2 ns	6.2 ns <sup>3</sup>	44.2 a	46.3 ns	4.9 a
Conventional	69.4 ab	25.6	1.4	26.7 b	63.8	8.1 b
FD20	60.9 b	22.4	1.8	25.4 b	61.3	11.5 c

<sup>1</sup> Percentage values were determined using weight.

<sup>2</sup> Numbers in a column followed by the same letter are not significantly different at  $P = 0.05$ , Fisher's Protected LSD test.

<sup>3</sup> ns= no significant differences were found at  $P = 0.05$ , Fisher's Protected LSD test.

**Funding for this project was provided by the Fresh Vegetable Growers of Ontario, Haggerty AgRobotics Inc., the Ontario Agri-Food Innovation Alliance, and Innovation Farms powered by AgExpert. The FD20 and Orio were provided by Haggerty AgRobotics Inc.**

**CROP:** Yellow cooking onions (*Allium cepa* L.)

**AUTHORS:** EZEH IN, VANDER KOOI K and MCDONALD MR  
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**TITLE:** ANALYSIS OF NUTRIENT CONCENTRATION FROM PICKETA LENS AND LABORATORY TISSUE TESTING OF ONION LEAVES FROM GROWER FIELDS, 2025

**METHODS:** Ten commercial onion fields in the Holland Marsh region were sampled three times during the 2025 growing season: 9–10 July, 23–24 July, and 5–7 August. At each sampling event, onion leaves were collected from five locations per field: one near each corner and one at the centre. At each location, the most recently mature leaf (typically the third fully expanded leaf) was taken from ten plants in each of the two inner rows of a bed, for a total of 20 leaves per location.

All leaves were transported the same day to the Ontario Crops Research Centre (OCRC), Bradford, where they were scanned using the Picketa Leaf Evaluated Nutrient System (LENS). The LENS operated using the manufacturer's updated general spectral model, which integrates data from multiple crops. LENS results were available immediately through the Picketa cloud-based Fieldbook platform. The same leaves were then bagged and submitted to SGS Canada Inc., Guelph Laboratory, for tissue nutrient analysis, with laboratory reports typically returned within 3–5 business days.

Nutrient concentrations were obtained for nitrogen (N), phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), zinc (Zn), manganese (Mn), copper (Cu), iron (Fe), boron (B), and sulphur (S). Values from both methods were compared to sufficiency ranges published in the OMAFA Vegetable Guide 839, adapted from Hochmuth et al. 2018. Plant Tissue Analysis and Interpretation for Vegetable Crops in Florida. University of Florida IFAS Extension. HS964.

Data analyses were conducted in SAS 9.4 (SAS Institute, Cary, USA). Nutrient concentrations were analyzed using a repeated-measures linear mixed model (PROC GLIMMIX), with tissue-testing method (LENS vs. laboratory), sampling date, and their interaction treated as fixed effects. Field was included as a random effect to account for repeated measurements across dates, and the five sampling locations within each field were treated as subsamples. Least-squares means were compared using the Tukey–Kramer adjustment. Linear associations between LENS and laboratory measurements were evaluated using Pearson correlation coefficients (PROC CORR) for each sampling round and for pooled data.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C) and September (16.6°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C. Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm), and above average for May (112 mm), July (84 mm), and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

**RESULTS:** as presented in Tables 1, 2 and 3.

**CONCLUSIONS:** Across the three sampling rounds, nutrient concentrations measured by the LENS and the SGS laboratory showed consistent directional patterns, although the magnitudes of the values differed between methods for several nutrients. Nitrogen concentrations declined slightly across sampling rounds and were similar between methods at each date. Phosphorus values were within published sufficiency ranges for both methods. LENS values were consistently higher than laboratory values, but the difference between methods varied by sampling date, indicating a method-by-date interaction. Potassium showed the largest differences between methods. LENS values were substantially higher than laboratory values at all sampling rounds. Both methods showed lower potassium concentrations by the third sampling date, but the decline was steeper in the LENS measurements. For magnesium, calcium, and sulphur, differences between methods also depended on sampling date. Calcium values were higher in the LENS than in the laboratory

at the first sampling, but the laboratory values exceeded those in the LENS at later dates. Sulphur concentrations were higher in the LENS at the later sampling rounds.

Among micronutrients, zinc, manganese, and iron showed clear method-by-date interactions. Laboratory manganese values were higher than LENS values at the second and third sampling rounds. Boron did not show a method-by-date interaction; however, laboratory values were consistently higher than LENS values, particularly at the later sampling date.

Seasonal changes were evident for several nutrients, with concentrations generally higher in early July and lower by early August, although the magnitude and direction of change varied by nutrient and method.

Correlations between LENS and laboratory measurements varied by nutrient and sampling round. During the first sampling period (9–10 July), significant correlations were observed for phosphorus and boron. In the second sampling period (23–24 July), significant correlations were again detected for phosphorus and boron. No significant correlations were observed during the third sampling period (5–7 August).

When data were pooled across all sampling rounds, significant positive correlations were found for nitrogen, potassium, manganese, iron, and boron, while phosphorus, calcium, and sulphur showed significant negative correlations. Magnesium and zinc showed weak or inconsistent associations across dates.

**Table 1:** Picketa LENS and SGS Labs nutrient measurements in onion leaves from various grower fields and sufficiency range by sampling rounds, 2025

Round	Test method	N <sup>1</sup>	P	K	Mg	Ca	Zn	Mn	B	S <sup>1</sup>
			Percentage			Part per million				
First	Picketa LENS	4.2 a <sup>2</sup>	0.4 a	14.8 a	0.32 a	2.5 a	49 a	42 c	19 d	0.81 c
First	SGS lab	4.3 a	0.4 a	4.5 c	0.20 c	1.4 d	35 b	48 c	27 c	0.84 bc
Second	Picketa LENS	3.7 b	0.4 a	9.9 b	0.24 b	2.1 b	46 a	36 c	19 d	0.94 a
Second	SGS lab	3.7 b	0.3 b	3.9 c	0.21 c	1.6 c	37 b	93 b	33 b	0.87 b
Third	Picketa LENS	3.4 c	0.4 a	3.2 c	0.19 c	1.4 d	32 b	40 c	28 bc	0.98 a
Third	SGS lab	3.3 c	0.2 c	3.2 c	0.19 c	1.6 c	36 b	153 a	41 a	0.66 d
Sufficiency range		2 – 3	0.2– 0.5	1.5 –3	0.15–	0.6 –	15 –	10 –	10 –	0.2 –0.6
					0.3	0.8	20	20	25	

<sup>1</sup> The nutrient was reported as “as is” for all lab measurements without any adjustments for moisture and reported as a percentage for the Picket LENS measurements.

<sup>2</sup> Means in a column followed by the same letter are not significantly different at  $p > 0.05$ , based on the Tukey-Kramer multiple comparison test.

**Table 3:** Correlation coefficients (r) and p-values between SGS laboratory tissue analysis and Picketa LENS for each nutrient at different sampling rounds and pooled data

Nutrient	9-10 July		23-24 July		5-7 August		Rounds pooled	
	r	p-value <sup>1</sup>	r	p-value	r	p-value	r	p-value
Nitrogen	0.23	0.12	0.02	0.92	0.01	0.95	<b>0.35</b>	<b>&lt;0.0001</b>
Phosphorus	<b>-0.33</b>	<b>0.02</b>	<b>-0.55</b>	<b>&lt;0.0001</b>	-0.08	0.63	<b>-0.42</b>	<b>&lt;0.0001</b>
Potassium	0.28	0.06	-0.07	0.63	-0.04	0.80	<b>0.48</b>	<b>&lt;0.0001</b>
Magnesium	-0.24	0.10	-0.07	0.64	-0.13	0.44	-0.15	0.09
Calcium	-0.22	0.15	0.001	0.99	0.14	0.43	<b>-0.25</b>	<b>0.004</b>
Zinc	-0.11	0.48	0.26	0.06	0.32	0.06	0.16	0.07
Manganese	-0.13	0.41	-0.16	0.28	-0.05	0.76	<b>0.25</b>	<b>0.004</b>
Iron	0.05	0.73	0.22	0.13	0.24	0.17	<b>0.18</b>	<b>0.04</b>
Boron	<b>0.29</b>	<b>0.05</b>	<b>-0.33</b>	<b>0.02</b>	-0.25	0.15	<b>0.35</b>	<b>&lt;0.0001</b>
Sulfur	-0.05	0.75	-0.18	0.22	0.04	0.81	<b>-0.26</b>	<b>0.0022</b>

<sup>1</sup>Significant at  $p < 0.05$ .

**Funding for this project was provided by the Fresh Vegetable Growers of Ontario, Haggerty AgRobotics Inc., the Ontario Agri-Food Innovation Alliance, and Innovation Farms powered by AgExpert.**

**CROP:** Yellow cooking onions (*Allium cepa* L.)

**AUTHORS:** EZEH IN, FARINTOSH G, VANDER KOOI K and MCDONALD MR  
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**TITLE:** **REVISED ONION LEAF NUTRIENT LEVELS IN GROWER FIELDS USING THE PICKETA LENS AND LABORATORY TISSUE ANALYSIS, 2024**

**METHODS:** The study was conducted in eight commercial grower fields (Labelled A-H). Six fields (A-F) were sampled in the first round between 15 and 19 July. Five fields were sampled in the second round between 2 and 6 August; three of these had also been sampled in the first round (Fields A, B, and C), and two were new fields (G and H). Field A was sampled a third time on 21 August; the only field with three sampling dates. Twenty plants in five locations per field were sampled each time, with samples taken near each field corner and one in the middle. The most recently mature leaf (usually the third leaf from the centre) from each of 10 plants per row in two centre rows of a bed was sampled at each location.

The leaves were scanned using the Picketa Leaf Evaluated Nutrient System (LENS) technology and the results were immediately available through the Picketa cloud-based 'Fieldbook'. The same leaves were sent to SGS Laboratory (Guelph, ON) for tissue analysis and the lab results were received five days later. The nutrients assessed were nitrogen (N as is), phosphorus (P %), potassium (K %), magnesium (Mg %), calcium (Ca %), zinc (Zn, ppm), manganese (Mn, ppm), copper (Cu, ppm), iron (Fe, ppm), boron (B, ppm) and sulfur (S as is). These results were compared to the nutrient sufficiency ranges from the OMAFA Vegetable Guide 839, adapted from Hochmuth, et al. 2018. Plant Tissue Analysis and Interpretation for Vegetable Crops in Florida. University of Florida IFAS Extension. HS964.

Data were analyzed using linear mixed models (PROC GLIMMIX) in SAS version 9.4 (SAS Institute, Cary, USA). For the main comparison between tissue testing methods, all sampling rounds were included with tissue testing method (Picketa LENS vs SGS laboratory) as a fixed effect, sampling round as a blocking factor, Field as a random effect, and sampling locations within fields treated as subsamples. Time effects and the interaction of method and sampling round were examined in a separate model using only the first and second sampling rounds, with the field as the experimental unit. The third sampling round (single resampled field) was analyzed separately as a case study using sampling locations as within-field replicates. Pairwise comparisons of least-squares means were adjusted using the Tukey–Kramer test. Pearson correlations between LENS and laboratory values were computed with PROC CORR for each nutrient by sampling round and for all observations pooled across the season.

**RESULTS:** as presented in Tables 1, 2, 3 and 4.

**CONCLUSIONS:** Across grower fields, the Picketa LENS technology consistently reported higher mean concentrations than the SGS laboratory for most macro and micronutrients; tissue concentrations were higher from the lab for B and S and not significant for Cu (Table 1). The only nutrient results that were below the sufficiency range were Cu, assessed by the LENS. Time effects and their interaction with the method were only analyzed for the first and second sampling rounds, where multiple fields were re-sampled. The method by sampling date interaction was significant for N, P, K, Mg, and Ca (Table 2). In this subset, LENS remained higher than the laboratory for most nutrients at both dates, with larger differences for Mn. The third sampling was treated as a case study; within that field, the direction and magnitude of method differences resembled those observed earlier but did not allow for replicated field-level inference (Table 3). When all scan points and sampling dates were pooled, Pearson correlations between LENS and laboratory values for Mn and S were moderately positive in the first round and the pooled data (Table 4). There was a similar correlation for K and S in the second round. The correlations in the third round are based on only one field and are reported descriptively, but not interpreted for field-level inference.

**Table 1:** Comparison of Picketa LENS and SGS laboratory analysis for onion leaf nutrient concentrations across all fields and sampling rounds, 2024.

Method	N <sup>1</sup>	P	K	Mg	Ca	Zn	Mn	B	Cu	S <sup>1</sup>
		Percentage					Part per million			
LENS	4.5 a <sup>2</sup>	0.4 a	3.6 a	0.25 a	1.03 a	41 a	74 a	24 b	4.8 ns <sup>3</sup>	0.48 b
LAB	2.8 b	0.3 b	2.6 b	0.16 b	0.97 b	21 b	33 b	29 a	6.8	0.67 a
Sufficiency range	2 – 3	0.2– 0.5	1.5–3	0.15– 0.3	0.6– 0.8	15– 20	10– 20	10– 25	5– 10	0.2– 0.6

<sup>1</sup> These nutrients were reported as “as is” for all lab measurements without any adjustments for moisture and reported as a percentage for the Picketa LENS measurements.

<sup>2</sup> Means in a column followed by the same letter are not significantly different at  $p < 0.05$ , based on the Tukey-Kramer multiple comparison test.

<sup>3</sup> ns - no significant difference among the treatments in a column at  $p \geq 0.05$

**Table 2:** Method by first and second sampling round for onion leaf nutrients across grower fields, 2024.

Sample date	Test method	N <sup>1</sup>	P	K	Mg	Ca	Zn	Mn	B	S <sup>1</sup>
			Percentage					Part per million		
First	LENS	4.5 a <sup>2</sup>	0.37 ab	3.5 a	0.24 b	0.9 b	41 a	80 a	25 ab	0.47 b
First	LAB	3.0 b	0.33 b	2.8 b	0.17 c	1.1 a	21 b	37 b	28 ab	0.67 a
Second	LENS	4.7 a	0.41 a	4.1 a	0.27 a	1.0 ab	44 a	75 a	23 b	0.47 b
Second	LAB	3.0 b	0.33 b	2.8 b	0.16 c	1.0 ab	24 b	39 b	31 a	0.67 a
Sufficiency range		2 – 3	0.2– 0.5	1.5 – 3	0.15– 0.3	0.6 – 0.8	15 – 20	10 – 20	10 – 25	0.2 –0.6

<sup>1</sup> The nutrients were reported as “as is” for all lab measurements without any adjustments for moisture and reported as a percentage for the Picketa LENS measurements.

<sup>2</sup> Means in a column followed by the same letter are not significantly different at  $p < 0.05$ , based on the Tukey-Kramer multiple comparison test.

**Table 3:** Picketa LENS and SGS Labs nutrient measurements in onion leaves from various grower fields and the sufficiency range by the third sampling date, 2024

Sample date	Test method	N <sup>1</sup>	P	K	Mg	Ca	Zn	Mn	Cu	B	S <sup>1</sup>
			Percentage					Parts per million			
Third	LENS	4.5 a <sup>2</sup>	0.4 a	3.9 a	0.27 a	1.1 ns <sup>3</sup>	43 a	74 a	7.2 ns	25	0.5 b
Third	LAB	2.5 b	0.2 b	2.4 b	0.16 b	1.0	17 b	17 b	7.8	27	0.6 a
Sufficiency range		2 – 3	0.2– 0.5	1.5 – 3	0.15– 0.3	0.6 – 0.8	15 – 20	10 – 20	5 – 10	10 – 25	0.2 – 0.6

<sup>1</sup> The nutrient was reported as “as is” for all lab measurements without any adjustments for moisture and reported as a percentage for the LENS measurements.

<sup>2</sup> Means in a column followed by the same letter are not significantly different at  $p > 0.05$ , based on the Tukey-Kramer multiple comparison method.

<sup>3</sup> ns - no significant difference among the treatments in a column at  $p \geq 0.05$

**Table 4:** Correlation coefficients (r) and p-values between SGS laboratory tissue analysis and Picketa LENS for each nutrient at different sampling dates and pooled data

Nutrient	15-19 July		2-6 August		21 August		Rounds pooled	
	r	p-value <sup>1</sup>	r	p-value	r	p-value	r	p-value
Nitrogen	0.02	0.91	-0.17	0.41	0.21	0.74	-0.01	0.93
Phosphorus	0.14	0.47	0.10	0.64	-0.53	0.36	0.06	0.65
Potassium	0.15	0.43	<b>0.47</b>	<b>0.02</b>	-0.54	0.34	0.14	0.28
Magnesium	0.14	0.47	0.00	0.99	0.25	0.69	0.08	0.54
Calcium	-0.02	0.93	0.09	0.68	-0.23	0.71	0.09	0.50
Zinc	0.12	0.52	0.03	0.88	-0.59	0.30	0.12	0.38
Manganese	<b>0.47</b>	<b>0.01</b>	0.03	0.88	-0.25	0.69	<b>0.28</b>	<b>0.03</b>
Iron	0.13	0.49	0.02	0.92	0.61	0.28	0.12	0.38
Boron	0.07	0.73	0.18	0.40	-0.17	0.79	0.12	0.38
Copper	-0.07	0.71	0.12	0.58	0.37	0.54	-0.02	0.90
Sulfur	<b>0.43</b>	<b>0.02</b>	<b>0.43</b>	<b>0.03</b>	0.39	0.52	<b>0.39</b>	<b>0.002</b>

<sup>1</sup>Significant at  $p < 0.05$ .

**Funding for this project was provided by the Fresh Vegetable Growers of Ontario, Haggerty AgRobotics Inc., the Ontario Agri-Food Innovation Alliance, Picketa Systems Inc., and Innovation Farms powered by AgExpert.**

**CROP:** Yellow cooking onions (*Allium cepa* L.) cv. Traverse

**AUTHORS:** EZEH IN, PRAPAGAR K, and MCDONALD MR  
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**TITLE:** **EFFECT OF FOLIAR ENDOPHYTIC BACTERIA ON GROWTH OF ONIONS (*Allium cepa* L.) UNDER CONTROLLED ENVIRONMENT CONDITIONS**

**MATERIALS:** UTRISHA™ N NUTRIENT EFFICIENCY BIOSTIMULANT (*Methylobacterium symbioticum*, CORTEVA AGRISCIENCE) and ENVITA™ NITROGEN-FIXING BIOLOGICAL (*Gluconacetobacter diazotrophicus*, AZOTIC TECHNOLOGIES)

**METHODS:** A controlled-environment study was conducted in the growth room facilities at the Department of Plant Agriculture, University of Guelph, between November 2024 and August 2025, to evaluate the effects of nitrogen-fixing bacteria and nitrogen fertilization on onion growth. Lighting in the growth room was set from 6:40 to 22:40, with day/night temperatures maintained at 25 °C and 21 °C, respectively. Relative humidity was maintained at 40% throughout the study.

Onions were transplanted on 28 November 2024 (Trial 1) and on 20 June 2025 (Trial 2) into 8 × 8 × 18 cm square conical pots filled with 150 g of moistened Sunshine Mix No. 4. Each replicate consisted of nine pots, with one plant per pot. The experiment was a randomized complete block design with four replications and a factorial structure. The two factors were: endophyte inoculation (none, *Metylobacterium symbioticum*, *Gluconacetobacter diazotrophicus*) and Standard Hoagland's Solution (SHS) levels (SHS absent, nitrogen-deficient SHS, complete recipe SHS). There were eight treatment combinations; the no SHS, no endophyte treatment was excluded as very poor onion growth was expected in this treatment (Table 1).

The different SHS treatment levels (Tables 2 and 3) were applied starting one week after transplanting with 25 ml twice a week and increased to 50 ml twice a week after two weeks. Endophyte presence was verified before inoculation by culturing on nitrogen-free Liquid *Gluconacetobacter* Isolate medium for *Gluconacetobacter diazotrophicus* (Gillis et al. 1989), Yamada et al. 1998, and on Ammonium Mineral Salts medium for the methylophilic bacterium *Methylobacterium symbioticum* Pascual et al. 2021. Both cultures produced colonies with distinctive signature coloration.

Endophyte inoculations began at four weeks after transplanting (WAT) in both trials and continued weekly for four weeks. Preliminary endophyte recovery at three days after first inoculation and leaf plating performed three days after inoculation at seven WAT yielded no recoverable colonies in *M. symbioticum* treatments, while *G. diazotrophicus* produced colonies.

Plant height was measured from the stem base to the tip of the tallest leaf in weeks 4, 9, and 12 of Trial 1 and in weeks 6 and 9 of Trial 2. Tissue tests were run at 9 and 12 WAT on the third most recently mature leaf using Picketa Leaf Evaluated Nutrient System (LENS) and SGS Laboratory. Fresh biomass without roots was collected at 14 WAT in Trial 1 and 9 WAT in Trial 2, then dried for five days.

Data for plant height, fresh and dry biomass, and tissue nutrient concentrations were analyzed using PROC GLIMMIX (SAS Institute Inc., Cary, NC) in a factorial design. Fixed effects included fertilizer regime, endophyte treatment, sampling time (for tissue data), and all associated interactions. Replication was a random effect. Pairwise comparisons of least squares means were adjusted using the Tukey–Kramer method at  $\alpha = 0.05$ .

**RESULTS:** As presented in tables 4, 5, 6, 7 and 8.

**CONCLUSION:** Plant height differed among treatments at 9 and 12 WAT in Trial 1 and at 6 and 9 WAT in Trial 2. In both trials, SHS-based treatments produced taller plants than N-deficient or endophyte-only

treatments. Endophyte inoculation did not increase plant height, and no interaction between fertilizer regime and endophyte treatment was detected.

Fresh and dry biomass were higher in Trial 1 than in Trial 2. Fertilizer effects were significant in both trials; the SHS control consistently produced the highest biomass, though it was not statistically different from several other treatments. Endophyte treatments did not increase biomass within any fertilizer level. Since no *M. symbioticum* was recovered from inoculated leaves, no effect of this endophyte was expected. As with plant height, there was no interaction between fertilizer and endophyte factors for biomass.

Tissue nutrient concentrations differed between assessment methods at both 9 and 14 WAT. A three-way interaction among assessment method, fertilizer regime, and endophyte treatment was observed for nitrogen concentration at both 9 WAT and 14 WAT. LENS values for N, K, Mn, and Fe were consistently higher than laboratory values across most treatments. Fertilizer effects were evident, as SHS-based treatments generally resulted in higher nutrient concentrations than N-deficient treatments. Endophyte effects were negligible, with no consistent differences among inoculants within either diagnostic method. Nitrogen concentration remained within the sufficiency range for all treatments except for *M. symbioticum* applied alone or with N-deficient SHS.

Table 1. Nutrient supply and inoculant treatment combinations

Treatments <sup>1</sup>	Treatments			
	Full SHS <sup>2</sup>	Nitrogen-deficient SHS	<i>Metylobacterium symbioticum</i>	<i>Gluconacetobacter diazotrophicus</i>
Control (Full SHS)	Yes			
Control N-deficient SHS		Yes		
<i>M. symbioticum</i> N-deficient SHS		Yes	Yes	
<i>G. diazotrophicus</i> under N-deficient SHS		Yes		Yes
<i>M. symbioticum</i> under full SHS	Yes		Yes	
<i>G. diazotrophicus</i> under full SHS	Yes			Yes
<i>M. symbioticum</i> only	None		Yes	
<i>G. diazotrophicus</i> only	None			Yes

<sup>1</sup>The no SHS and no endophyte control check was not included in the trials because it was biologically impractical to implement under the given conditions.

<sup>2</sup>SHS - Standard Hoagland's Solution

Table 2. Table 2: Standard Hoagland Solution recipe<sup>1</sup>

Macronutrients	mL/L	Micronutrients	mg/L
1 M Potassium nitrate	5	H <sub>3</sub> BO <sub>3</sub>	2.86
1 M Calcium nitrate tetrahydrate (Ca(NO <sub>3</sub> ) <sub>2</sub> ·4H <sub>2</sub> O)	5	MnCl <sub>2</sub> ·4H <sub>2</sub> O	1.81
1 M Monopotassium phosphate (KH <sub>2</sub> PO <sub>4</sub> )	1	ZnSO <sub>4</sub> ·7H <sub>2</sub> O	0.22
1 M Magnesium sulphate (MgSO <sub>4</sub> ·7H <sub>2</sub> O)	1	CuSO <sub>4</sub> ·5H <sub>2</sub> O	0.08
		85% MoO <sub>3</sub>	0.02
		Fe Chelate (Fe-EDTA)	1 mg/L

<sup>1</sup> The final solution applied to the plant was at 50% dilution to give half-strength.

Table 3. N-deficient Standard Hoagland Solution recipe<sup>1</sup>

Macronutrients	mL/L	Micronutrients	mg/L
1 M Potassium Chloride (KCl)	4	H <sub>3</sub> BO <sub>3</sub>	2.86
1 M Calcium Chloride dihydrate (CaCl <sub>2</sub> ·2H <sub>2</sub> O)	5	MnCl <sub>2</sub> ·4H <sub>2</sub> O	1.81
1 M Monopotassium phosphate (KH <sub>2</sub> PO <sub>4</sub> )	1	ZnSO <sub>4</sub> ·7H <sub>2</sub> O	0.22
1 M Magnesium sulphate (MgSO <sub>4</sub> ·7H <sub>2</sub> O)	1	CuSO <sub>4</sub> ·5H <sub>2</sub> O	0.08
		85% MoO <sub>3</sub>	0.02
		Fe Chelate (Fe-EDTA)	1 mg/L

<sup>1</sup> The final solution applied to the plant was at 50% dilution to give half-strength.

Table 4. Interaction effects of standard Hoagland solution and endophyte treatments on onion height in Trial 1 in a controlled environment, 2025.

Treatment combinations	Plant height (cm)		
	4 WAT	9 WAT	12 WAT
Control (SHS)	32 ns <sup>1</sup>	48 a <sup>2</sup>	46 a
Control (N-deficient SHS)	30	44 ab	40 ab
<i>M. symbioticum</i> + SHS	31	43 abc	39 ab
<i>G. diazotrophicus</i> + SHS	30	42 abc	39 ab
<i>G. diazotrophicus</i> + N-deficient SHS	31	42 abc	39 ab
<i>G. diazotrophicus</i> only	28	39 bc	35 b
<i>M. symbioticum</i> only	30	38 bc	35 b
<i>M. symbioticum</i> + N-deficient SHS	30	37 c	33 b

<sup>1</sup> ns = no significant differences were found among treatments.

<sup>2</sup> Means in a column by the same letter are not significantly different at  $p > 0.05$  (Tukey-Kramer test).

Table 5. Interaction effect of standard Hoagland solution and endophyte treatments on onion height in Trial 2 in a controlled environment, 2025.

Treatment combinations	Plant height (cm)	
	6 WAT	9 WAT
<i>G. diazotrophicus</i> + SHS	24 ab	33 a
<i>M. symbioticum</i> + SHS	25 a	31 a
Control (SHS)	22 ab	31 a
Control + N-deficient SHS	21 ab	19 b
<i>G. diazotrophicus</i> only	21 ab	18 b
<i>M. symbioticum</i> + N-deficient SHS	19 ab	17 b
<i>M. symbioticum</i> only	17 b	17 b
<i>G. diazotrophicus</i> + N-deficient SHS	19 ab	14 b

<sup>1</sup> Means in a column by the same letter are not significantly different at  $p > 0.05$ , (Tukey-Kramer test).

Table 6. Effects of standard Hoagland solution and endophyte treatments on onion biomass in the controlled environment 2025

Treatment	Fresh leaf biomass (g)		Dry leaf biomass (g)	
	Trial 1	Trial 2	Trial 1	Trial 2
Control (SHS)	417.2 a <sup>1</sup>	70.4 a	57.8 a	6.9 abc
<i>M. symbioticum</i> + SHS	328.4 b	82.3 a	47.1 ab	8.2 a
<i>G. diazotrophicus</i> + SHS	301.4 bc	80.0 a	40.8 abc	7.5 ab
Control (N-deficient SHS)	262.2 bcd	35.1 b	47.3 ab	4.7 bcd
<i>G. diazotrophicus</i> + N-deficient SHS	229.3 cde	16.0 b	42.7 abc	2.3 d
<i>G. diazotrophicus</i> only	211.3 def	26.8 b	38.4 abc	3.6 cd
<i>M. symbioticum</i> only	158.5 ef	25.4 b	28.4 bc	3.5 cd
<i>M. symbioticum</i> + N-deficient SHS	140.5 f	24.3 b	24.6 c	3.1 d

<sup>1</sup> Means in a column with the same treatment grouping followed by the same letter are not significantly different at  $p > 0.05$ , based on the Tukey-Kramer multiple comparison test.

Table 7: Effects of standard Hoagland solution and endophyte treatments on nutrient levels of key elements in onion leaves at 9 WAT in the controlled environment trial, winter 2025.

Treatments	N <sup>1</sup>	P	K	Mg	Mn	B	Fe
	Percent			mg kg <sup>-1</sup>			
<b>LENS concentrations</b>							
<i>G. diazotrophicus</i> only	5.1 a <sup>2</sup>	0.39 ab	7.4 a	0.3 ns <sup>3</sup>	87.3 a	17.7 b	167.7 a
<i>M. symbioticum</i> + SHS	5.1 a	0.39 ab	7.0 a	0.3	85.3 a	17.7 b	162.7 a
<i>G. diazotrophicus</i> + SHS	5.1 a	0.39 ab	6.5 ab	0.3	87.7 a	19.0 ab	153.0 a
Control (N-deficient SHS)	5.1 a	0.39 ab	6.7 ab	0.3	87.0 a	18.3 ab	149.7 a
Control (SHS)	5.0 a	0.39 ab	6.8 ab	0.3	84.7 ab	18.7 ab	153.3 a
<i>G. diazotrophicus</i> + N-deficient SHS	4.9 a	0.38 ab	5.9 abc	0.3	85.3 a	19.7 ab	146.7 ab
<i>M. symbioticum</i> only	4.9 a	0.37 ab	5.2 bc	0.3	83.3 ab	19.3 ab	146.7 ab
<i>M. symbioticum</i> + N-deficient SHS	4.4 b	0.36 ab	4.6 c	0.3	77.3 b	19.7 ab	123.0 b
<b>SGS laboratory concentrations</b>							
<i>G. diazotrophicus</i> only	2.5 c	0.27 cd	2.9 d	0.3	15.7 c	15.1 b	46.6 cd
<i>G. diazotrophicus</i> + SHS	2.4 c	0.30 bcd	2.9 d	0.3	20.8 c	22.0 a	39.6 cd
Control (SHS)	2.2 c	0.26 d	2.7 d	0.3	16.8 c	17.5 ab	32.8 cd
<i>M. symbioticum</i> + SHS	2.2 c	0.27 cd	3.0 d	0.3	19.5 c	21.0 ab	52.8 c
Control (N-deficient SHS)	2.1 cd	0.30 bcd	2.8 d	0.3	18.3 c	17.1 ab	37.5 cd
<i>G. diazotrophicus</i> + N-deficient SHS	2.1 cd	0.35 abc	3.0 d	0.3	20.9 c	22.3 a	38.2 cd
<i>M. symbioticum</i> only	1.7 de	0.36 ab	2.4 d	0.3	18.7 c	22.3 a	29.6 cd
<i>M. symbioticum</i> + N-deficient SHS	1.6 e	0.43 a	2.1 d	0.3	19.9 c	23.0 a	27.0 d
Sufficiency range	2-3	0.2–0.5	1.5 – 3	0.15 – 0.3	10 – 20	10 – 25	–
SGS Critical level	3.5	0.35	4	0.2	20	25	75

<sup>1</sup> The nutrient was reported as “as is” for all lab measurements. This means the content was measured in the sample as is, without any moisture adjustment. The nutrient was reported in ‘percentage’ for the LENS measurements

<sup>2</sup> Means in a column followed by the same letter are not significantly different at  $p > 0.05$ , based on the Tukey-Kramer multiple comparison test. Means were approximated to two decimal places.

<sup>3</sup> ns = no significant interactions were found among treatments.

Table 8: Effects of standard Hoagland solution and endophyte treatments on nutrient levels of key elements in onion leaves at 14 WAT in the winter-controlled environment trial, winter 2025.

Treatments	N <sup>1</sup>	P	K	Mg	Mn	B	Fe
	Percent			mg kg <sup>-1</sup>			
<b>LENS concentrations</b>							
<i>G. diazotrophicus</i> + SHS	4.9 a <sup>2</sup>	0.39 ab	5.1 a	0.29 b	81 a	17.7 d	151 a
<i>M. symbioticum</i> + SHS	4.8 a	0.39 ab	5.0 a	0.26 cde	79 a	17.7 d	144 a
<i>G. diazotrophicus</i> only	4.8 a	0.38 bc	4.5 a	0.26 cde	79 a	18.3 cd	138 ab
Control (SHS)	4.7 ab	0.38 bc	4.4 ab	0.25 cde	79 a	17.3 d	143 a
Control (N-deficient SHS)	4.4 bc	0.36 bcd	3.7 bc	0.23 ef	75 ab	18.7 bcd	122 c
<i>G. diazotrophicus</i> + N-deficient SHS	4.2 c	0.35 bcd	3.2 c	0.24 def	76 a	19.7 bcd	126 bc
Utrisha-N only	4.2 c	0.35 bcd	3.7 bc	0.25 cde	74 ab	19.3 bcd	129 bc
<i>M. symbioticum</i> + N-deficient SHS	3.4 d	0.31 cd	3.2 c	0.22 f	68 b	19.7 bcd	126 bc
<b>SGS laboratory concentrations</b>							
Control (SHS)	1.8 e	0.22 de	1.9 de	0.25 cde	18 cd	19.9 bcd	23 def
<i>G. diazotrophicus</i> + SHS	1.7 e	0.25 cd	2.0 d	0.28 bc	24 c	24.0 bc	26 de
<i>M. symbioticum</i> + SHS	1.5 ef	0.20 e	1.6 de	0.28 bc	20 cd	18.7 bcd	31 d
<i>G. diazotrophicus</i> only	1.4 efg	0.21 de	1.4 de	0.24 def	20 cd	17.9 cd	22 def
Control (N-deficient SHS)	1.2 fg	0.22 de	1.2 de	0.25 cde	18 cd	22.4 bcd	29 d
<i>M. symbioticum</i> only	1.2 fg	0.34 bcd	1.2 de	0.25 cde	17 cd	24.7 b	21 def
<i>G. diazotrophicus</i> + N-deficient SHS	1.2 fg	0.30 cde	1.1 e	0.24 def	15 d	20.6 bcd	12 ef
<i>M. symbioticum</i> + N-deficient SHS	1.1 g	0.53 a	1.3 de	0.34 a	22 cd	33.3 a	10 f
Sufficiency range	2-3	0.2–0.5	1.5 – 3	0.15 – 0.3	10 – 20	10 – 25	-
SGS Critical level	3.5	0.35	4	0.2	20	25	75

<sup>1</sup> The nutrient was reported as “as is” for all lab measurements. This means the content was measured in the sample as is, without any moisture adjustment. The nutrient was reported in ‘percentage’ for the Picket LENS measurements

<sup>2</sup> Means in a column followed by the same letter are not significantly different at  $p > 0.05$ , based on the Tukey-Kramer multiple comparison test. Means were approximated to two decimal places.

**Funding for this project was provided by the Fresh Vegetable Growers of Ontario, the Ontario Agri-Food Innovation Alliance and Innovation Farms powered by AgExpert. Contributions were provided by Picketa Systems Inc., Corteva Agriscience and Syngenta.**

**CROP:** Canola (*Brassica napus* cv. InVigor L233P)  
**PEST:** Clubroot (*Plasmodiophora brassicae* Woronin)

**AUTHORS:** CAMPBELL ME<sup>1</sup>, GOSSSEN BD<sup>2</sup> & MCDONALD MR<sup>1</sup>  
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**TITLE: EFFECT OF SOIL PH AND CALCIUM BASE SATURATION ON CLUBROOT SEVERITY IN CANOLA, 2025**

**MATERIALS:** GPYSUM (calcium: 27%, sulfur: 22%, trade name: Secural), HYDRATED LIME (calcium hydroxide: 98%, magnesium oxide: 0.7%, silica: 0.7%, Sylvite), POTASSIUM BICARBONATE (potassium bicarbonate 99%, Rich Grow), WOLLASTONITE (silicon: 27%, calcium: 14%, magnesium: 4%, Canadian Wollastonite)

**METHODS:** A field trial was conducted to assess the effect of soil pH and calcium base saturation on clubroot severity in canola at the Ontario Crops Research Centre – Bradford, ON, in 2025. The site was muck soil (pH ~ 6.4, organic matter ~ 70%) infested with pathotype 2 of *P. brassicae*. The trial was laid out in a randomized complete block design with four replicates; each plot was 1.75 m x 4.0 m. Ten soil core samples were taken to 15 cm depth from each block to establish initial soil pH and calcium base-saturation on 03 June, 2025. The treatments were applied on 11 July to target pH 8.0 or 95% calcium-base saturation based on a formula provided by Amanda Hermans (Crop Advisor, Holmes Agro). The treatments were: GYPSUM (CaSO<sub>4</sub>) to increase calcium-base saturation (CBS) without altering soil pH, POTASSIUM BICARBONATE (KHCO<sub>3</sub>) to increase soil pH without adding calcium, a combination of GYPSUM and POTASSIUM BICARBONATE to increase both calcium and pH, WOLLASTONITE (CaSiO<sub>3</sub>) to increase both soil pH and calcium, HYDRATED LIME (Ca(OH)<sub>2</sub>) to simultaneously increase soil calcium and pH, and a nontreated control. Rates of application were: 1.3 t/ha GYPSUM, 4.1 t/ha POTASSIUM BICARBONATE, 6.9 t/ha WOLLASTONITE, and 3.1 t/ha HYDRATED LIME.

Canola cv. InVigor L233P (BASF, susceptible to pathotype 2) was seeded on 25 July, two weeks after application of the amendment treatments. Seeds were sown in four rows per plot, spaced approximately 40 cm apart, using an Earthway push seeder (1002 – 24 seeding disk, with every other hole covered). Post-amendment soil samples were taken from each plot on 11 August, approximately four weeks after the amendment application. Fifty plants per plot were assessed for clubroot incidence and severity using a standard 0–3 scale on 02 October, where 0 = no symptoms and 3 = severe clubbing, following the methods of Crete et al. (1963).

$$DSI (\%) = \frac{\sum((class\ no.)(no.\ plants\ in\ each\ class))}{(total\ no.\ plants\ per\ sample)(no.\ classes - 1)} \times 100\%$$

Fresh shoot weight was measured from 10 random plants per plot immediately after removal from the field. These shoots were dried at 60°C for five days, and then the dry weight was measured.

Conditions after seeding in the summer of 2025 were extremely dry, which was not conducive to clubroot development. Rainfall (54 mm) and temperature (19.6°C) in August were below the 10-year average. Rainfall was above average in July (84 mm) and September (82 mm). The 10-year rainfall averages were: July 74 mm, August 73 mm, and September 48 mm. The temperature was above average in July (22.6°C) and average in September (16.6°C). The 10-year average temperatures were: July 21.3°C, August 20.5°C, September 17.0°C.

The data were analyzed using ANOVA in RStudio with treatment as a fixed factor and block as a random factor. No datapoints were identified as outliers (Grubbs' test,  $\alpha = 0.05$ ). Tukey's HSD test was used to separate the means of soil metrics and plant weights. A one-sided Dunnett's test was used to compare clubroot incidence and severity to the control. Pearson's correlation coefficients ( $r$ ) were calculated to assess linear associations between variables, and significance was evaluated at  $\alpha = 0.05$ .

**RESULTS:** As presented in Table 1 and Figure 1.

**CONCLUSIONS:** The POTASSIUM BICARBONATE treatment and the combination of POTASSIUM BICARBONATE and GYPSUM increased soil pH; the other treatments had no effect on pH (Table 1). Calcium base saturation (CBS) was high in the nontreated control, and none of the treatments increased CBS, but the POTASSIUM BICARBONATE and combination treatments reduced CBS slightly. CBS showed a moderate negative correlation with fresh weight ( $r = -0.49$ ,  $p = 0.015$ ), representing the only statistically significant association among the variables.

The level of clubroot was very low in 2025, likely as a result of dry conditions after amendment application and seeding (Fig. 1). Overall, none of the soil amendments reduced clubroot incidence (CI), severity (disease severity index, DSI), or increased plant biomass (fresh or dry weight). There was a slight trend of higher soil pH and lower DSI ( $r = -0.37$ ,  $p = 0.074$ ) and CI ( $r = -0.31$ ,  $p = 0.14$ ), however, these relationships were not statistically significant. Clubroot DSI was low, and the variability in clubroot levels was high, which may have obscured the true differences among treatments.

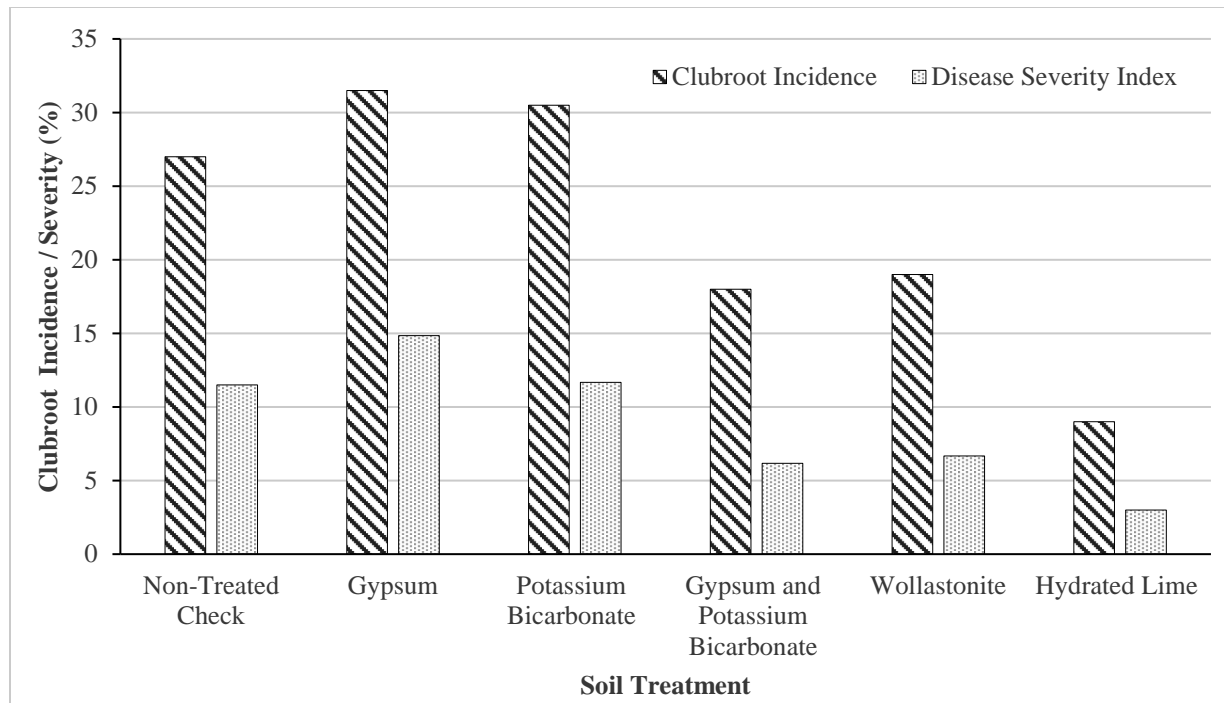
**Table 1:** Effect of pre-seeding soil amendment application on soil pH, calcium base saturation (CBS), calcium concentration, and fresh and dry weight of canola in a field trial at the Ontario Crops Research Centre –Bradford in 2025.

Treatment	Soil pH	CBS (%)	Ca (ppm) <sup>1</sup>	Fresh wt. (kg)	Dry wt. (kg)
CONTROL (NON-TREATED)	7.0 ab <sup>2</sup>	86 b	7000 ab	1.3 ns <sup>3</sup>	0.46 ns
GYPSUM (CaSO <sub>4</sub> )	6.8 a	86 b	7000 ab	1.4	0.45
POTASSIUM BICARBONATE (KHCO <sub>3</sub> )	7.6 c	74 a	6600 a	1.5	0.45
COMBINATION (G + PB)	7.6 c	74 a	6700 a	1.7	0.52
WOLLASTONITE (CaSiO <sub>3</sub> )	7.0 ab	86 b	6500 a	1.4	0.45
HYDRATED LIME (CaOH <sub>2</sub> )	7.3 bc	87 b	7700 b	1.2	0.30

<sup>1</sup> Ca (ppm) rounded to two significant figures.

<sup>2</sup> Means followed by the same letter in a column do not differ based on Tukey's Test ( $\alpha = 0.05$ ).

<sup>3</sup> ns = no significant differences at  $\alpha = 0.05$ .



**Figure 1:** Clubroot incidence and severity of canola InVigor L233P in response to soil amendment treatments in a field trial at the Ontario Crops Research Centre – Bradford in 2025. There were no significant differences from the control, based on a one-sided Dunnett's test,  $\alpha = 0.05$ .

**Funding for this project was provided by the Ontario Agri-Food Innovation Alliance, Natural Sciences and Engineering Research Council of Canada (NSERC), the Fresh Vegetable Growers Association of Ontario, and the Ontario Canola Growers Association.**

**CROP:** Canola (*Brassica napus* L.) cv. L233P  
 Fall rye (*Secale cereale* L.)  
 Daikon radish (*Raphanus sativus* var. *longipinnatus*) cv. Eco Till  
 Perennial ryegrass (*Lolium perenne* L.)

**PEST:** Clubroot (*Plasmodiophora brassicae* Woronin)

**AUTHORS:** RUIGROK K<sup>1</sup>, GOSSEN BD<sup>2</sup> & MCDONALD MR<sup>1</sup>  
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**TITLE: REDUCTION OF CLUBROOT IN A MUCK SOIL BY COVER CROPS, 2025**

**METHODS:** A field trial was conducted to assess the reduction of clubroot by cover crops on muck soil (pH 6.3, organic matter 70%) naturally infested with *Plasmodiophora brassicae* pathotype 2 at the Ontario Crops Research Centre – Bradford, Ontario. The trial was arranged in a randomized complete block with six replicates. Each plot was 1.5 m x 5.0 m, with six evenly spaced rows of the cover crop treatment per plot. The treatments were fall rye, daikon radish, or perennial ryegrass, and a bare soil (fallow) control. The trial was seeded using an Earthway seeder fitted with a 1002-22 disc on 04 June, 2025. The cover crops grew for 8 weeks and were hand weeded at regular intervals. On 30 July, ROUNDUP (glyphosate) was applied at 3 L ha<sup>-1</sup> in 400 L ha<sup>-1</sup> water to burn down the cover crops. The plots were mowed, and the residue was manually removed from the field; no tillage was applied. The biomass of each plot was taken just before burndown to estimate canopy density. A 1 m<sup>2</sup> quadrat frame was placed in each plot and all aboveground biomass within the quadrat was cut at the base and placed in paper bags for fresh weight measurement. Dry weight was also recorded after 72 hr in a drying oven at 60°C.

The effects of the treatments on the concentration of resting spores of *P. brassicae* in the soil and subsequent effects on clubroot severity were assessed in a bioassay in which canola cv. L233P, which is susceptible to pathotype 2, was seeded across the entire trial on 06 August, 2025. The canola was seeded with an Earthway seeder fitted with a 1002-24 disc, with four rows per plot. On 09 October, 2025, clubroot severity was assessed on each of 50 plants from the interior two rows of each plot.

Clubroot incidence and severity were assessed by sorting the plants into classes using a standard 0–3 scale (Crete et al. 1963), where 0 = no clubs, 0.2 = 1 very small club ( $\leq 2$  cm), 1 = small clubs on less than 1/3 of roots, 2 = small or intermediate clubs on 1/3 to 2/3 of roots, and 3 = clubs on over 2/3 of roots. The proportion of roots in classes 1–3 was used to calculate a disease severity index (DSI) for each plot using the following formula:

$$DSI = \frac{\sum [(\text{class no.})(\text{no. roots in each class})]}{(\text{total no. roots per sample})(\text{no. class} - 1)} \times 100$$

Soil samples were taken three times over the course of the trial: pre-plant, cover crop burndown, and at canola harvest. Samples were collected in a W pattern using a standard soil probe, with nine soil cores to 20 cm depth from each plot. Samples were stored at -20°C until ready for analysis. The fresh and dry weight of the above ground plant material for 10 plants per plot was assessed at final disease assessment.

Quantitative Polymerase Chain Reaction (qPCR) analysis was conducted to assess the quantity of *P. brassicae* DNA in each soil sample. Also, the quantity of viable resting spores in the soil samples from each plot was assessed using the propidium monoazide (PMA) qPCR following the method of Al-Daoud et al. (2017). PMA analysis distinguishes between viable and dead resting spores; PMA can enter the nuclei of dead resting spores and binds to the DNA, preventing amplification in qPCR.

Data were analyzed as a mixed model ANOVA with PROC GLIMMIX. The cover crop treatments were a fixed effect and block and year (when data from two years were combined) were random effects. Means were separated using the Tukey's test at  $P = 0.05$  in SAS 9.4 (SAS Institute, Cary, IN).

Compared to the previous 10-year average, air temperatures in 2025 were above normal for June (20.0°C) and July (22.6°C), average for May (12.8°C), September (16.6°C) and October (9.9°C) and below normal for August (19.6°C). The 10-year average temperatures were: May, 13.6°C; June, 18.6°C; July, 21.3°C; August, 20.5°C; September, 17.0°C and October, 9.9°C. Monthly rainfall was below the 10-year average for June (46 mm), August (54 mm) and October (45 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May, 61 mm; June, 94 mm; July, 74 mm; August, 73 mm; September, 48 mm and October, 58 mm.

**RESULTS:** As presented below in Table 1 through 3.

**CONCLUSION:** Clubroot severity was moderate across all treatments, with a severity range of 48 -65%. Cover crop treatments had no effect on clubroot severity. There were some differences in canola biomass among treatments, canola following bare soil had greater biomass than the daikon radish treatment, but not the other treatments (Table 1). Residue from the previous crops could have adversely affected the seedbed at seeding, giving the canola seedlings planted in bare soil a head start. It is also possible that cover crops depleted plant-available soil nutrients, resulting in smaller plants than in bare soil.

The bare soil treatment had the highest concentration of resting spores of *P. brassicae* in spring, based on PMA-qPCR analyses (Table 2). Only two treatments had lower resting spore counts than the spring levels, fall rye at burndown and perennial ryegrass at harvest. None of the treatments increased the concentration of viable resting spores. Results from the pooled data for 2024 and 2025 with the standard qPCR with no PMA, the concentration of resting spores was higher in the spring assessment than in any of the treatments. The concentration of resting spores declined numerically but not statistically over time from cover crop burndown to canola harvest (Table 3).

**Table 1.** Fresh and dry shoot biomass of cover crop treatments collected before burndown on 30 July, 2025 (8 weeks after seeding) at the Ontario Crops Research Centre – Bradford, ON.

Cover crop	Fresh biomass (tonnes ha <sup>-1</sup> ) <sup>1</sup>	Dry biomass (tonnes ha <sup>-1</sup> ) <sup>2</sup>
Daikon radish	23.3	2.76
Fall rye	16.5	2.04
Perennial ryegrass	3.0	1.92

<sup>1</sup> Mean fresh biomass collected from a 1 m<sup>2</sup> quadrat and converted to a T ha<sup>-1</sup> rate.

<sup>2</sup> Mean dry biomass collected after 72 hr in 60°C drying oven.

**Table 2.** Effect of cover crop species on resting spore concentration of *Plasmodiophora brassicae* in soil, after 8 weeks of cover crop growth and in subsequent canola crop after 9 weeks of growth at the Ontario Crops Research Centre – Bradford in 2025.

Sample collection	Treatment	Spore conc. (g <sup>-1</sup> soil) <sup>1,2</sup>	Clubroot severity (DSI, %)	Canola dry shoot wt. (g <sup>-1</sup> plant) <sup>4</sup>
Spring (pre-plant)	Initial spore conc.	1.28 x 10 <sup>7</sup> a		
Cover crop burndown	Bare soil (control)	1.89 x 10 <sup>6</sup> abc		
	Fall rye	9.33 x 10 <sup>5</sup> c		
	Daikon radish	2.04 x 10 <sup>6</sup> abc		
	Perennial ryegrass	2.17 x 10 <sup>6</sup> abc		
Canola harvest	Bare soil (control)	2.57 x 10 <sup>6</sup> abc	65 ns <sup>3</sup>	110.6 a
	Fall rye	6.47 x 10 <sup>6</sup> ab	50	96.2 ab
	Daikon radish	4.20 x 10 <sup>6</sup> abc	48	77.1 b
	Perennial ryegrass	1.54 x 10 <sup>6</sup> bc	55	92.0 ab

<sup>1</sup> Mean spore concentration based on estimates from propidium monoazide (PMA) - qPCR. Spore estimates from PMA were log transformed for analysis but nontransformed data are presented.

<sup>2</sup> Means followed by the same letter do not differ, Tukey's test at  $P < 0.05$ .

<sup>3</sup> ns = not significantly different at  $P < 0.05$ .

<sup>4</sup> Clubroot severity and mean shoot weight measured in subsequent canola crop after 72 hr in a 60°C drying oven after canola harvest.

**Table 3.** Effect of cover crop on resting spore concentration of *Plasmodiophora brassicae* in soil after 8 weeks of growth and on clubroot severity (disease severity index, DSI) and dried biomass of a following crop of canola grown for 9 weeks at the Ontario Crops Research Station – Bradford. Pooled data from 2024 and 2025 trials – Standard qPCR, no PMA treatment.

Sampling collection	Treatment	Mean spore conc. (spore g <sup>-1</sup> soil) <sup>1,2</sup>	DSI (%)	Dry shoot wt (g <sup>-1</sup> plant) <sup>4</sup>
Spring (pre-plant)	Initial spore conc.	2.00 x 10 <sup>7</sup> a		
Cover crop burndown	Bare soil (control)	7.56 x 10 <sup>6</sup> b		
Cover crop burndown	Fall rye	6.28 x 10 <sup>6</sup> b		
Cover crop burndown	Daikon radish	7.64 x 10 <sup>6</sup> b		
Canola harvest	Bare soil (control)	1.27 x 10 <sup>6</sup> b	36 ns <sup>3</sup>	142.9 ns
Canola harvest	Fall rye	1.94 x 10 <sup>6</sup> b	28	137.1
Canol harvest	Daikon radish	2.76 x 10 <sup>6</sup> b	27	129.9

<sup>1</sup> Mean spore concentration was based on estimates from standard qPCR analysis that were log transformed for statistical analysis but nontransformed data are presented.

<sup>2</sup> Means followed by the same letter do not differ based on Tukey's test at  $P < 0.05$

<sup>3</sup> ns = not significantly different at  $P < 0.05$

<sup>4</sup> Clubroot severity and mean shoot weight measured in subsequent canola crop collected at harvest after 72 hours in a 60°C oven

**Funding for this project was provided by the Ontario Agri-Food Innovation Alliance, the Ontario Canola Growers Association, the Fresh Vegetable Growers of Ontario and Agriculture and Agri-Food Canada.**

**CROP:** Cabbage (*Brassica oleracea* var. *capitata* L.) cv. Bronco  
**PEST:** Clubroot (*Plasmodiophora brassicae* Woronin)

**AUTHORS:** RUIGROK K<sup>1</sup>, GOSSEN BD<sup>2</sup> & MCDONALD MR<sup>1</sup>  
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**TITLE:** **FIELD EVALUATION OF *BEAUVERIA BASSIANA* FOR SUPPRESSION OF CLUBROOT AND GROWTH PROMOTION ON CABBAGE, 2025**

**MATERIALS:** BIOCERES EC (*Beauveria bassiana* strain ANT-03 @ > 1 x 10<sup>10</sup> spore/mL) (Anatis Bioprotection, QB, Canada); BOTANIGARD ES (*B. bassiana* strain GHA, 11.3%) (Laverlam Int. Corporation, Butte, MN)

**METHODS:** Two field trials of cabbage were conducted on muck soil (pH 6.3, organic matter 70%) at the Ontario Crops Research Centre – Bradford, Ontario in 2025. A clubroot trial was at a field site naturally infested with *Plasmodiophora brassicae* pathotype 2, while a growth promotion trial was in an area with no history of clubroot at the Research Centre. In addition, a field trial was conducted on mineral soil (pH 7.8, organic matter 4%) in a commercial field near New Tecumseth, ON (mineral soil trial).

Cabbage cultivar Bronco was used in the study because it is highly susceptible to the pathotype of *P. brassicae* present at this site. One seed per plug was seeded into 128 cell plug trays (Koro Products Toronto) filled with L4A Sunshine Mix (Sun Gro Horticulture, Agawam, MA) on 29 April, 2025. Plants were grown in a greenhouse and watered by hand as needed.

The treatments were two commercial biocontrol products containing the fungal endophyte and entomopathogen, *Beauveria bassiana*: BOTANIGARD at a concentration of 10 mL/L water and BIOCERES at 8 mL/L water, and a control treated with water. Both products are registered as biological controls for several insect pests. The product formulations were streaked onto commercial potato dextrose agar to check the viability of *B. bassiana* at application. When the seedlings reached the 1<sup>st</sup> true leaf stage (~2 weeks after seeding), each treatment was applied as a soil drench at 500 mL/ seedling tray. Six weeks after seeding (4 weeks after *B. bassiana* application), on 10 June, the young cabbage plants were transplanted to the field at the Research Centre. Young cabbage plants were transplanted into the mineral soil site on 02 July (7 weeks after *B. bassiana* application).

Each trial was arranged as a randomized complete block, with six replicates for the clubroot trial and four replicates for the growth promotion and mineral soil trials. Each plot was 1.5 m x 5 m, with two rows of plants per plot. There was 20 cm between plants for the clubroot trial, to provide many plants for disease assessment, and 40 cm between plants in the growth promotion trial to provide space for normal plant development. Clubroot incidence and severity were assessed on 19 August in the growth promotion trial and on 26 August for the mineral soil trial. No clubroot was observed in either trial. Fresh weight was recorded for each of the treatments. On 18 August, 9 weeks after transplanting, clubroot incidence and severity were visually assessed in the clubroot trial. The roots were sorted into classes based on a standard 0–3 scale, where: 0 = no clubs, 0.2 = one very small club (≤ 2 cm diam.), 1 = small clubs on less than 1/3 of roots, 2 = small or intermediate clubs on 1/3 to 2/3 of roots, and 3 = clubs on over 2/3 of roots (adapted from Crete et al. 1963). The ratings were used to calculate a disease severity index (DSI) using the following formula:

$$DSI = \frac{\sum [(\text{class no.})(\text{no. roots in each class})]}{(\text{total no. roots per sample})(\text{no. class} - 1)} \times 100$$

Colonization by *B. bassiana* in plant leaf tissue was assessed twice over the course of each study: at 28 days after *B. bassiana* application, before exposure to *P. brassicae*, and again at 91 days after application, at the termination of the study. In the first assessment, the newest true leaf was collected from each of 40 plants per treatment from each replicate. The leaves were surface sterilized in 70% ethanol for 2 min and 2% sodium hypochlorite (household bleach) for 2 min, then triple rinsed in sterile deionized water. Four 1 cm<sup>2</sup> leaf sections were cut from each leaf using a sterile blade and air-dried on Kimwipes (40 leaves per treatment x 4 tissue samples/leaf = 160 samples per treatment in each replicate). The tissue samples were plated on commercial potato dextrose agar (PDA) medium amended with 0.125 g/L streptomycin sulphate salt (Sigma-Aldrich, Missouri) and 0.25 g/L ampicillin sodium salt (Mediatech Inc. Virginia) antibiotics to reduce contamination, in a 9-cm-diam. plastic Petri dish and each dish was sealed using parafilm. The samples were incubated at 21°C in the dark and checked for fungal growth every few days up to 2 weeks. During the second assessment (91 days post application), 10 consecutive plants per plot were assessed for colonization. The newest leaf and the oldest healthy leaf were assessed for endophytic colonization (10 plants/plot x 2 leaves/plant x 4 tissue samples/leaf = 80 tissue samples / treatment / replicate).

The presence of pests and the extent of feeding damage were assessed for the imported cabbage worm (*Pieris rapae* L.) and diamondback moth (*Plutella xylostella* L.) infestation every two weeks for the entirety of the growth promotion trial. The total number of caterpillars per plant was counted on 10 consecutive plants per plot. Leaves were rated for feeding damage, where: 0 = no damage, 1 = 1–10%, 2 = 11–25%, 3 = 26–50%, 4 > 50% of leaf area consumed. Caterpillar presence was visually assessed on the upper and lower leaf surface of the three outermost leaves on each plant, as they are most susceptible during early growth stages. As head formation began, wrapper leaves on each head were also assessed.

The fresh weight of the above-ground biomass of 10 plants per plot was collected at harvest. In addition, the wrapper leaves of each head were removed to produce marketable heads, which were weighed again. Statistical analysis were conducted using a mixed model ANOVA in PROC GLIMMIX (SAS 9.4, SAS Institute, Cary, IN). Treatment with *B. bassiana* was a fixed effect and replicate was a random effect. Means separation was based on Tukey's test at  $P = 0.05$  level of significance.

Compared to the previous 10-year average, air temperature in 2024 was above normal for June (20.0°C) and July (22.6°C), near-normal for September (16.6°C) and below normal for August (19.6°C). The 10-year average monthly temperatures were: June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C. Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for July (84 mm) and September (82 mm). The 10-year monthly rainfall averages were: June 94 mm, July 74 mm, August 73 mm and September 48 mm.

**RESULTS:** As presented in Table 1–5.

**CONCLUSIONS:** Clubroot pressure was low in the clubroot trial. BOTANIGARD reduced clubroot levels relative to the control, but was not statistically different from BIOCERES. There was substantial increases in fresh and marketable weights in both *B. bassiana* treatments compared to the nontreated control in both trials on muck soil; BOTANIGARD had the largest biomass overall numerically but was not statistically greater than BIOCERES (Tables 1 and 2). No clubroot symptoms were observed in the trial on mineral soil and treatments had no effect on plant weight. In assessments of colonization by *B. bassiana*, the endophyte was isolated from leaf tissue at a rate of 42% for BIOCERES and 62% BOTANIGARD in the pre-transplant assessment (Table 3) but was not isolated at harvest.

Seedling drench application of BIOCERES and BOTANIGARD did not reduce insect presence or feeding damage during the growing season compared to the nontreated control. While *B. bassiana* formulations are registered for the control of several insect species, foliar applications are usually repeated several times

over the growing season. This trial only applied treatments once as a soil drench when plants were at the 1<sup>st</sup> true leaf stage. The lack of insect reduction could also be related to the absence of colonization in new leaf tissue by *B. bassiana* when assessed at harvest in August. The reason for loss of the endophyte is not known, but it may not have been able to keep up with the rate of growth of the plants under field conditions.

**Table 1.** Effect of commercial biocontrol products containing *Beauveria bassiana*, BIOCERES and BOTANIGARD, on clubroot incidence and severity (disease severity index, DSI), and fresh top weight of cabbage grown on muck soil naturally infested with *Plasmodiophora brassicae* at the Ontario Crops Research Centre – Bradford, Ontario, 2025.

Treatment	Incidence (%)	DSI (%)	Fresh wt. <sup>1</sup> (kg)
Control	42 a <sup>2</sup>	15 a	1.5 b
BIOCERES	32 a	12 ab	1.8 a
BOTANIGARD	13 b	8 b	1.7 a

<sup>1</sup> Mean fresh top weight from 10 plants per plot.

<sup>2</sup> Means in a column followed by the same letter do not differ, Tukey's test at  $P = 0.05$ .

**Table 2.** Effect of commercial biocontrol products containing *Beauveria bassiana*, BIOCERES and BOTANIGARD, as a soil drench application, on fresh and marketable weight of cabbage grown on muck soil at the Ontario Crops Research Centre – Bradford, Ontario, 2025.

Treatment	Fresh wt. (kg) <sup>1</sup>	Marketable wt. (kg) <sup>2</sup>
Control	2.8 b <sup>3</sup>	2.4 b
BIOCERES	3.2 a	2.8 a
BOTANIGARD	3.1 a	2.6 a

<sup>1</sup> Mean fresh top weight of 10 plants assessed at 9 weeks after transplanting.

<sup>2</sup> Mean marketable weight of cabbage with wrapper leaves removed until there was no insect damage visible.

<sup>3</sup> Means followed by the same letter do not differ, Tukey's test at  $P = 0.05$ .

**Table 3.** Effect of commercial biocontrol products containing *Beauveria bassiana*, BIOCERES and BOTANIGARD, on clubroot incidence, clubroot severity (disease severity index, DSI), and fresh top weight of cabbage grown on mineral soil naturally infested with *Plasmodiophora brassicae* in New Tecumseth, ON 2025.

Treatment	Incidence (%)	DSI (%)	Fresh wt. <sup>1</sup> (g)
Control	0	0	353 ns <sup>2</sup>
BIOCERES	0	0	407
BOTANIGARD	0	0	431

<sup>1</sup> Mean fresh top weight of 10 plants per plot.

<sup>2</sup> ns = no significant differences at  $P = 0.05$ .

**Table 4.** Effect of commercial biocontrol products containing *Beauveria bassiana*, BIOCERES and BOTANIGARD, on insect herbivory and caterpillar counts on cabbage plants at the Ontario Crops Research Centre – Bradford, Ontario, 2025

Treatment	Counts of Imported cabbageworm caterpillars <sup>1</sup>				Counts of Diamondback moth caterpillars <sup>1</sup>				Leaf damage (%) <sup>2</sup>			
	15 Jul	25 Jul	11 Aug	26 Aug	15 Jul	25 Jul	11 Aug	26 Aug	15 Jul	25 Jul	11 Aug	26 Aug
Control	32ns <sup>3</sup>	30	28	25	3	4	3	2	50	51	50	43
BIOCERES	27	24	28	27	4	4	4	2	49	49	49	41
BOTANIGARD	27	26	19	27	3	4	3	2	46	47	48	41

<sup>1</sup> Assessed every 2 weeks on: 15 July, 25 July, 11 August, and 26 August, 2025; Mean number of caterpillars assessed on 30 leaves per plot (10 consecutive plants, 3 leaves each).

<sup>2</sup> Mean percentage leaf damage scored on 30 leaves per plot.

<sup>3</sup> ns = no significant differences at  $P = 0.05$ .

**Table 5.** Effect of commercial biocontrol products containing *Beauveria bassiana*, BIOCERES or BOTANIGARD, applied as a soil drench at the 1<sup>st</sup> true leaf stage on colonization (%) of the endophyte at 28 and 91 days after application in a cabbage trial at the Ontario Crops Research Centre – Bradford, Ontario, 2025.

Treatment	Colonization (pre-transplant, 28 days post application) <sup>1</sup>	Colonization (post-harvest, 91 days post application) <sup>1</sup>
Control	0 %	0 %
BIOCERES	42 %	0 %
BOTANIGARD	62 %	0 %

<sup>1</sup> Colonization assessed on 40 plants per plot at 28 days and 10 plants at harvest.

**Funding for this project was provided by the Ontario Agri-Food Innovation Alliance and the Fresh Vegetable Growers of Ontario.**

**CROP:** Artichoke (*Cynara cardunculus* var. *scolymus* L.)

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**TITLE:** EVALUATION OF ARTICHOKE CULTIVARS IN MINERAL SOIL, 2025

**MATERIALS:** Ocean Mist artichoke cvs. S1 and S2

**METHODS:**

Artichoke, cvs. S1 and S2, were transplanted with 60 cm of space between each plant on 28 May into mineral soil (organic matter  $\approx$  5.7%, pH  $\approx$  7.5) near the Ontario Crops Research Centre - Bradford, Ontario. A randomized complete block arrangement with four replicates per treatment was used. Each replicate consisted of two raised beds spaced 86 cm apart, and 12 m in length. Gibberellic acid was applied at 25 ppm on 17 June to stimulate the production of buds. The two cultivars were assessed for the percentage of plants that produced buds on 14 August and 24 September. The number of king and secondary buds were counted in each plot on 14 and 22 August, 2, 12 and 24 September. The king buds were also weighed. Data were analyzed using the General Analysis of Variance function of Statistix V.10. Means separation was obtained by using Fisher's Protected LSD test at  $P = 0.05$  level of significance.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C) and September (16.6°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C.

Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

**RESULTS:** As presented in Tables 1-2.

**CONCLUSIONS:** Growth was slow for both cultivars during the months of June, July and August, but some buds were still produced. Growth of foliage increased in September and October, coinciding with cooler and wetter weather. However, less than half the plants produced buds and the artichoke buds did not produce flowers before the end of the growing season. There were no differences in the percentage of budding plants, buds produced or bud weight between the two cultivars. Artichoke cvs. S1 and S2 were not well adapted to the hot and dry weather conditions in Ontario during the summer months.

**Table 1.** Percentage of plants of artichoke cultivars that produced buds at the Ontario Crops Research Centre – Bradford, Holland Marsh, Ontario, 2025.

Cultivar	Budding plants (%)	
	14 August	24 September
S2	17 ns <sup>1</sup>	36 ns
S1	12	25

<sup>1</sup>ns = not significant at  $P = 0.05$ .

**Table 2.** Number and weight of king and secondary buds produced by artichoke cultivars at the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

Cultivar	# King buds	# Secondary buds	Wgt / king bud (g)	King bud yield (g)
S2	18 ns <sup>1</sup>	91 ns	323 ns	534 ns
S1	11	54	313	367

<sup>1</sup>ns = not significant at  $P = 0.05$ .

**CROP:** Celery (*Apium graveolens*) cv. TZ 6200

**PESTS:** *Cercospora* leaf blight (*Cercospora apii* (Fres.))

**AUTHORS:** BLASS D<sup>1</sup>, VANDER KOOI K<sup>2</sup> & MCDONALD MR<sup>1</sup>

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- Bradford

**TITLE:** **EFFECT OF PRE-PLANT NITROGEN AND FUNGICIDE ON CELERY YIELD AND SUCEPTIBILITY TO CERCOSPORA EARLY BLIGHT, 2025**

**MATERIALS:** QUADRIS TOP (azoxystrobin 200g/L, difenoconazole, 125 g/L), SWITCH 62.5WG (cyprodinil 37.5%, fludioxonil 25.0%)

**METHODS:** The trial was conducted on organic soil (pH  $\approx$  7.3, organic matter  $\approx$  56.8%) near the Ontario Crops Research Centre - Bradford, Ontario. Celery, cv. TZ 6200, was seeded in the greenhouse on 11 April and mechanically transplanted in the field on 9 June, with an in-row plant spacing of 18 cm. Each experimental unit consisted of 2 beds of three rows, for a total of 6 rows spaced 55 cm apart, and 6 m in length. The trial was conducted as a randomized complete block factorial design, with four pre-plant nitrogen levels (0, 45, 95, and 135 kg N/ ha) and two fungicide levels (no fungicide and fungicide). Pre-plant nitrogen fertilizer was applied to each experimental unit as 21-0-0 (AXAN) via hand broadcasting. No pre-plant phosphorus or potassium was applied as soil testing conducted prior to transplanting indicated sufficient levels within the trial area. Fungicides were applied as QUADRIS TOP (1.12 L / ha) and SWITCH (975 g/ha) on 29 August and 5 September, respectively, using a CO2 backpack sprayer equipped with four TeeJet 8002 VS fan nozzles spaced 40 cm apart and calibrated to deliver 400 L/ha at 275 kPa

Early blight severity was assessed in each plot on 17, 29 July, 20 August, and 3, 18 September. The leaves of 10 plants per plot (5 plants from the middle rows of each bed) were rated and placed into classes based on a 0-10 scale for percentage of the leaflet and petiole area with symptoms of early blight disease where: 0 = no lesions, 1 = 1–10% of leaflet area and 0 % of petiole area, 2 = 11–25% leaflet area and 0% of petiole area, 3 = 26–50% leaflet area and 1-10% of petiole area, 4 = 51 - 75% leaflet area and 11-25% of petiole area, 5 = >75% of leaflet area and 26-50% petiole area, 6 = >75% leaflet area and >50% of petiole area, 7 = 1-25% leaf dieback, 8 = 26-50% leaf dieback, 9 = 51-75% leaf dieback and 10 = 76-100% leaf dieback. The scores of each individually rated leaf were utilized to calculate disease severity index (DSI) for each plot using the following formula:

$$DSI = \frac{\sum[(class\ no.)(no.\ of\ leaves\ in\ each\ class)]}{(total\ no.\ of\ leaves\ assessed)(no.\ of\ classes - 1)} \times 100$$

The area under the disease progress curve (AUDPC) was calculated with the following formula:

$$AUDPC = \sum_{j=1}^{Nj-1} \left( \frac{y_j + y_{j+1}}{2} \right) (t_{j+1} - t_j)$$

where  $j$  is the order index for the assessments over time,  $n_j$  is the number assessments,  $y_j$  is the average rating at day  $t_j$ ,  $y_{j+1}$  is the average rating day  $t_{j+1}$  and  $(t_{j+1}-t_j)$  is the number of days between the assessments.

On 23 July and 8, 25 August the youngest, fully expanded petiole was collected from 10 plants per row in the two center rows of each bed, for a total of 20 leaves. Leaves were sent to SGS Laboratory (Guelph, ON) for tissue analysis, with results received five days later. Nutrient assessments were nitrogen (N as is, not adjusted for water content), phosphorus (P%), potassium (K%), magnesium (Mg%), calcium (Ca%), zinc (Zn, ppm), manganese (Mn, ppm), copper (Cu, ppm), boron (B, ppm), and sulfur (S as is).

On 1 October, 10 consecutive plants from the inner rows of each bed (total of 20) were harvested by cutting at the soil level just above the roots. Celery was trimmed to 40 cm, sorted into marketable and unmarketable categories based on the presence of *Cercospora* symptoms remaining after trimming. Celery in both categories were then counted and weighed to determine marketable yield. Marketable plants were further categorized into size classes based on plant diameter, according to the number of similarly sized plants that would fit into 24-, 30-, or 48-count fresh-market shipping cartons.

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for May (12.8°C) and September (16.6°C) and below average for August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C.

Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

Data were analyzed in RStudio (version 2025.09.1). Foliar nutrient content and disease severity index (DSI) were measured repeatedly throughout the growing season and therefore were analyzed using a linear mixed-effects model with repeated measures, with replication treated as a random effect. Yield parameters at harvest were analyzed using linear mixed-effects models with replication as a random effect. In all cases, mean separation was

conducted using Tukey's HSD test at  $P = 0.05$ . Relationships between foliar nitrogen contents measured by SGS Laboratory, and marketable yield, weight per marketable plant and AUDPC were analyzed using Pearson's correlations.

**RESULTS:** as presented in Tables 1 to 6.

**CONCLUSION:** There was no significant difference in early blight DSI among treatments at any date throughout the growing season. However, there was lower AUDPC in celery that received 135 kg of pre-plant nitrogen and fungicide compared to the no nitrogen fungicide check.

Early blight severity was very low in this trial throughout the growing season. The DSI across treatments increased to a relative maximum by 20 August, then decreased to close to zero in all treatments by the end of the growing season. This was likely a result of weather conditions throughout the growing season that were not conducive to recurring infection. Specifically, compared to the 10-year average, the air temperature was below average for August ( $19.6^{\circ}\text{C}$  compared to  $20.5^{\circ}\text{C}$ ) and monthly rainfall was below average for June (46 mm compared to 94 mm) and August (54 mm compared to 73 mm). These conditions would have reduced leaf wetness duration and provided suboptimal temperatures for disease development. This period typically corresponds to peak early blight pressure in Ontario, thereby likely constraining infection and disease progression. Therefore, interpretation of these results should be limited to conditions of low early blight disease pressure and may not be directly extrapolated to seasons or environments more conducive to disease development.

As a result of low early blight disease pressure, all of the treatments resulted in marketable plants at harvest. There were no differences among treatments in total yield, weight per marketable plant, or the distribution of harvested celery plants into size categories. Interestingly, there were no significant differences among treatments with respect to foliar nitrogen content, as measured by SGS laboratory tissue analysis, at each sampling date. This is consistent with a lack of observed differences in yield among treatments. This suggests that mineralization rates of muck soil at the trial site were sufficient to meet the nitrogen requirements of celery, even when grown with no or low pre-plant nitrogen fertilization. Similarly, there were no significant differences in the foliar contents of any of the other nutrients tested, regardless of sampling date. Foliar nitrogen contents at each sampling point were not significantly correlated with AUDPC, total yield or weight per marketable plant. However, the relationship between foliar nitrogen content with total yield and weight per marketable plant approached significance on 25 August, suggesting that increased foliar nitrogen content late in the growing season may be related to lower yields in celery; which was unexpected.

**Table 1.** Effect of pre-plant nitrogen rates and fungicide application on early blight severity (disease severity index, DSI) and area under the disease progress curve (AUDPC) in celery, cv. TZ 6200, grown at a muck soil site near the Ontario Crops Research Centre -Bradford, Holland Marsh, Ontario, 2025.

N rate (kg ha <sup>-1</sup> )	DSI					AUDPC <sup>1</sup>
	17 July	29 July	20 Aug	3 Sept	18 Sept	
0	6.4 ns <sup>2</sup>	5.4 ns	9.3 ns	2.7 ns	0.6 ns	20.9 b <sup>3</sup>
0 + Fungicide	5.9	5.3	7.5	3.6	0.2	19.4 ab
45	0.8	6.4	8.5	2.9	0.0	18.3 ab
45 + Fungicide	4.1	3.8	9.1	3.1	0.0	18.0 ab
90	1.5	4.1	7.2	3.3	0.0	15.4 ab
90 + Fungicide	1.4	4.0	8.3	4.3	0.0	17.3 ab
135	5.2	3.3	9.7	3.1	0.1	18.7 ab
135 + Fungicide	0.9	2.0	7.5	3.3	0.0	13.3 a

<sup>1</sup> AUDPC was calculated based on the DSI assessed on 11, 25 July and 8, 23 August

<sup>2</sup> ns = no significant differences among the treatments at P = 0.05

<sup>3</sup> Numbers in a column followed by the same letter are not significantly different at P = 0.05, Tukey HSD.

**Table 2.** Effect of pre-plant nitrogen rates and fungicide application on yield of celery, cv. TZ 6200, grown at a muck soil site near the Ontario Crops Research Centre -Bradford, Holland Marsh, Ontario, 2025.

N rate (kg ha <sup>-1</sup> )	Mkb yield(t/ha)	Wgt/ Mkb plant (g)	Size distribution <sup>1</sup> (% by weight)		
			24-carton (Large)	30-carton (Medium)	48-carton (small)
0	84.0 ns <sup>2</sup>	821.3 ns	22.8 ns	68.7 ns	8.5 ns
0 + Fungicide	79.3	785.5	19.9	74.3	5.8
45	84.0	832.2	28.9	60.2	10.9
45 + Fungicide	89.1	882.3	35.7	58.3	6.0
90	83.7	818.3	19.8	68.7	11.5
90 + Fungicide	88.5	855.9	21.1	72.0	6.9
135	84.7	828.2	26.0	62.5	11.5
135 + Fungicide	84.0	831.6	20.7	73.8	5.5

<sup>1</sup> Individual celery plants were graded based on the number of trimmed plants of that given size that fit into a standard fresh-market shipping carton.

<sup>2</sup> ns = no significant differences at P = 0.05

**Table 3.** Effect of pre-plant nitrogen rates with and without fungicide application on foliar nutrient contents as determined by SGS laboratory tissue nutrient analysis on 23 July in celery, cv. TZ 6200, grown at a muck soil site near the Ontario Crops Research Centre - Bradford, Holland Marsh, Ontario, 2025.

N rate (kg ha <sup>-1</sup> )	N <sup>1</sup>	P (%)	K (%)	Mg (%)	Ca (%)	Zn (ppm)	Mn (ppm)	Cu (ppm)	B (ppm)	S <sup>1</sup>
0	3.5 ns <sup>2</sup>	0.3 ns	3.6 ns	0.2 ns	2.4 ns	53.9 ns	14.7 ns	5.0 ns	25.1 ns	1.2 ns
0 + Fungicide	3.6	0.3	3.9	0.2	2.5	59.8	16.0	6.1	26.6	1.3
45	3.5	0.3	3.8	0.2	2.4	57.6	15.6	6.9	26.1	1.3
45 + Fungicide	3.6	0.3	3.9	0.2	2.5	60.5	16.0	5.9	26.6	1.3
90	3.6	0.3	3.7	0.2	2.3	58.0	14.5	5.6	25.2	1.2
90 + Fungicide	3.7	0.3	3.7	0.2	2.6	62.5	16.6	5.8	26.3	1.3
135	3.6	0.3	3.7	0.2	2.4	58.9	15.8	4.8	26.4	1.2
135 + Fungicide	3.6	0.3	3.6	0.2	2.5	58.7	16.4	5.2	25.4	1.3
Sufficiency Ranges <sup>3</sup>	1.5-1.7	0.3-0.6	6-8	0.3-0.6	1.3-2.0	20-40	5-10	4-6	15-25	-

<sup>1</sup> The nutrient was reported "as is" for all lab measurements. This means that the content was measured without any adjustments for moisture.

<sup>2</sup> ns = no significant differences among the treatments at P = 0.05.

<sup>3</sup> As reported in OMAFA publication 839

**Table 4.** Effect of pre-plant nitrogen rates with and without fungicide application on foliar nutrient contents as determined by SGS laboratory tissue nutrient analysis on 8 August in celery, cv. TZ 6200, grown at a muck soil site near the Ontario Crops Research Centre -Bradford, Holland Marsh, Ontario, 2025.

N rate (kg ha <sup>-1</sup> )	N <sup>1</sup>	P (%)	K (%)	Mg (%)	Ca (%)	Zn (ppm)	Mn (ppm)	Cu (ppm)	B (ppm)	S <sup>1</sup>
0	2.9 ns <sup>2</sup>	0.3ns	3.2 ns	0.2 ns	2.1 ns	61.5 ns	66.6 ns	7.7 ns	64.5 ns	1.4 ns
0 + Fungicide	3.2	0.4	3.4	0.2	1.9	57.9	29.7	8.0	63.3	1.3
45	3.2	0.3	3.2	0.2	2.2	58.2	32.1	7.6	65.4	1.4
45 + Fungicide	3.3	0.4	3.5	0.2	2/2	66.6	35.8	8.5	76.2	1.3
90	3.3	0.4	3.6	0.2	2.2	62.9	39.4	8.4	77.4	1/3
90 + Fungicide	3.3	0.4	3.6	0.2	2.2	66.0	31.8	8.6	72.8	1.3
135	3.4	0.4	3.4	0.2	2.0	62.1	29.1	8.5	72.5	1.2
135 + Fungicide	3.4	0.4	3.5	0.2	2.1	60.1	32.8	8.1	77.4	1.2
Sufficiency Ranges <sup>3</sup>	1.5-1.7	0.3-0.6	6-8	0.3-0.6	1.3-2.0	20-40	5-10	4-6	15-25	-

<sup>1</sup> The nutrient was reported "as is" for all lab measurements. This means that the content was measured without any adjustments for moisture.

<sup>2</sup> ns = no significant differences among the treatments at P = 0.05.

<sup>3</sup> As reported in OMAFA publication 839

**Table 5.** Effect of pre-plant nitrogen rates with and without fungicide application on foliar nutrient contents as determined by SGS laboratory tissue nutrient analysis on 23 August in celery, cv. TZ 6200, grown at a muck soil site near the Ontario Crops Research Centre -Bradford, Holland Marsh, Ontario, 2025.

N rate (kg ha <sup>-1</sup> )	N (%)	P (%)	K (%)	Mg (%)	Ca (%)	Zn (ppm)	Mn (ppm)	Cu (ppm)	B (ppm)	S
0	3.0 ns	0.4ns	3.0ns	0.2 ns	1.9 ns	58.5 ns	17.7 ns	5.2 ns	43.9 ns	1.1 ns
0 + Fungicide	2.9	0.4	3.0	0.2	1.98	60.0	16.6	5.0	39.9	1.1
45	3.0	0.4	3.5	0.2	2.0	64.5	16.0	5.6	42.0	1.1
45 + Fungicide	2.9	0.4	3.2	0.2	1.8	61.9	14.7	5.0	44.7	1.0
90	3.1	0.4	3.3	0.2	1.7	63.0	14.6	5.8	45.0	1.0
90 + Fungicide	3.0	0.4	3.2	0.2	1.7	65.6	15.8	6.5	45.0	1.1
135	3.1	0.5	3.0	0.2	1.6	67.5	16.4	6.9	48.1	1.0
135 + Fungicide	3.1	0.4	2.9	0.2	2.0	67.2	15.3	5.3	40.9	1.1
Sufficiency Ranges <sup>3</sup>	1.5-1.7	0.3-0.6	6-8	0.3-0.6	1.3-2.0	20-40	5-10	4-6	15-25	-

<sup>1</sup> The nutrient was reported "as is" for all lab measurements. This means that the content was measured without any adjustments for moisture.

<sup>2</sup> ns = no significant differences among the treatments at P = 0.05.

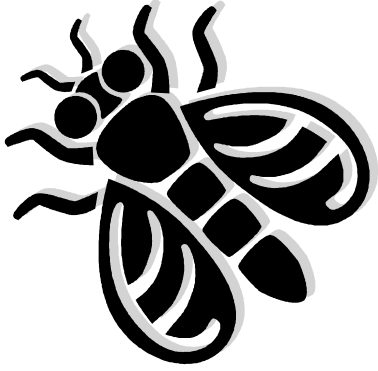
<sup>3</sup> As reported in OMAFA publication 839

**Table 6.** Correlation coefficients and p-values between nitrogen foliar contents as determined by SGS laboratory tissue nutrient analysis and Early Blight disease severity (DSI) and Yield in celery, cv. TZ 6200, grown at a muck soil site near the Ontario Crops Research Centre -Bradford, Holland Marsh, Ontario, 2025.

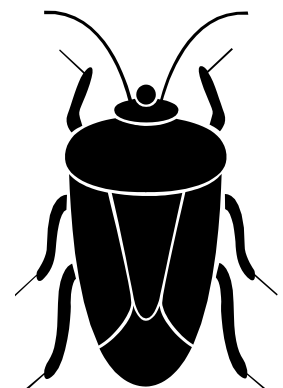
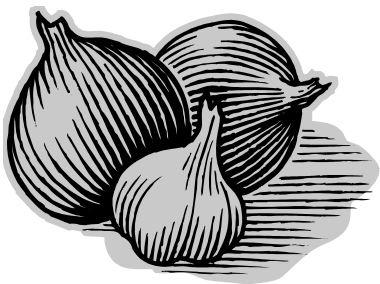
Variable	23 July	8 August	23 August
AUDPC	-0.11 <sup>1</sup> (0.57) <sup>2</sup>	-0.09 (0.64)	0.00 (0.10)
yield (t/ha)	-0.17 (0.35)	0.06 (0.77)	-0.34 (0.06)
Wgt/ Mkb plant (g)	-0.18 (0.31)	-0.01 (0.96)	-0.34 (0.06)

<sup>1</sup>Pearson correlation coefficient (r).

<sup>2</sup>Associated P-value.



**Integrated  
Pest  
Management  
Report - 2025**



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**TITLE: THE INTEGRATED PEST MANAGEMENT PROGRAM SUMMARY FOR  
 MUCK VEGETABLE CROPS, 2025**

An Integrated Pest Management (IPM) program is provided to growers in the Holland/Bradford Marsh, Ontario, by the University of Guelph Ontario Crops Research Centre - Bradford. This program is funded by growers participating in the Research Centre's IPM Program, agrochemical companies, seed and fertilizer companies and the Bradford Cooperative Storage Ltd. The main objectives of the program are: to scout growers' fields for diseases, weeds, and insect pests, to provide growers with disease and insect forecasting information, to identify and diagnose diseases, insect pests and weeds, and to implement roto-rod spore traps to trap and analyze spores of various vegetable crop pathogens.

#### SCOUTING

In 2025, 45 commercial vegetable fields, totalling 568 acres (onion 276 ac, carrot 266 ac, celery 20 ac and potato 6 ac), were intensively scouted for 17 growers. Fields were scouted twice per week during the growing season and growers received scouting reports after each field survey.

#### DIAGNOSTICS, EXTENSION & DISSEMINATION OF INFORMATION

Any grower, whether participating in the IPM program or not, may bring in samples (plant, insect, or weed) for diagnosis. The on-site tools available for diagnosis are visual inspection and laboratory inspection using a microscope and culturing. Diagnoses are made by comparison to known symptoms, published descriptions of pathogens, insect pests and weeds, and personal experience. Following assessment, the extension advice given was based on Ontario Ministry of Agriculture, Food and Agribusiness (OMAFRA) recommendations for pesticides.

From 1 March to 1 October, 2025, the diagnostic laboratory of the OCRC-B received 66 samples for diagnosis. Of these, 77% were diagnosed with infectious diseases (51 samples), 12% with insect issues (8 samples) and 11% were diagnosed with an abiotic disorder (7 samples). These samples were associated with the following crops: onion (47%), carrot (36%), celery (14%) and other crops (3%). For extension services, data collected from growers' fields and research station plots were compiled twice per week, analyzed and summarized. The results were compiled in an 'IPM Report' and updated twice per week and circulated to participating growers, academia, industry, OMAFRA staff, posted on the OCRC-B website (<https://bradford-crops.uoguelph.ca>), and a copy was displayed at the Bradford Co-op.

#### PEST PREDICTIVE MODELS

The IPM program provides disease and insect forecasting based on spore traps, disease forecasting models: BOTCAST (for botrytis leaf blight of onion), DOWNCAST (for onion downy mildew), BREMCAST (for lettuce downy mildew), BSPCAST (for Stemphylium leaf blight of onion), an onion white rot model and a Sclerotinia white mold of carrot model, insect degree day models, and insect traps. These disease and insect forecasts alert growers by predicting the potential for disease and insect pest incidence.

#### CROP PEST SUMMARIES

At the end of the scouting program, samples were taken from each field for assessment. One hundred onions were examined after lodging and 100 carrot samples were collected before harvest. The samples were assessed for damage from insects, diseases and physiological disorders. The onion samples were examined by hand pulling 10 onions from 10 random locations throughout each field. The carrot samples were collected by hand pulling 20 carrots near each of the four corners and middle (5 locations total) of each field.

## CARROT

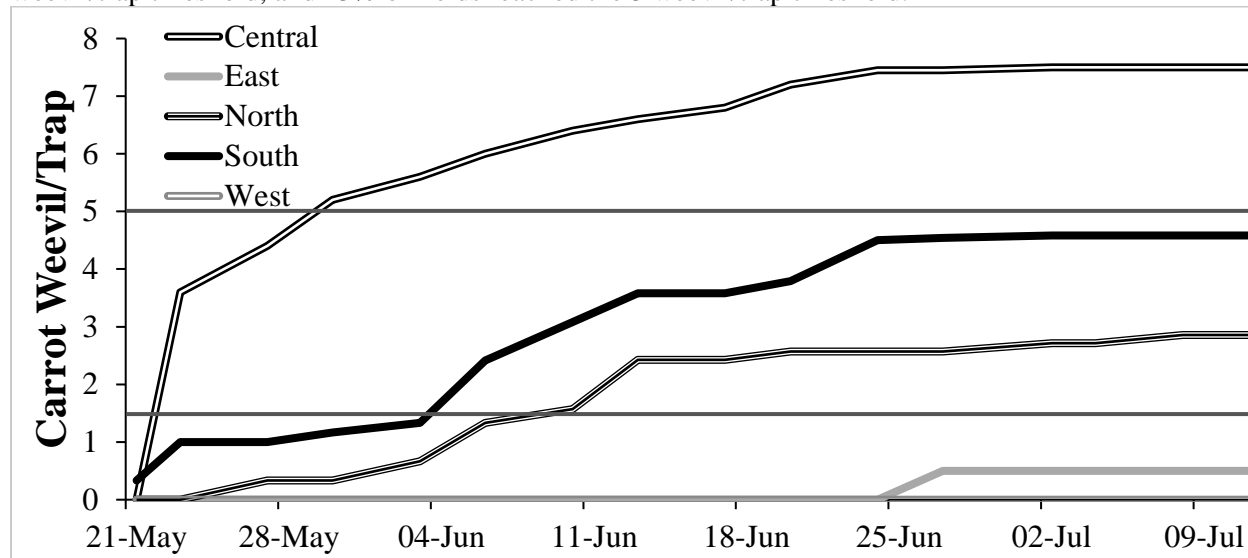
### Insects

In 2025, carrot fields were scouted for carrot weevil (*Listronotus oregonensis*), carrot rust fly (*Psila rosae*), aster leafhopper (*Macrostelus quadrilineatus*) and other insect pests. Degree day models were used to predict the occurrence of the various life stages of these insects. Carrot rust fly damage was high in a few fields, especially in the central region (Table 1). There was very minimal carrot weevil damage reported this year. Aster leafhoppers were found throughout the season and populations were fairly high, but aster yellows severity was lower than expected again this year.

**Table 1.** Average percent carrot weevil and carrot rust fly damage on carrots at harvest in scouted fields in the Holland Marsh, 2025.

Location within Holland Marsh	% Damaged Carrots	
	Weevil damage	Rust fly damage
West	0.0	0.0
South	0.2	3.4
Central	0.0	13.8
North	0.1	1.3
East	0.0	1.5
Average	0.07	4.0

Carrot weevil adults were first found in Boivin traps on 14 May in carrot fields (Fig. 1). Carrot weevils were found in 50% of scouted carrot fields. Overall, 27% of fields in the IPM program reached the 1.5 weevil/trap threshold, and 23% of fields reached the 5 weevil/trap threshold.

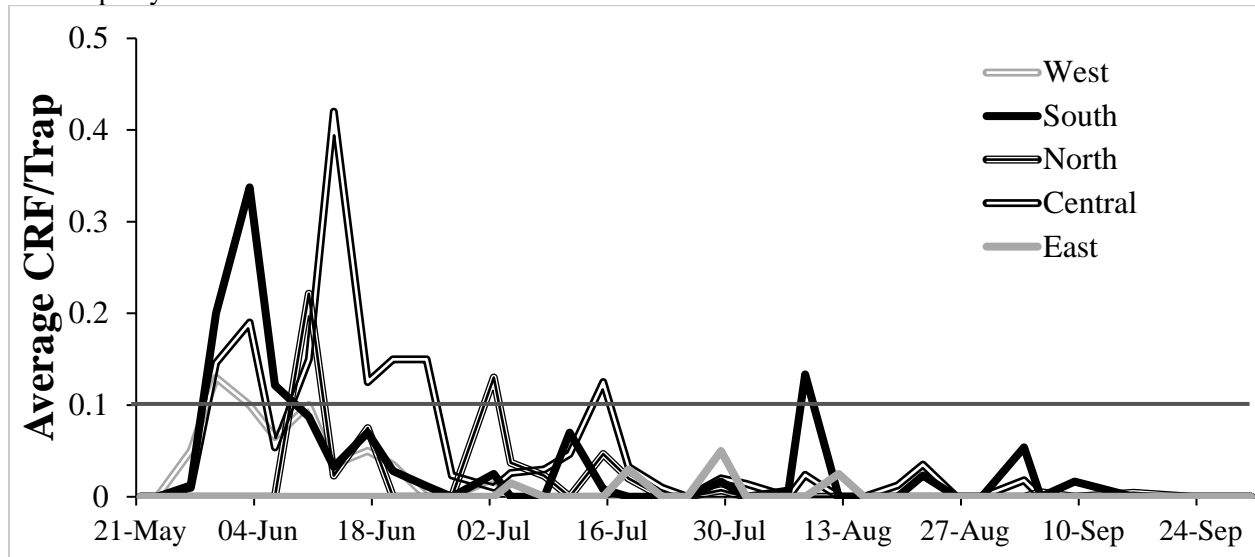


**Figure 1.** Average cumulative number of carrot weevils/trap in different regions of the Holland Marsh, 2025. The horizontal lines indicate the 1.5 and 5 cumulative weevils/trap thresholds.

Carrot weevil damage was very minimal at harvest this year. Damage continues to be minimal over the past several years now. The consistency of growers using Rimon and Exirel, which are very effective at controlling carrot weevil, has contributed to the steady decline of carrot weevil damage.

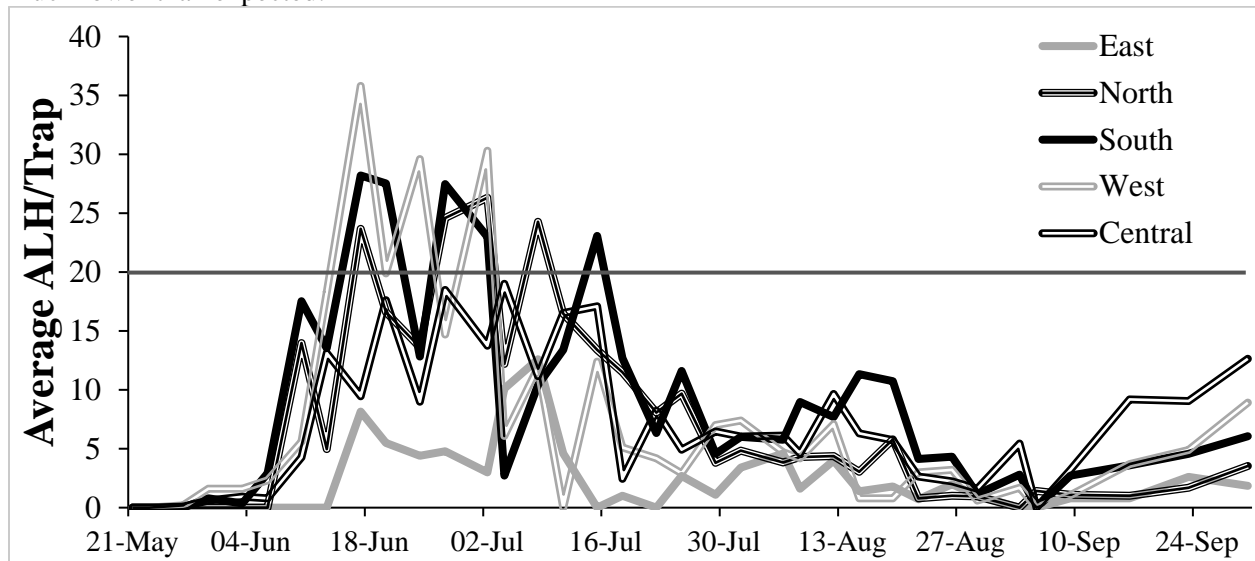
Orange sticky traps and degree day models were used to monitor and estimate carrot rust fly (Fig. 2). Carrot rust flies were first found on sticky traps on 26 May, 6 days after the degree day model predicted first generation emergence (20 May). The first generation was very active throughout the marsh from mid-May

to near the end of June. Second generation activity peaked around mid-July and activity remained consistent in some fields into early August. During the second generation, 36% of scouted fields exceeded the 0.1 flies/trap/day threshold.



**Figure 2.** Average carrot rust flies (CRF)/trap/day in different regions of the Holland Marsh, 2025. The horizontal line indicates the 0.1 rust flies/trap/day threshold.

Aster leafhoppers are pests of carrots, celery, lettuce and leafy greens. Aster leafhoppers were first found on orange sticky traps on 26 May in carrots and celery (Fig. 3). Sticky traps and sweepnetting (100 sweeps per field) were used to estimate populations occurring within fields. Counts peaked during the second half of June during which 45% of fields were above the 20 ALH/trap threshold at some point. Although most fields surpassed the threshold at some point during the season, harvested carrots with aster yellows was much lower than expected.



**Figure 3.** Average aster leafhoppers/trap in different regions of the Holland Marsh, 2025. The horizontal line indicates the 20 ALH/trap threshold.

## Diseases

Carrot fields were scouted for diseases throughout the growing season. Leaf blights, which are caused by the fungi *Alternaria dauci* and *Cercospora carotae*, were first seen on 31 July. Throughout the season only 9% of scouted carrot fields reached the leaf blight threshold of 25% of plants infected. Carrot leaf blight severity was quite low with the warm and dry conditions throughout the season.

Samples of 100 carrots were taken from each scouted field and roots were assessed for diseases (Table 2). All fields developed multiple diseases at varying levels of severity. Crater rot (*Rhizoctonia* spp.) was found in every carrot field and severity may have been slightly amplified during storage. All fields also had some level of forking/stubby carrots which can be caused by nematodes, *Pythium* spp. or taproot disturbance during germination and establishment. Cavity spot (*Pythium* spp.) incidence was lower than previous years and severity was quite low which is likely due to the fairly dry season. Fusarium dry rot, crown gall, and aster yellows were also present on harvested carrots.

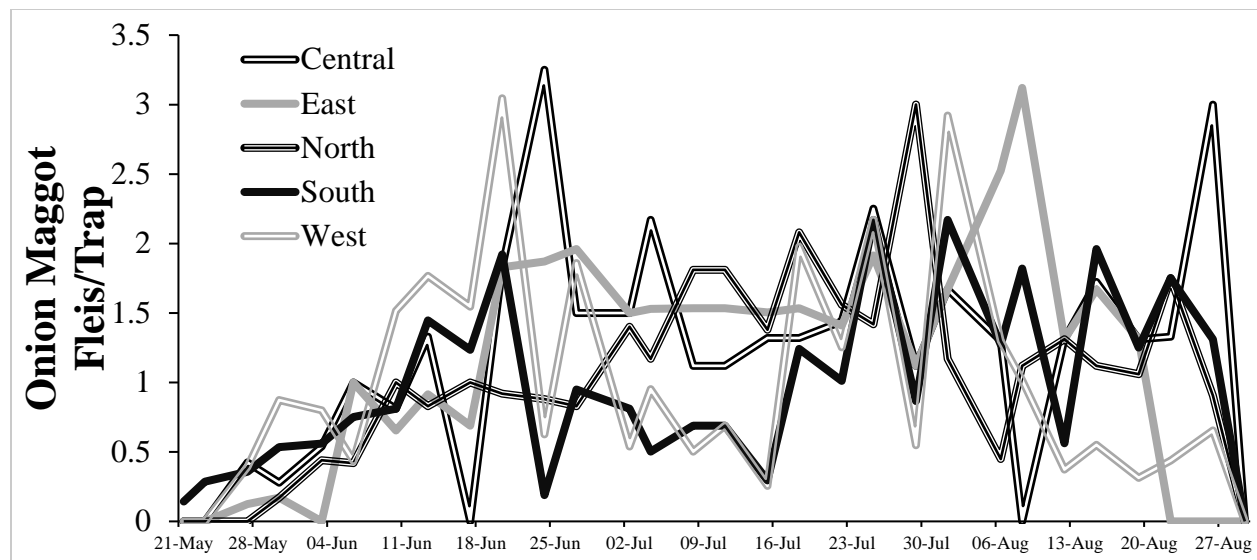
**Table 2.** Disease incidence on carrot samples collected from commercial fields in the Holland Marsh, Ontario in 2025.

DISEASE	CAUSAL AGENT	FIELDS INFECTED (%)	INCIDENCE (%)
Crater Rot	<i>Rhizoctonia</i> spp.	100	4-74
Forking/Stubby	Nematodes and/or <i>Pythium</i> spp.	100	2-20
Fusarium Dry Rot	<i>Fusarium</i> spp.	90	0-10
Cavity Spot	<i>Pythium</i> spp.	81	0-13
Crown Gall	<i>Agrobacterium tumefaciens</i>	24	0-2
Aster Yellows	<i>Candidatus Phytoplasma asteris</i>	19	0-1

## ONION

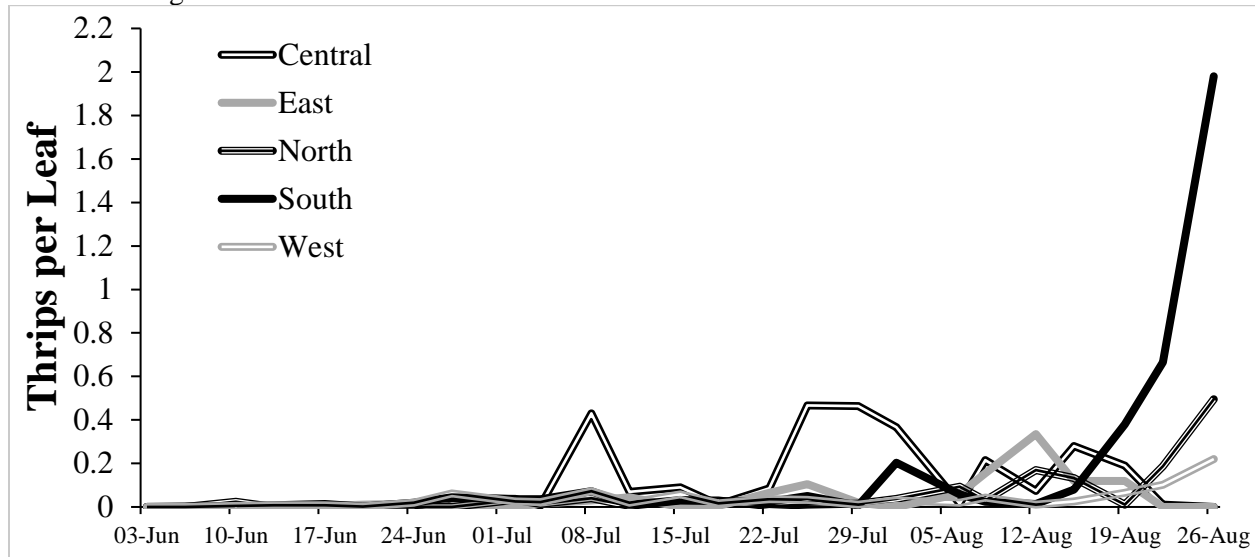
### Insects

Onion fields were scouted for onion maggot (*Delia antiqua*) (Fig. 4), onion thrips (*Thrips tabaci*) (Fig. 5), cutworms and other insect pests. The degree day model predicted first generation onion fly emergence on 13 May and first onion flies were found on yellow sticky traps on 20 May. Counts remained very low overall (Fig. 4). A couple transplant onion fields experienced some minor onion maggot activity and damage.



**Figure 4.** Average onion flies/trap/day in different regions of the Holland Marsh, 2025.

Thrips were first identified on 5 June and populations fluctuated but remained low throughout the season and never surpassed the 3 thrips/leaf spray threshold. Thrips counts were highest from the end of July to the end of August.



**Figure 5.** Average thrips/leaf in different regions of the Holland Marsh, 2025.

### Diseases

Onion fields were scouted for botrytis leaf blight (*Botrytis squamosa*), downy mildew (*Peronospora destructor*), purple blotch (*Alternaria porri*), white rot (*Stromatinia cepivora*), pink root (*Setophoma terrestris*), stemphylium leaf blight (*Stemphylium vesicarium*) and other diseases.

Conditions were generally good for onion growth during the season. Precipitation at the beginning of the season created good soil conditions for seeding. Cooler temperatures after emergence slowed onion growth. Temperatures were hot throughout most of June to August and precipitation was sporadic, which resulted in dry conditions that were managed with regular irrigation. The hot and dry conditions throughout most of the growing season delayed or prevented disease development and minimized severity, along with timely fungicide sprays.

Stemphylium leaf blight continued to be the main disease on onions in 2025 (Table 3). First symptoms of Stemphylium leaf blight in scouted fields were seen on 30 June. Severity was very low in most transplant onion fields at harvest, but increased in most seeded fields by the end of the season. All scouted onion fields showed symptoms of the disease.

Conditions were not favourable for the development of onion downy mildew and the disease was not found in 2025.

Pink root was found in all onion fields, but disease severity was generally low which was surprising considering the high temperatures during the season. Bacterial rot was found in a few fields where irrigation was common. Smut, white rot, purple blotch and fusarium basal rot were also present but were not major concerns.

**Table 3.** Disease incidence on onion samples examined in commercial fields in the Holland Marsh, Ontario in 2025.

DISEASE	CAUSAL AGENT	FIELDS INFECTED	INCIDENCE
		(%)	(%)
Stemphylium leaf blight	<i>Stemphylium vesicarium</i>	100	80-100
Pink root	<i>Setophoma terrestris</i>	100	2-50
Fusarium basal rot	<i>Fusarium oxysporum</i> f. sp. <i>cepae</i>	76	0-6
Purple blotch	<i>Alternaria porri</i>	64	0-51
White rot	<i>Stromatinia cepivora</i>	33	0-8
Bacterial rot/soft rot	<i>Pectobacterium carotovorum</i> subsp. <i>carotovorum</i>	24	0-2

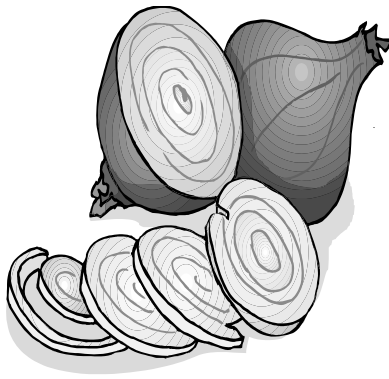
**CELERY****Insects**

In 2025, two celery fields were scouted for carrot weevil, aster leafhopper, tarnished plant bug (*Lygus lineolaris*) and aphids. Insect traps and degree day models were used to predict the occurrence of the various life stages of carrot weevil, aster leafhopper and tarnished plant bug. Tarnished plant bugs were found in all fields but populations and damage were low. Aster yellows incidence was also low this year considering the high aster leafhopper populations. Cutworm, aphid and caterpillar activity was very low and no leaf miner damage was reported. No carrot weevil damage was found. Overall, insect activity in celery was very minimal in 2025.

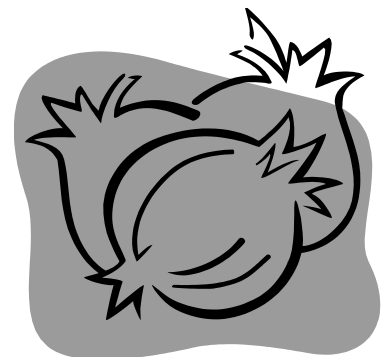
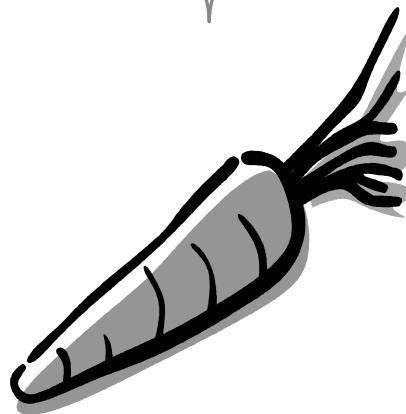
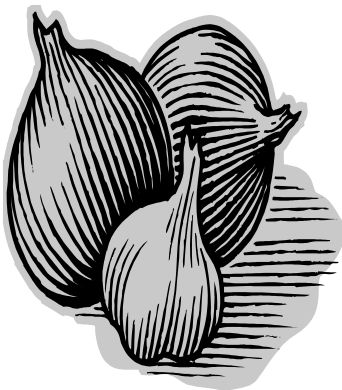
**Diseases**

Leaf blights (*Cercospora apii* and *Septoria apiicola*) were common, but disease severity was low throughout the season. Celery leaf curl, or celery anthracnose (*Colletotrichum fioriniae*), was found in all fields but only a few plants per field were found to have the disease. The hot and dry conditions prevented diseases from developing, or increasing in severity, in addition to timely fungicide sprays. Although not a disease, blackheart was fairly frequent in celery fields this year.

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# Cultivar Trials 2025



### CARROT CULTIVAR TRIAL SEASON SUMMARY – 2025

Daytime air temperatures seven days before seeding fluctuated between low to high twenties and nighttime air temperatures fluctuated in the low single digits. The last half of April and the first half of May received slightly below average rainfall. A total of 5/8 of an inch of rainfall occurred on 1 May. The below average rainfall environment prior to seeding provided poor soil moisture for carrot hill formation and seeding. In the marsh, most of the carrot seeding occurred within the two-week period of 15-26 May. Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for September (16.6°C) and October (9.9°C) and below average for May (12.8°C) and August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C, September 17.0°C and October 9.9°C. Monthly rainfall was below the 10-year average for June (46 mm), August (54 mm) and October (45 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm, September 48 mm and October 58 mm.

The carrot trial was seeded on 16 May. Soil moisture was insufficient for forming proper carrot hills. One day after seeding a significant rain fall of 1.5 inches of rain occurred. Day time air temperatures dropped to low double digits and nighttime air temperatures to single digits. An additional 1 inch of rainfall occurred on 21 and 22 May. These cool / wet conditions slowed germination. Additionally, the remainder of May had no significant rainfall. By 10 June plant stands were very erratic between replicates and cultivars. A decision was made to reseed the entire trial on 25 June. Irrigation water (3/4”) was applied on 27 June to aid in seed germination. Emergence and plant vigour were only fair. A second application of irrigation water on 13 July aided in plant establishment. Several light rain showers through out July provide favourable conditions for plant establishment. Two applications of irrigation water of 3/4” on 23 July and 8 August helped establish and encourage strong plant growth.

Weed control was challenging after the reseeding on 25 June. Five applications of small dosages of Lorox + Assist Oil were required on 30 June, 11, 14 & 18 July and 1 August. These applications provided a moderate job of cleaning up the trial. The trial was hand weeded a few times through the growing season to keep it free of weeds.

Scouting for carrots began at the station on 14 May. The carrot weevil count on 22 May was 0.67 weevils/trap. By 29 May, weevil numbers had passed the first spray threshold with 1.5 cumulative weevils/trap. When the carrots were reseeded on 25 June the cumulative weevils/trap was at 21.5. The insecticide Rimon was applied once on 24 July to prevent carrot weevil damage. Very limited weevil damage (dead carrot seedlings) were observed in the variety trial during hand weeding. Only one carrot was found to have

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## CARROT CULTIVAR TRIAL SEASON SUMMARY – 2025 – continued

weevil damage during evaluation. Carrot rust flies were first found on 29 May. There were five minor rust fly peaks occurring on 29 May, 9 & 19 June, 3 July and 12 August (0.20, 0.55, 0.2, 0.1 and 0.01 flies/trap/day, respectively). At evaluation, the trial average for carrot rust fly damage was 0.3%. A very small increase compared to the 2023 and 2024 trial average of 0.15% and 0.1% rust fly damage. Aster leafhoppers were first found on 20 May at 1.5 leafhoppers/trap. On 16 July, leafhopper numbers had peaked at 40 leafhoppers/trap. Leafhopper population remained high above 20+ hoppers/trap through July and August. Two insecticide applications were applied on 6 and 22 August to reduce the population. The higher pressure of aster leafhoppers correlated with some noticeable aster yellows infection in the field, but at evaluation the number of carrots with the disease in yield samples was low.

Alternaria and Cercospora leaf blights were first found on 12 August, with Cercospora at very minimal levels the entire season. No fungicides were applied to the trial. Throughout the months of September and October, leaf blight incidence did not increase in most cultivars. Leaf blight severity was low in most varieties at harvest in October. Differences in leaf blight incidence among cultivars were evaluated and noted. All cultivars had a significantly higher incidence of blight in the first replicate than the other two replicates. By Grower Field Week, starting on 5 September, some bolting was noted in a several cultivars in the trial. At harvest, twelve cultivars had no seeders present and for cultivars where seeders were present the total numbers were very low.

On 5 September, Grower Field Day, most carrot roots that were pulled appeared to be progressing well. Lengths were a bit short, and weight was surprisingly quite good considering the late seeding date. The carrot lengths and additional weight did improve thanks to some good rainfalls in September. Weather conditions in October were very favourable for the entire harvest period which began on 27 October. At harvest, carrots had fair diameters and fair lengths and were nice in quality. There were low to moderate numbers of forked and split carrots in the yield samples. Drier conditions during October appeared to discourage blight development. The carrot tops had low levels of leaf blight and strong petiole attachment. No pockets of sclerotinia were found in the trial at harvest even though some patches were found in September scouting. Very little bacterial canker rot was noted. Carrot samples were placed in a cold storage immediately after harvest.

At evaluation in January, the trial average yield for cellos and jumbos was poor with 1032 and 1096 bu/A respectively. This is a decrease of approximately 300 to 500 bu/A for both the cellos and jumbos compared to 2024. Significant differences in bu/A were found between cultivars in the jumbos but not in the cellos. The percentage of oversized carrot in both the cellos and jumbos had significant differences among cultivars. The percentage of oversized carrot dropped by approximately 10% in both cellos and jumbos. Both cellos

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**CARROT CULTIVAR TRIAL SEASON SUMMARY – 2025 – continued**

and jumbos had average root lengths and satisfactory widths in the cellos and fair widths in the jumbos. Both cellos and jumbos had significant differences in length and width between cultivars and replicates. Lengths in the cellos and jumbos were shorter in the first replicate compared to the second and third replicates. For in the jumbos, the first replicate was significantly narrower than the second and third replicates. Overall quality was nice in both cellos and jumbos with approximately two thirds of the carrot roots matured. In both the cellos and jumbos, the percentage of cull carrots was low with an average of 11% of the harvest yield. The percentage of culls dropped by approximately 4% compared to the 2024 carrot trial. The culls in both the cellos and jumbos were split between small or forked carrots; however, these were at lower levels than 2023 and 2024. There were the odd split carrots found during evaluation with cello types having slightly higher incidence. At evaluation very low levels of rot was found. For cellos, the stand average was low at 14 carrots/foot compared to the desired trial seeding average of 25 carrots/foot and significantly different among cultivars. The stand average for jumbos was 11 carrots/foot compared to the desired trial seeding average of 18 carrots/foot with a significant difference between first and second replicates. In the cellos the total number of carrots harvested was significantly different among cultivars. In the jumbos there was a significant difference between the first and second replicate. The low stands for both cellos and jumbos were disappointing because the emergence and establishment of carrots in the second seeding appeared to be good. The trial average for cavity spot incidence was 24%, equal to 2024 levels, but a significant drop compared to the 60.5% levels of 2023 and 2022. Cavity spot incidence was low with one to two spots per infected root. The trial average for severity was only light to light/moderate-sized lesions. It appeared the later seeding date and drier conditions of the growing season significantly decrease the percentage of incidence of cavity spot and lowered the severity compared to previous years. The uniformity of length rating was below average for the cellos and average for the jumbos. The uniformity of widths ratings was slightly below average for both cellos and jumbos. Exterior colour for all cultivars was fair for all carrots within the samples with jumbo varieties having a slightly above average rating. Most of the jumbo cultivars only had a few visible lenticels. For appearance, the cellos and jumbos had a similar average rating for the trial. Most carrot samples had a smooth skin with only a few cello cultivars having a slightly ringy surface. Interior colour blending was good, with very few carrots having any translucency in the core or red/green rings around the core compared to 2024. Green shoulders were not present in most cello cultivars and, if found, were mostly in the jumbos and just starting to develop. There was one carrot found with a gall at evaluation. Average leaf lengths cellos (45.3 cm) and jumbos (43.8 cm) decreased by 15 cm compared to the 2024 trial. This decrease was likely due to the late seeding date of 25 June. Fifty percent of the cultivars had no aster yellow present in the harvest yield samples. The cellos had a trial average of 0.2% infection, and the jumbos had a trial average of 0.3%. These trial percent averages of aster yellows infection were much lower than anticipated. At evaluation, no significant differences were found in percentage of weevil or rust fly damage.

## CARROT CULTIVAR TRIALS - 2025

### MANAGEMENT PROCEDURES

#### **Fertilizer:**

20 kg/ha Nitrogen (Calcium Ammonium Nitrate 27-0-0) + 75 kg/ha Phosphorous (MESZ 10-40-0) + 175 kg/ha Potassium (ASPIRE 0-0-58) + 125 kg/ha of K-Mag (0-0-22) + 35 kg/ha of Manganese Sulfate + 3.5 kg/ha Boron (10%) and 100 kg/ha of Gypsol was worked into the soil.

#### **Seeded:**

All trials were seeded on 16 May using a push cone seeder. If seed had a germination rate of 95 to 100%, a target of 26-22 seeds per foot was desired for Cello type carrots and 15-18 seeds per foot for Jumbo type carrots. All trials were seeded on beds 86 cm apart. The seeding rate was done according to percent germination. **RIDOMIL 1G** was applied at 25 kg/ha in the seed furrow. The Main Trial was replicated three times, and the Adaptation Trial was not replicated.

**Note Well: The trial was reseeded after very poor germination on 25 June.**

#### **Weed Control:**

Pre-emergence: 1 application: **GESAGARD 480** at 7.0 L/ha on 29 May.

Post-emergence: 1 application: **LOROX L** at 250 ml/ha + **ASSIST OIL** at 1.0 L/ha on 16 June.

#### **After Reseeding**

Post-emergence: 4 applications: **LOROX L** at 500 ml/ha + **ASSIST OIL** at 1.0 L/ha on 30 June, 14 & 18 July and 1 August.

1 application: **LOROX L** at 300 ml/ha + **ASSIST OIL** at 1.0 L/ha on 11 July.

#### **Minor Elements:**

Three foliar sprays: Calimax on 24 July (1.0 L/ha) and 4 & 22 August (2.0 L/ha).

Two foliar sprays: Suprafeed on 4 and 22 August (2.0 kg/ha).

Two foliar sprays: Alexin on 24 July (1.0 L/ha) and 22 August (2.0 L/ha).

Two foliar sprays: Mag Max on 24 July (1.0 L/ha) and 22 August (2.0 L/ha).

One foliar spray: Manganese Sulfate on 4 August (2.0 kg/ha).

One foliar spray: Epsom Salts on 1 August (2.0 kg/ha).

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## **CARROT CULTIVAR TRIALS - 2025 - continued**

### **Insect and Disease Control:**

According to IPM recommendations.

**RIMON** at 820 ml/ha on 24 July.

**CLOSER** at 300 ml/ha + **EXIREL** 1.5 L/ha 6 August.

**CLOSER** at 300 ml/ha and Minor Elements on 22 August.

### **Harvest:**

The Main and Adaptation Trials were harvested on 27-30 October and 3 & 4 November. All trials were immediately placed in a temperature and humidity controlled storage (1°C, 95 % RH) respectively.

### **Irrigation:**

Irrigation water was applied at  $\frac{3}{4}$ " on 27 June, 13 & 23 July and 8 August.

### **EVALUATION PROCEDURES**

The cultivars were evaluated on 5 – 20 January after 9 weeks in storage.

### **# Carrots Harvested:**

Total number of carrots harvested from 2.32 m of row.

### **Harvest Weight:**

Weights from the harvested 2.32 m of row.

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## CARROT CULTIVAR TRIALS - 2025 - continued

### **Marketable Yield t/ha + B/A:**

Marketable yield includes the packaging size, 2.0 cm to 4.4 cm ( $\frac{3}{4}$ " to  $1\frac{3}{4}$ " ) as well as the oversize > 4.4 cm ( $> 1\frac{3}{4}$ " ).

### **% Oversize:**

The percentage of carrots > 4.4 cm ( $> 1\frac{3}{4}$  ") and greater.

### **Majority of Culls:**

Sp = Splits    F = Forked    Sm = Small (< 2.0 cm)    R = Rot    A = Aster Yellows

### **Shape:**

GP = Gold Pak    N = Nantes    Imp = Imperator    Cyl = Cylindrical    LD = Long Danver    LO = Long Orange  
B = Berlicum    F = Flakkee    K = Kuroda    D = Danver    SP = Spartan Bonus

### **Appearance:**

Appearance is based on qualities of straightness of root and smoothness.

10.0 = very straight and smooth,    6.0 = a few rough carrots in mix,    1.0 = bends and curves in root with very rough surface.

### **Resistance to Greening:**

The higher the number, the less green tissue on the crown of the carrot

10.0 = no green tissue,    6.0 = moderate green tissue,    1.0 = total green tissue.

### **External Colour:**

DO = Dark Orange    O = Orange    BO = Bright Orange    LO = Light Orange    LY = Light Yellow    LPR = Light Purple

### **Internal Colour:**

DO = Dark Orange    O = Orange    BO = Bright Orange    LO = Light Orange    YO = Yellow Orange

### **Blight Rating:**

No fungicides were applied during the 2025 season. Evaluation took place at harvest. 10.0 = Most Desirable, no lesions; 8.0 = Good, mild lesions on leaves, no lesions on petioles; 6.0 = Moderate, lesions on leaves, some lesions on petioles; 3.0 = Poor, numerous lesions on leaves, numerous lesions on petioles; 1.0 = Severe, tops completely rotted, crop cannot be harvested.

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## CARROT CULTIVAR TRIALS - 2025 - continued

**Score:**

The average of the 9 marks from Uniformity of Shape to Blight Rating. 10.0 = Most Desirable, 7.5 = Good, 6.0 = Average.

**% Cavity Spot & Degree:**

The number indicates the percentage of roots with cavity spots.

The letters indicate the degree to which the roots were infected.

VL = Very Light, cavity spots are few and barely visible. Lesion size < 1 mm.

L = Light, few small spots. Lesion size 1 - 2 mm.

M = Medium, roots borderline marketable. Lesion size 2 - 5 mm.

H = Heavy, large cavity spots, roots unmarketable. Lesion size 5 - 10 mm.

VH = Very Heavy, many large cavity spots, roots unmarketable. Lesion size > 10 mm.

**Example: 50 H = 50% of the roots were heavily infected with cavity spots, roots unmarketable**

**Shape of Crown:**

CV = Convex (no indentation around crown)

CC = Concave (indentation around crown)

**Root Length (cm):**

Twenty centimetres is approximately eight inches.

**Root Width (cm):**

One inch is approximately two and a half centimetres.

**Seeding Rate:**

Number of seeds per foot as specified by seed company.

**Stand per Foot:**

Stand per Foot times 3.28 equals Stand per Metre.

**Top Length (cm):**

Small = 20-30 centimetres

Medium = 30-45 centimetres

Large = 45 centimetres and greater

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**CARROT CULTIVAR TRIALS - 2025 - continued**

**Leaf Colour:**

LG = Light Green      G = Green      DG = Dark Green      PG = Pale Green

**Leaf Structure:**

F = Fine leaf structure      ST = Standard leaf structure      C = Course heavy leaf structure

**% Weevil & Rust Fly Damage:**

Percent of carrot roots damaged by carrot weevil & carrot rust fly that were found in the 2.32 m harvest sample.

**% Aster Yellows:**

Percent of Aster yellows infected roots that were found in the 2.32 m harvest sample.

**Average Number of Seeders:**

Average number of seeders found in each cultivar of 15 m of row.

**Root Gall:**

Root gall was only found on one carrot in the 2025 carrot cultivar trial.

**CARROT CULTIVAR MAIN TRIAL CELLO TYPES - 2025**

Cultivar	Source	# Carrots Harvested	# > 4.4 cm	# 2.0 to 4.4 cm	Total Harvest Weight (kg)	Weight > 4.4 cm (kg)	Weight 2.0 to 4.4 cm (kg)	Marketable Yield t/ha	Marketable Yield B/A
BRILLYANCE	Sto	98 c-g*	19 a-d	69 bcd	15.37 abc	4.47 a-e	9.76 c-f	71.1	1145 ns**
PINK PUNK	Vil	64 g	28 a	30 e	11.29 def	6.37 ab	3.81 g	50.9	819
NAVAL	Bejo	85 efg	4 fgh	69 bcd	11.21 ef	1.01 fgh	9.18 def	50.9	820
CELLOBUNCH	Sto	138 abc	7 e-h	105 a	15.14 a-e	1.99 d-h	11.76 a-d	68.8	1107
ENVY	Sto	130 a-d	14 c-f	91 ab	15.55 abc	3.89 b-g	10.20 a-f	70.5	1134
SVDL 2191	Sem	100 b-g	4 fgh	83 a-d	13.70 b-e	1.19 e-h	11.13 a-e	61.6	992
SVDL 2190	Sem	123 a-e	16 b-e	85 a-d	14.60 a-e	3.81 b-g	9.21 def	65.1	1048
ORANGE FANCY	Nor	111 b-f	7 e-h	92 ab	17.29 ab	2.37 d-h	13.03 ab	77.0	1240
CROFTON	RZ	86 efg	0 h	75 a-d	9.47 f	0.00 h	8.41 ef	42.1	677
NAVEDO - cello	Bejo	142 ab	8 d-h	104 a	17.84 a	2.65 c-h	13.32 a	79.9	1286

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

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**CARROT CULTIVAR MAIN TRIAL CELLO TYPES - 2025 - continued**

Cultivar	Source	# Carrots Harvested	# > 4.4 cm	# 2.0 to 4.4 cm	Total Harvest Weight (kg)	Weight > 4.4 cm (kg)	Weight 2.0 to 4.4 cm (kg)	Marketable Yield t/ha	Marketable Yield B/A
ORANGE SLICE	Nor	129 a-d*	5 fgh	103 a	15.82 abc	1.37 e-h	12.59 abc	69.8	1124 ns**
ENTERPRISE	Sto	86 efg	19 a-d	55 cde	15.21 a-d	5.77 abc	7.62 f	66.9	1078
ISTANBUL	Bejo	90 d-g	15 c-f	62 b-e	13.84 b-e	4.06 a-f	8.20 ef	61.3	987
JUNCTION	Bejo	75 fg	13 c-g	53 de	13.99 a-e	3.96 b-f	8.25 ef	61.0	983
TROPHY PAK	Sto	68 g	26 ab	30 e	12.59 c-f	7.41 a	3.79 g	56.0	901
JERADA	RZ	113 b-f	10 c-h	82 a-d	16.75 ab	2.99 c-h	11.41 a-e	72.0	1159
JEFFERSON	Bejo	126 a-e	13 c-g	88 abc	16.61 ab	4.06 a-f	9.90 b-f	69.8	1124
SVDL 2154	Sem	112 b-f	20 abc	67 bcd	15.95 abc	5.11 a-d	8.15 ef	66.3	1067
NARVIK	Bejo	165 a	2 gh	108 a	13.95 a-e	0.57 gh	10.73 a-f	56.5	909
<b>Trial Average</b>		<b>107</b>	<b>12</b>	<b>76</b>	<b>14.53</b>	<b>3.32</b>	<b>9.50</b>	<b>64.1</b>	<b>1032</b>

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

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**CARROT CULTIVAR MAIN TRIAL CELLO TYPES - 2025 - continued**

Cultivar	Source	% Marketable	% Oversize	Majority of Culls	Shape	Uniformity of Shape	Uniformity of Length	Uniformity of Width	Appearance	Resistance to Greening
BRILLYANCE	Sto	91.3 ns**	29.0 cde*	SM	N	4.7 ns	6.0 abc	6.3 ab	7.0 ab	9.3 abc
PINK PUNK	Vil	91.3	50.4 ab	SpF	Imp	7.7	7.0 a	7.2 a	7.3 a	10.0 a
NAVAL	Bejo	90.6	8.8 g-j	SM	Cyl	6.0	5.0 cd	6.0 abc	6.8 ab	9.2 a-d
CELLOBUNCH	Sto	90.4	12.7 e-j	SM	ImpCyl	7.0	4.7 cd	5.3 bcd	6.5 bc	7.7 e
ENVY	Sto	90.0	22.7 c-h	SM	Imp	7.3	5.5 bc	5.0 cd	5.7 d	8.8 bcd
SVDL 2191	Sem	89.5	8.8 g-j	SM	ImpCyl	7.0	4.0 d	4.7 d	6.0 cd	9.0 a-d
SVDL 2190	Sem	89.3	25.3 c-g	F	Imp	7.7	4.7 cd	5.0 cd	5.7 d	9.2 a-d
ORANGE FANCY	Nor	89.2	11.7 f-j	F	Cyl	6.3	5.3 bcd	5.7 bcd	6.5 bc	8.3 cde
CROFTON	RZ	89.1	0.0 j	SM	Cyl	8.3	5.3 bcd	6.3 ab	7.0 ab	8.5 cde
NAVEDO - cello	Bejo	89.0	13.9 e-j	SM	ImpCyl	6.3	5.3 bcd	5.3 bcd	5.7 d	8.7 b-e
Listed in order of % Marketable.										10.0 = Most Desirable,
										7.5 = Good, 6.0 = Average

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

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**CARROT CULTIVAR MAIN TRIAL CELLO TYPES - 2025 - continued**

Cultivar	Source	% Marketable	% Oversize	Majority of Culls	Shape	Uniformity of Shape	Uniformity of Length	Uniformity of Width	Appearance	Resistance to Greening
ORANGE SLICE	Nor	88.1 ns**	8.0 hij*	SpFSM	ImpCyl	6.3 ns	5.7 abc	5.0 cd	6.3 bcd	9.7 ab
ENTERPRISE	Sto	88.0	36.8 bc	F	ImpCyl	6.7	5.3 bcd	5.3 bcd	6.3 bcd	8.3 cde
ISTANBUL	Bejo	87.1	28.2 c-f	F	Imp	8.3	4.0 d	5.7 bcd	5.7 d	8.7 b-e
JUNCTION	Bejo	86.4	27.5 c-f	F	Imp	6.3	5.0 cd	5.3 bcd	6.0 cd	8.7 b-e
TROPHY PAK	Sto	86.0	55.2 a	F	Imp	7.0	4.7 cd	5.7 bcd	5.7 d	8.3 cde
JERADA	RZ	85.9	17.2 d-i	F	Cyl	7.7	6.7 ab	7.0 a	6.0 cd	8.2 de
JEFFERSON	Bejo	83.9	22.0 c-h	SM	Imp	7.3	5.7 abc	5.7 bcd	6.0 cd	8.8 bcd
SVDL 2154	Sem	83.0	31.0 cd	F	Imp	6.3	5.0 cd	5.3 bcd	6.3 bcd	9.0 a-d
NARVIK	Bejo	81.3	4.2 ij	SM	N	7.3	5.7 abc	6.0 abc	6.3 bcd	9.3 abc
<b>Trial Average</b>		<b>87.9</b>	<b>21.8</b>			<b>6.9</b>	<b>5.3</b>	<b>5.7</b>	<b>6.3</b>	<b>8.8</b>

Listed in order of % Marketable.      10.0 = Most Desirable,      7.5 = Good,      6.0 = Average

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

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**CARROT CULTIVAR MAIN TRIAL CELLO TYPES - 2025 - continued**

Cultivar	Source	External Colour	External Colour Rating	Internal Colour	Internal Colour Rating	% Core of Total Width	Blight Rating	Score	% Cavity Spot & Degree	Shape of Crown
BRILLYANCE	Sto	O	6.7 ns**	O	7.3 ns	49.8 a*	10.0 a	6.76 a-d	13L ns	CC
PINK PUNK	Vil	LPR	6.0	OP	6.3	45.2 b-e	7.3 cd	7.36 a	17LM	CC
NAVAL	Bejo	O	7.3	O	6.7	45.9 a-d	7.3 cd	6.71 bcd	17L	CC
CELLOBUNCH	Sto	O	6.0	O	7.0	48.0 abc	7.3 cd	6.31 de	17LM	CC
ENVY	Sto	O	6.0	O	6.7	44.9 cde	8.7 abc	6.43 cde	28L	CV
SVDL 2191	Sem	O	5.0	O	6.3	45.7 a-e	7.7 bcd	6.00 e	25L	CV
SVDL 2190	Sem	DO	6.3	O	6.7	44.0 cde	7.3 cd	6.45 b-e	32L	CC
ORANGE FANCY	Nor	O	6.3	O	6.7	45.7 a-e	5.3 e	6.45 b-e	30LM	CC
CROFTON	RZ	O	7.0	O	6.7	33.0 f	8.0 bcd	7.02 abc	15LM	CC
NAVEDO - Cello	Bejo	O	6.3	O	6.0	44.5 cde	7.3 cd	6.24 de	7LM	CV

Listed in order of % Marketable.      10.0 = Most Desirable,      7.5 = Good,      6.0 = Average

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

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**CARROT CULTIVAR MAIN TRIAL CELLO TYPES - 2025 - continued**

Cultivar	Source	External Colour	External Colour Rating	Internal Colour	Internal Colour Rating	% Core of Total Width	Blight Rating	Score	% Cavity Spot & Degree	Shape of Crown
ORANGE SLICE	Nor	O	6.0 ns**	O	7.7 ns	41.4 de*	8.7 abc	6.67 bcd	13L ns	CV
ENTERPRISE	Sto	O	6.0	O	7.0	41.4 de	9.0 ab	6.43 cde	20L	CC
ISTANBUL	Bejo	DO	6.3	O	7.3	45.8 a-e	8.7 abc	6.57 b-e	15L	CC
JUNCTION	Bejo	DO	6.0	O	6.7	42.8 de	8.3 bcd	6.29 de	20L	CC
TROPHY PAK	Sto	O	7.7	O	7.7	49.6 ab	7.7 bcd	6.67 bcd	3L	CC
JERADA	RZ	O	7.7	LO	6.3	41.4 e	7.0 d	7.07 ab	12L	CC
JEFFERSON	Bejo	O	6.3	O	7.7	43.3 de	7.0 d	6.79 a-d	32L	CC
SVDL 2154	Sem	O	6.3	O	6.7	43.3 de	7.0 d	6.43 cde	15L	CC
NARVIK	Bejo	O	6.7	O	7.3	41.5 de	7.0 d	6.95 abc	15L	CC
<b>Trial Average</b>			<b>6.4</b>		<b>6.9</b>	<b>44.1</b>	<b>7.7</b>	<b>6.61</b>	<b>23 LM</b>	

Listed in order of % Marketable.      10.0 = Most Desirable,      7.5 = Good,      6.0 = Average

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\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

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**CARROT CULTIVAR MAIN TRIAL CELLO TYPES - 2025 - continued**

Cultivar	Source	Root Length (cm)	Root Width (cm)	Seeding Rate	Stand per Foot	Top Length (cm)	Leaf Colour	Leaf Structure	% Weevil Damage	% Rust Fly Damage	% Aster Yellows
BRILLYANCE	Sto	18.1 gh*	3.9 ab	25	13 c-g	37.1	LG	ST	0.0 ns**	0.0 ns	0.0 ns
PINK PUNK	Vil	19.6 e-h	4.2 a	25	8 g	43.8	G	ST	0.0	0.5	0.0
NAVAL	Bejo	18.8 fgh	3.6 cde	25	11 efg	39.5	G	ST	0.0	0.4	0.0
CELLOBUNCH	Sto	21.7 b-e	3.4 def	23	18 abc	41.0	G	ST	0.0	0.9	0.5
ENVY	Sto	21.0 c-f	3.5 c-f	23	17 a-d	42.4	G	ST	0.0	0.9	0.5
SVDL 2191	Sem	25.1 a	3.5 c-f	25	13 b-g	51.8	G	ST	0.0	0.4	0.3
SVDL 2190	Sem	21.8 b-e	3.7 bcd	25	16 b-e	45.3	G	ST	0.0	0.2	0.0
ORANGE FANCY	Nor	22.4 bc	3.5 c-f	20	15 b-f	51.1	G	ST	0.0	0.0	0.3
CROFTON	RZ	20.1 d-g	3.2 f	25	11 efg	39.8	LG	ST	0.0	0.0	0.0
NAVEDO - cello	Bejo	20.9 c-f	3.5 c-f	25	19 ab	42.7	G	ST	0.0	0.0	0.2

Listed in order of % Marketable.

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\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

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**CARROT CULTIVAR MAIN TRIAL CELLO TYPES - 2025 - continued**

Cultivar	Source	Root Length (cm)	Root Width (cm)	Seeding Rate	Stand per Foot	Top Length (cm)	Leaf Colour	Leaf Structure	% Weevil Damage	% Rust Fly Damage	% Aster Yellows
<b>ORANGE SLICE</b>	Nor	24.0 ab*	3.3 f	24	17 a-d	54.1	G	ST	0.0 ns**	0.0 ns	1.0 ns
ENTERPRISE	Sto	24.0 ab	3.6 cde	25	11 efg	44.4	G	ST	0.0	0.4	0.0
ISTANBUL	Bejo	22.6 bc	3.7 bcd	25	12 d-g	46.9	G	ST	0.0	0.0	0.4
JUNCTION	Bejo	25.2 a	3.6 bcd	25	10 fg	46.1	G	ST	0.0	0.0	0.0
TROPHY PAK	Sto	21.6 cde	3.8 bc	23	9 g	50.1	G	ST	0.0	0.0	0.0
JERADA	RZ	20.0 d-g	3.5 c-f	25	15 b-f	46.1	LG	ST	0.0	0.5	0.0
JEFFERSON	Bejo	22.2 bcd	3.3 ef	25	17 a-e	49.4	G	ST	0.6	1.0	0.0
SVDL 2154	Sem	20.5 c-f	3.5 c-f	20	15 b-f	51.5	G	ST	0.0	0.3	0.3
NARVIK	Bejo	17.5 h	3.4 def	25	22 a	38.0	DG	ST	0.0	1.1	0.2
<b>Trial Average</b>		<b>21.4</b>	<b>3.6</b>	<b>24</b>	<b>14</b>	<b>45.3</b>			<b>0.0</b>	<b>0.3</b>	<b>0.2</b>

Listed in order of % Marketable.

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**CARROT CULTIVAR MAIN TRIAL JUMBO TYPES - 2025**

Cultivar	Source	# Carrots Harvested	# > 4.4 cm	# 2.0 to 4.4 cm	Total Harvest Weight (kg)	Weight > 4.4 cm (kg)	Weight 2.0 to 4.4 cm (kg)	Marketable Yield t/ha	Marketable Yield B/A
EXP 3497	Bejo	84 a-d*	34 bcd	35 c	14.55 b-e	8.80 a-e	4.31 d	65.6	1055 b-e
BERLIN	Bejo	90 a-d	32 b-e	40 bc	16.00 bcd	10.35 a-d	3.88 d	71.2	1146 a-e
CANBERRA	Bejo	77 bcd	54 a	9 d	16.17 bcd	13.52 a	1.10 e	73.1	1177 a-d
WARMIA	RZ	81 a-d	24 cde	46 bc	10.97 ef	5.30 de	4.96 cd	51.3	825 def
BALDIO	Bejo	88 a-d	47 ab	28 cd	18.19 ab	12.54 ab	3.83 d	81.9	1318 abc
ORCHESTRO	Vil	90 a-d	47 ab	33 cd	18.56 ab	12.76 ab	4.59 cd	86.7	1396 ab
BRAVA	Bejo	82 a-d	31 b-e	31 cd	13.22 cde	8.05 b-e	3.53 de	57.9	932 def
ALTIPLANO	Vil	95 abc	38 abc	45 bc	18.21 ab	10.87 abc	5.81 cd	83.4	1343 abc

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\*\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

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**CARROT CULTIVAR MAIN TRIAL JUMBO TYPES - 2025 - continued**

Cultivar	Source	# Carrots Harvested	# > 4.4 cm	# 2.0 to 4.4 cm	Total Harvest Weight (kg)	Weight > 4.4 cm (kg)	Weight 2.0 to 4.4 cm (kg)	Marketable Yield t/ha	Marketable Yield B/A
SVDN 6111	Sem	64 d*	19 de	40 bc	12.26 def	5.66 cde	5.79 cd	57.3	922 def
SILVER STAR	Sto	106 a	31 b-e	62 ab	20.71 a	9.04 a-e	9.66 ab	93.5	1505 a
WOLIN	RZ	73 cd	19 de	35 c	8.63 f	4.10 e	3.36 de	37.3	601 f
NAVEDO - Jumbo	Bejo	81 a-d	17 e	51 abc	14.26 b-e	5.65 cde	7.13 bc	63.9	1029 cde
SVDN 6105	Sem	102 ab	22 cde	72 a	17.53 abc	5.80 cde	10.51 a	81.5	1313 abc
YMER	RZ	89 a-d	17 e	52 abc	11.19 ef	3.80 e	5.94 cd	48.7	784 ef
<b>Trial Average</b>		<b>86</b>	<b>31</b>	<b>41</b>	<b>15.03</b>	<b>8.30</b>	<b>5.31</b>	<b>68.1</b>	<b>1096</b>

Listed in order of % Marketable.

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**CARROT CULTIVAR MAIN TRIAL JUMBO TYPES - 2025 - continued**

Cultivar	Source	% Marketable	% Oversize	Majority of Culls	Shape	Uniformity of Shape	Uniformity of Length	Uniformity of Width	Appearance	Resistance to Greening
EXP 3497	Bejo	89.7 ns**	58.4 a-f*	SM	F	6.3 abc	5.0 ns	6.7 ab	6.5 bc	7.0 def
BERLIN	Bejo	88.8	64.1 a-d	FSM	F	7.3 ab	6.3	7.0 a	7.7 a	9.0 ab
CANBERRA	Bejo	90.5	83.6 a	SM	F	5.3 cd	4.0	5.3 c	6.0 cd	9.2 ab
WARMIA	RZ	92.0	45.0 b-f	SM	SB	7.3 ab	5.3	7.0 a	5.0 de	9.0 ab
BALDIO	Bejo	90.1	68.8 ab	F	F	6.7 abc	5.7	7.0 a	7.7 a	7.0 def
ORCHESTRO	Vil	93.1	68.1 abc	FSM	GP	7.0 abc	6.5	7.0 a	7.0 abc	4.7 g
BRAVA	Bejo	87.2	59.4 a-e	SM	F	4.0 d	5.7	5.7 bc	4.7 e	8.0 b-e
ALTIPLANO	Vil	91.5	58.3 a-f	F	F	5.7 bcd	6.0	6.7 ab	6.7 abc	6.7 ef

Listed in order of % Marketable.      10.0 = Most Desirable,      7.5 = Good,      6.0 = Average

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\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

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**CARROT CULTIVAR MAIN TRIAL JUMBO TYPES - 2025 - continued**

Cultivar	Source	% Marketable	% Oversize	Majority of Culls	Shape	Uniformity of Shape	Uniformity of Length	Uniformity of Width	Appearance	Resistance to Greening
SVDN 6111	Sem	92.6 ns**	46.3 b-f*	SM	ImpCyl	4.0 d	5.7 ns	7.0 a	6.3 bc	6.3 f
SILVER STAR	Sto	90.5	41.8 def	SM	F	6.3 abc	6.7	6.7 ab	7.7 a	7.3 c-f
WOLIN	RZ	85.4	42.4 c-f	SM	SB	7.7 a	5.7	7.0 a	5.0 de	9.3 ab
NAVEDO - Jumbo	Bejo	89.7	37.7 ef	Sp	ImpCyl	6.7 abc	5.3	7.7 a	7.3 ab	8.7 abc
SVDN 6105	Sem	92.8	33.3 f	F	CyIGP	5.3 cd	7.0	7.3 a	7.0 abc	8.3 a-d
YMER	RZ	86.5	32.7 f	SM	GP	6.7 abc	6.7	7.7 a	6.3 bc	9.7 a
<b>Trial Average</b>		<b>90.0</b>	<b>52.8</b>			<b>6.2</b>	<b>5.8</b>	<b>6.8</b>	<b>6.5</b>	<b>7.9</b>
Listed in order of % Marketable. 10.0 = Most Desirable, 7.5 = Good, 6.0 = Average										

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 \*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

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**CARROT CULTIVAR MAIN TRIAL JUMBO TYPES - 2025 - continued**

Cultivar	Source	External Colour	External Colour Rating	Internal Colour	Internal Colour Rating	% Core of Total Width	Blight Rating	Score	% Cavity Spot & Degree	Shape of Crown
EXP 3497	Bejo	O	7.3 abc*	O	6.3 cd	59.5 a	8.7 ab	6.45 e-h	23L bcd	CC
BERLIN	Bejo	O	8.0 ab	O	8.0 a	58.0 ab	9.0 a	7.62 a	37L ab	CC
CANBERRA	Bejo	O	6.0 c	LO	6.7 bcd	54.9 bc	8.0 a-d	6.07 fgh	22L bcd	CC
WARMIA	RZ	DO	7.0 abc	O	6.0 d	50.9 cde	7.3 cd	6.67 c-f	15LM cd	CV
BALDIO	Bejo	O	7.3 abc	O	6.3 cd	57.3 ab	8.7 ab	6.81 b-e	8L d	CC
ORCHESTRO	Vil	O	7.7 abc	LO	6.0 d	48.9 def	8.7 ab	6.55 d-g	12LM cd	CC
BRAVA	Bejo	O	6.3 bc	LO	6.7 bcd	60.0 a	8.3 abc	5.86 h	27LM bcd	CC
ALTIPLANO	Vil	O	6.7 abc	O	7.3 abc	49.1 def	8.7 ab	6.52 d-g	23L bcd	CC

Listed in order of % Marketable.      10.0 = Most Desirable,      7.5 = Good,      6.0 = Average

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\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

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**CARROT CULTIVAR MAIN TRIAL JUMBO TYPES - 2025 - continued**

Cultivar	Source	External Colour	External Colour Rating	Internal Colour	Internal Colour Rating	% Core of Total Width	Blight Rating	Score	% Cavity Spot & Degree	Shape of Crown
SVDN 6111	Sem	O	6.0 c*	O	6.7 bcd	49.5 def	7.0 d	6.00 gh	55LM ab	CC
SILVER STAR	Sto	O	6.7 abc	LO	6.0 d	47.4 ef	5.3 e	6.76 b-e	28L bcd	CC
WOLIN	RZ	DO	7.7 abc	O	7.3 abc	52.5 cd	8.3 abc	7.10 a-d	30L bc	CV
NAVEDO - Jumbo	Bejo	O	8.3 a	O	6.3 cd	50.5 def	7.3 cd	7.19 abc	13L cd	CC
SVDN 6105	Sem	O	7.3 abc	O	7.7 ab	46.8 f	7.7 bcd	7.14 a-d	42L ab	CC
YMER	RZ	O	8.3 a	LO	6.3 cd	49.5 def	7.7 bcd	7.38 ab	22LM bcd	CC
<b>Trial Average</b>			<b>7.2</b>		<b>6.7</b>	<b>52.5</b>	<b>7.9</b>	<b>6.72</b>	<b>25LM</b>	
Listed in order of % Marketable.										
10.0 = Most Desirable, 7.5 = Good, 6.0 = Average										

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\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

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**CARROT CULTIVAR MAIN TRIAL JUMBO TYPES - 2025 - continued**

Cultivar	Source	Root Length (cm)	Root Width (cm)	Seeding Rate	Stand per Foot	Top Length (cm)	Leaf Colour	Leaf Structure	% Weevil Damage	% Rust Fly Damage	% Aster Yellows
EXP 3497	Bejo	21.4 cd*	5.0 bc	18	11 ns**	39.9	LG	ST	0.0 ns	0.0 ns	1.6 a
BERLIN	Bejo	19.7 def	5.0 abc	18	12	38.6	LG	FST	0.0	0.0	1.5 ab
CANBERRA	Bejo	19.2 ef	5.4 a	12	10	52.2	LG	ST	0.0	0.0	0.4 bc
WARMIA	RZ	21.9 bc	4.9 bcd	18	11	37.4	G	FST	0.0	0.0	0.4 c
BALDIO	Bejo	20.3 c-f	5.1 abc	18	12	44.6	LG	ST	0.0	0.3	0.4 bc
ORCHESTRO	Vil	21.1 cde	5.2 ab	25	12	51.9	G	F	0.0	1.7	0.4 c
BRAVA	Bejo	19.1 f	5.1 ab	18	11	40.1	LG	ST	0.0	1.7	0.0 c
ALTIPLANO	Vil	21.6 bcd	5.1 abc	25	12	50.1	G	ST	0.0	0.0	0.0 c

Listed in order of % Marketable.

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**CARROT CULTIVAR MAIN TRIAL JUMBO TYPES - 2025 - continued**

Cultivar	Source	Root Length (cm)	Root Width (cm)	Seeding Rate	Stand per Foot	Top Length (cm)	Leaf Colour	Leaf Structure	% Weevil Damage	% Rust Fly Damage	% Aster Yellows
SVDN 6111	Sem	23.5 b*	5.0 bc	18	8 ns**	41.1	G	ST	0.0 ns	0.0 ns	0.0 c
SILVER STAR	Sto	22.0 bc	5.0 bc	18	14	55.4	LG	ST	0.0	0.0	0.0 c
WOLIN	RZ	21.4 cd	4.8 b-e	18	10	34.1	DG	ST	0.0	0.0	0.0 c
NAVEDO - Jumbo	Bejo	25.5 a	4.7 cde	18	11	41.3	G	ST	0.0	0.4	0.0 c
SVDN 6105	Sem	21.1 cde	4.6 de	18	13	41.1	LG	ST	0.0	0.0	0.0 c
YMER	RZ	18.5 f	4.5 e	20	12	45.4	G	FST	0.0	0.0	0.0 c
<b>Trial Average</b>		<b>21.2</b>	<b>5.0</b>	<b>19</b>	<b>11</b>	<b>43.8</b>			<b>0.0</b>	<b>0.3</b>	<b>0.3</b>

Listed in order of % Marketable.

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## CARROT CULTIVAR MAIN TRIAL CELLO TYPES EVALUATION NOTES – 2025

- Brilliance:** *Stokes sample*, Nantes blood, Okay to average length uneven, Average width a little even, Uniformity of shape a little uneven, Odd carrot with bends and curves, Full tips matured (80%) immature (20%), Average to good appearance, Odd noticeable lenticle, Average weight a little uneven, Fair to good smoothness, Fair exterior colour even, 1 to 2 cavity spots per root, Good to nice interior blending even, Translucent core dead center (10-30%), Average core size, Okay Packer short, Okay to average Jumbo short.
- Pink Punk:** *Vilmorin sample*, Okay to average length slightly even, Average to good width even, Uniformity of shape very even, Tapered tips matured (70%) immature (30%), Slightly thicker shoulders, Average to good appearance, Noticeable lenticles, Average weight, Good to nice smoothness, Fair to good exterior colour slightly uneven, 1 to 2 cavity spots per root, Poor interior blending uneven, Orange purple mix in cores, Translucent core dead centers (20%), Green ring around core (40%), Average core size, Core has uneven boarders, Okay to good Packer some short, Okay Jumbo bit tapered ends.
- Naval:** *Bejo sample*, Nantes blood, Okay to average length slightly uneven, Average width slightly uneven, Uniformity of shape uneven, Full tips matured, Average to good appearance, Average weight a little uneven, Good smoothness, Fair to good exterior colour even, 1 to 2 cavity spots per root, Average to good interior blending even, Translucent throughout core (20%), Red ring around core (10-40%), Average to large core size, Okay to average Packer slightly short, Okay to good Jumbo.
- Cellobunch:** *Stokes sample*, Average to good length uneven, Average width slightly uneven, Uniformity of shape a little uneven, Tapered tips matured (80%) immature (20%), Average appearance, Odd ringy carrot, Average to good weight uneven, Fairly smooth, Fair to good exterior colour a little uneven, 1 to 2 cavity spots per root, Average to good interior blending a little uneven, White or yellow in core (10%), Translucent core dead center (30%), Red or yellow ring around core (10%), Average core size, Average Packer, Okay Jumbo, Jumbos are an oversized packer.

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## CARROT CULTIVAR MAIN TRIAL CELLO TYPES EVALUATION NOTES – 2025 - continued

- Envy:** *Stokes sample*, Okay to average length uneven, Okay to good width uneven, Uniformity of shape even, Tapered tips matured (50%) immature (50%), Average appearance, Odd ringy carrot, Average weight uneven, Fairly smooth, Fair to good exterior colour a little uneven, 1 to 2 cavity spots per root, Average to good interior blending even, Translucent core dead center (30%), Average core size, Okay to average Packer, Jumbos are an oversized packer.
- SVDL 2191:** *Seminis sample*, Average to good length uneven, Okay to good width uneven, Uniformity of shape even, Tapered and full tips matured (80%) immature (20%), Average appearance, Odd ringy carrot, Average to good weight uneven, Fairly smooth, Fair exterior colour uneven, 1 to 2 cavity spots per root, Average to good interior blending a little even, White in core (10%), Translucent core dead center (20%), Average core size, Average to good Packer, Jumbos are an oversized packer.
- SVDL 2190:** *Seminis sample*, Okay to average length uneven, Okay to good width uneven, Uniformity of shape even, Tapered tips matured (80%) immature (20%), Appearance a little rough, Some ringy carrots, Poor to good weight uneven, Smoothness a little rough, Fair to good exterior colour a little even, 1 to 2 cavity spots per root, Average interior blending even, Red ring around core (30%), Average core size, Okay to average Packer bit short tapered ends, Jumbos are an oversized packer uneven.
- Orange Fancy:** *Norseco sample*, Larger carrots have slicer potential, Average to good length uneven, Average to good width a little uneven, Uniformity of shape a little uneven, Tapered and full tips matured (70%) immature (30%), Average to good appearance, Odd ringy carrot, Average to good weight uneven, Fairly smooth, Fair to good exterior colour a little uneven, Odd noticeable cavity spot, 1 to 2 cavity spots per root, Average to good interior blending a little uneven, Translucent throughout core (20-70%), Average core size, Average to good Packer, Okay to average Jumbo.

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**CARROT CULTIVAR MAIN TRIAL CELLO TYPES EVALUATION NOTES – 2025 - continued**

- Crofton:** *Rijk Zwaan sample*, Okay at average length uneven, Okay to average width a little thin & even, Uniformity of shape very even, Odd carrot with bends and curves, Full tips matured (65%) immature (35%), Average to good appearance, Poor to average weight, Smoothness uneven, Fair to good exterior colour even, 1 to 2 cavity spots per root, Average to good interior blending uneven, White in cores (30%), Translucent core dead center (20-60%), Green ring around core (20%), Small core size, Average Packer some bit thin more weight.
- Navedo:** *Bejo sample*, Average length uneven, Average width slightly uneven, Uniformity of shape even, Odd carrot with bends and curves, Tapered and full tips matured (65%) immature (35%), Average appearance, A touch ringy, Average weight a little uneven, Fairly smooth, Fair exterior colour even, 1 to 2 cavity spots per root, Average interior blending a little uneven, White in cores (10%), Translucent core dead center (20-30%), Average to large core size, Okay to average Packer, Poor to average Jumbo bit more weight and length.
- Orange Slice:** *Norseco sample*, Cut & Peel blood? Good length slightly uneven long, Okay to average width uneven, Uniformity of shape even, Odd carrot with bends and curves, Tapered and full tips matured (60%) immature (40%), Average appearance, Odd ringy carrot, Average to good weight uneven, Fairly smooth, Fair exterior colour a little uneven, 1 to 2 cavity spots per root, Good interior blending even, Translucent core dead center (10%), Green ring around core (10%), Average core size, Average to good Packer long, Jumbos are an oversized packer.
- Enterprise:** *Stokes sample*, Average to good length uneven, Average width uneven, Uniformity of shape a little even, A few carrots with bends and curves, Tapered and full tips matured, Average appearance, Odd ringy carrot, Average weight uneven, Fairly smooth, Fair exterior colour a little uneven, 1 to 2 cavity spots per root, Good interior blending a little even, Translucent core dead center (10%), Red ring around core (10%), Average core size, Average Packer, Okay Jumbo, Jumbos are an oversized packer.

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## CARROT CULTIVAR MAIN TRIAL CELLO TYPES EVALUATION NOTES – 2025 - continued

- Istanbul:** *Bejo sample*, Average to good length uneven, Average width a little uneven, Uniformity of shape even, Odd carrot with bends and curves, Tapered tips matured (80%) immature (20%), Little rough to average appearance, Ringy carrots, Average to good weight uneven, Rough smoothness, Good exterior colour slightly even, 1 to 2 cavity spots per root, Good to nice interior blending even, Average core size, Odd carrot with mouse damage, Okay to good Packer long, Okay Jumbo, Jumbos are an oversized packer.
- Junction:** *Bejo sample*, Cut & Peel blood, Good length uneven, Average to good width uneven, Uniformity of shape a little even, Tapered tips matured (70%) immature (30%), A little rough to average appearance, Slightly ringy carrots, Average to good weight a little uneven, Smoothness a little rough, Fair to good exterior colour uneven, 1 to 2 cavity spots per root, Average to good interior blending a little uneven, Translucent core dead center (30%), Red ring around core (10%), Average core size, Average to good Packer long, Jumbos are an oversized packer long bit thin.
- Trophy Pak:** *Stokes sample*, Okay to good length uneven, Okay to average width slightly uneven, Uniformity of shape even, Tapered tips matured (80%) immature (20%), Average appearance, Odd ringy carrot, Average weight a little uneven, Fairly smooth, Fair to good exterior colour even, 1 to 2 cavity spots per root, Average to nice interior blending even, White in cores (10%), Average to large core size, Odd carrot with mouse damage, Okay to average Packer, Okay to average Jumbo, Jumbos are an oversized packer, Some more length and weight.
- Jerada:** *Rijk Zwaan sample*, Larger ones slicer potential, Okay to average length a little even, Average to good width even, Uniformity of shape very even, Odd carrot with bends and curves, Full tips matured, A little rough to good appearance, Some ringy carrots, Average to good weight even, A little poor to fairly smooth, Fair to good exterior colour even, 1 to 2 cavity spots per root, Average interior blending a little uneven, Translucent core dead center (10-70%), Small to average core size, Average Packer, Okay to average Jumbo bit more weight.

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**CARROT CULTIVAR MAIN TRIAL CELLO TYPES EVALUATION NOTES – 2025 - continued**

- Jefferson:** *Bejo sample*, Cut & Peel blood? Average to good length slightly uneven, Okay to average width uneven, Uniformity of shape even, Odd carrot with bends and curves, Tapered and full tips matured, Average appearance, A little ringy, Average to good weight a little uneven, A little rough smoothness, Fair to good exterior colour a little even, 1 to 2 cavity spots per root, Good interior blending a little even, Average core size, Average to good Packer some long, Okay to average Jumbo, Jumbos are an oversized packer.
- SVDL 2154:** *Seminis sample*, Okay to average length uneven, Average width uneven, Uniformity of shape even, Tapered tips matured (65%) immature (35%), A little rough to good appearance uneven, Odd ringy carrot, Average weight a little uneven, Fairly smooth, Fair exterior colour a little even, 1 to 2 cavity spots per root, Average to good interior blending uneven, Translucent core throughout (20%), Red ring around core (10-50%), Average core size, Odd carrot with mouse damage, Okay to good Packer, Okay to average Jumbos.
- Narvik:** *Bejo sample*, Nantes carrot, Poor to good length uneven, Okay to average width uneven, Uniformity of shape a little even, Odd carrot with bends and curves, Full tips matured, Average to good appearance, Odd ringy carrot, Poor to good weight uneven, Fairly smooth, Fair exterior colour slightly uneven, 1 to 2 cavity spots per root, Good interior blending a little even, Translucent core dead center (20-40%), Red or green ring around core (10%), Small to average core size, Odd carrot with mouse damage, Okay to average Packer short, Okay Jumbo.

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## CARROT CULTIVAR MAIN TRIAL JUMBO TYPES EVALUATION NOTES – 2025

### EXP 3497:

*Bejo sample*, Okay to good length uneven, Good width slightly uneven, Uniformity of shape even, Tapered tips matured, Odd noticeable lenticel, Average appearance, Odd ringy carrot, Average to good weight a little uneven, Fairly smooth, Fair to good exterior colour a little even, 1 to 2 cavity spots per root, Average interior blending, Translucent core dead center (20-50%), Red ring around core (10-30%), Large core size, Okay Packer a bit short, Average to good Jumbo odd bit short.

### Berlin:

*Bejo sample*, Okay to average length even, Average to good width even, Uniformity of shape even, Tapered and full tips matured, Odd noticeable lenticel, Average to good appearance, Odd ringy carrot, Average to good weight a little uneven, Fairly to good smoothness, Good exterior colour even, 1 to 2 cavity spots per root, Good to nice interior blending even, White in cores (10%), Average to large core size, Poor to average Packer, Okay to good Jumbo some to short.

### Canberra:

*Bejo sample*, Okay to average length uneven, Average to good width slightly uneven, Uniformity of shape a little uneven, Tapered and full tips matured (70%) immature (30%), Odd heavy shoulder, Average appearance, Odd ringy carrot, Average to good weight a little uneven, A little rough to fairly smooth, Fair exterior colour a little uneven, 1 to 2 cavity spots per root, Average to good interior blending even, White in cores (10%), Translucent core dead center (20%), Green in cores (10%), Large to extra-large core size, Poor Packer, Okay to average Jumbo a few short.

### Warmia:

*Rijk Zwaan sample*, Okay at average length uneven, Average to good width a little even, Uniformity of shape even, Tapered tips matured (40%) immature (60%), Most lenticels noticeable, Rough to good appearance, Ringy carrots a little concern, Average weight a little uneven, A little rough smoothness, Good exterior colour even, 1 to 2 cavity spots per root, Average interior blending a little uneven, Red ring in core (10%), Large core size, Poor to average Packer, Poor to okay Jumbo, Packer/Jumbo split of 60/40.

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## CARROT CULTIVAR MAIN TRIAL JUMBO TYPES EVALUATION NOTES – 2025

- Baldio:** *Bejo sample*, Average length a little uneven, Average to good width slightly uneven, Uniformity of shape a little uneven, Full tips matured, Odd noticeable lenticel, Average to good appearance, Odd ringy carrot, Average to good weight a little uneven, Fairly good smoothness, Fair to good exterior colour even, 1 to 2 cavity spots per root, Average interior blending a little uneven, White in cores (10%), Translucent core dead center (20%), Large core size, Poor to okay Packer a bit short, Average to good Jumbo odd one bit short.
- Orchestro:** *Vilmorin sample*, Average to good length even, Average to good width even, Uniformity of shape even, Full tips matured, A few noticeable lenticles, Good appearance, Good weight a little even, Good smoothness, Fair to good exterior colour even, 1 to 2 cavity spots per root, Poor to average interior blending a little uneven, Translucent throughout core (30-60%), Green ring around core (60%), Average core size, Okay to good Packer bit short, Average to good Jumbo.
- Brava:** *Bejo sample*, Poor to okay length uneven, Average to good width a little uneven, Uniformity of shape very uneven, Tapered and full tips matured, A few noticeable lenticels, Rough appearance, Ringy carrots a little concern, Poor to good weight uneven, Smoothness rough, Fair to good exterior colour slightly uneven, Odd noticeable cavity spot, 1 to 2 cavity spots per root, Average interior blending even, Translucent throughout core (10%), Red ring around core (10%), Large to extra-large core size, Poor Packer short, Okay to good Jumbo some short.
- Altiplano:** *Vilmorin sample*, Okay to good length slightly uneven, Good width a little even, Uniformity of shape a little uneven, Tapered and full tips matured, A few noticeable lenticles, Average to good appearance, Odd ringy carrot, Average to good weight a little uneven, Fair to good smoothness, Fair to good exterior colour even, 1 to 2 cavity spots per root, Average to nice interior blending even, Translucent core dead center (10%), Large core size, Okay to average Packer, Average to good Jumbo.

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## CARROT CULTIVAR MAIN TRIAL JUMBO TYPES EVALUATION NOTES – 2025

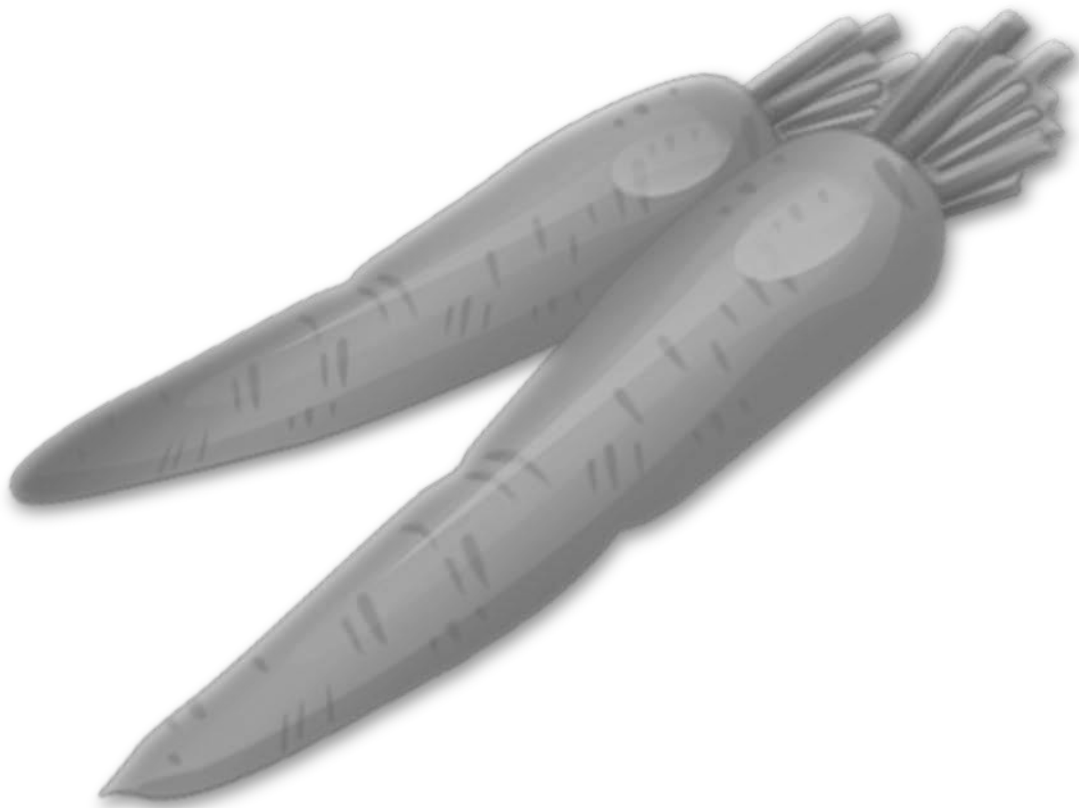
- SVDN 6111:** *Seminis sample*, Average to good length uneven, Average to good width slightly uneven, Uniformity of shape uneven, Tapered full tips mature, A little rough to average appearance, Average to good weight a little uneven, Fair to good smoothness, Fair to good exterior colour a little uneven, 1 to 2 or 2 to 3 cavity spots per root, Average to good interior blending a little uneven, White in cores (10%), Translucent throughout core (20%), Average core size, Okay to average Packer, Average to good Jumbos.
- Silver Star:** *Seminis sample*, Okay to good length a little even, Average to good width slightly uneven, Uniformity of shape a little uneven, Full tips matured, Odd noticeable lenticel, Average to good appearance, Average to good weight a little uneven, Good smoothness, Fair exterior colour slightly uneven, 1 to 2 cavity spots per root, Average interior blending even, White in core (10%), Translucent throughout core or dead center (30%), Red ring around cores (10%), Average core size, Okay to good Packer, Okay to good Jumbo
- Wolin:** *Rijk Zwaan sample*, Okay at good length a little uneven, Average width even, Uniformity of shape even, Tapered tips matured, Odd noticeable lenticel, Rough appearance, Ringy carrots a little concern, Poor to average weight, Rough smoothness, Good exterior colour even, 1 to 2 cavity spots per root, Average to good interior blending a little uneven, Translucent core dead center (30%), Red or green ring in core (10-30%), Average to large core size, Poor to okay Packer, Okay Jumbo tapered ends, Packer/Jumbo split of 40/60.
- Navedo:** *Bejo sample*, Good length a little uneven, Average to good width even, Uniformity of shape a little uneven, Full tips matured, Odd noticeable lenticle, Average to good appearance, Average to good weight even, Fairly good smoothness, Fair to good exterior colour even, 1 to 2 cavity spots per root, Average to good interior blending even, White or yellow in cores (10-30%), Translucent core dead center (30-60%), Red ring around core (20%), Large core size, Average to good Packer, Average Jumbo needs a bit more weight.

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## CARROT CULTIVAR MAIN TRIAL JUMBO TYPES EVALUATION NOTES – 2025

- SVDN 6105:** *Seminis sample*, Average to good length a little even, Average to good width even, Uniformity of shape a little uneven, Odd carrot with bends or curves, Tapered and full tips mature, Average to good appearance, Average to good weight a little even, Fair to good smoothness, Fair to good exterior colour a little uneven, Odd noticeable cavity spot, 1 to 2 cavity spots per root, Average to good interior blending even, Average core size, Average to good Packer, Average Jumbos.
- Ymer:** *Rijk Zwaan sample*, Poor to okay length even short, Average to good width even, Uniformity of shape even, Full tips matured (80%) immature (20%), Average appearance, A touch ringy, Poor to good weight even, Fairly smooth, Fair to good exterior colour even, 1 to 2 cavity spots per root, Average interior blending uneven, Translucent throughout core (10-30%), Average to large core size, Poor to okay Packer, Poor to average Jumbo short, Packer/Jumbo split of 40/60.

# ADAPTATION TRIAL



**CARROT CULTIVAR ADAPTATION TRIAL - 2025**

Cultivar	Source	# Carrots Harvested	# > 4.4 cm	# 2.0 to 4.4 cm	Total Harvest Weight (kg)	Weight > 4.4 cm (kg)	Weight 2.0 to 4.4 cm (kg)	Marketable Yield t/ha	Marketable Yield bu/A	% Marketable	% Oversize	Majority of Culls
CARIANA	EZ	101	6	83	14.03	1.55	11.35	64.5	1038	91.9	11.0	SM
CALINDOR	EZ	105	16	73	15.47	3.99	9.73	68.6	1104	88.7	25.8	SM
CALANTIS	EZ	84	3	66	12.34	1.01	9.84	54.3	873	87.9	8.2	SM
CALIBRA	EZ	111	1	93	12.52	0.24	10.39	53.2	856	84.9	1.9	Sp
VIVA	EZ	86	8	53	12.06	2.49	7.60	50.5	812	83.7	20.6	SM

Listed in order of % Marketable.

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**CARROT CULTIVAR ADAPTATION TRIAL - 2025 - continued**

Cultivar	Source	Shape	Uniformity of Shape	Uniformity of Length	Uniformity of Width	Appearance	Resistance to Greening	External Colour	External Colour Rating	Internal Colour	Internal Colour Rating	Score	Blight Rating
CARIANA	EZ	Imp	6.0	3.0	5.0	6.0	8.0	0	8.0	0	8.0	6.29	8.0
CALINDOR	EZ	GP	5.0	6.0	6.0	7.0	9.0	0	7.0	0	7.0	6.71	9.0
CALANTIS	EZ	Cyl	7.0	6.0	6.0	6.0	6.0	0	6.0	0	7.0	6.29	8.0
CALIBRA	EZ	ImpCyl	7.0	6.0	6.0	6.0	9.0	0	6.0	0	6.0	6.57	8.0
VIVA	EZ	Cyl	6.0	5.0	6.0	6.5	7.0	0	6.0	0	8.0	6.36	8.0

Listed in order of % Marketable.

10.0 = Most Desirable,

7.5 = Good,

6.0 = Average

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**CARROT CULTIVAR ADAPTATION TRIAL - 2025 - continued**

Cultivar	Source	% Core of Total Width	% Cavity Spot & Degree	Shape of Crown	Root Length (cm)	Root Width (cm)	Seeding Rate	Stand per Foot	Leaf Heights (cm)	Leaf Colour	Leaf Structure	% Weevil Damage	% Rust Fly Damage	Average # of Seeders	% Aster Yellows
CARIANA	EZ	45.3	50LM	CC	19.9	3.6	23	13	38.1	G	ST	0.0	0.0	0.0	0.0
CALINDOR	EZ	45.4	5L	CC	18.7	3.7	23	14	43.4	G	ST	0.0	0.0	1.0	1.0
CALANTIS	EZ	38.9	20LM	CV	20.9	3.8	23	11	39.4	G	ST	0.0	0.0	0.0	1.2
CALIBRA	EZ	44.4	25L	CC	20.5	3.4	23	15	36.0	G	ST	0.9	2.7	0.0	0.0
VIVA	EZ	40.3	40LM	CV	19.9	3.8	23	11	36.2	LG	FST	0.0	0.0	1.0	0.0

Listed in order of % Marketable.

## ADAPTATION CARROT CULTIVAR TRIAL EVALUATION NOTES - 2025

- Cariana:** *Enza Zaden*, Okay to average length very uneven, Average to good width uneven, Uniformity of shape even, A few carrots with bends and curves, Fairly blunt tips matured, Odd lenticel noticeable, Average appearance, Average weight a little uneven, Fairly smooth, Fair exterior colour slightly pale even, 1 to 2 cavity spots per root, Odd noticeable cavity spot, Average interior blending slightly uneven, White or green in cores (10%), Translucent through core (30%), Green ring around core (20%), Average core size, Odd carrot with canker rot, Average Packer, Okay Jumbo bit short.
- Calindor:** *Enza Zaden*, Okay to average length a little uneven, Okay to average width a little uneven, Uniformity of shape a little uneven, Odd carrot with bends and curves, Full tips matured (80%) immature (20%), Lenticels slightly noticeable, Average to good appearance, Average weight uneven, Good smoothness, Fair exterior colour a little even, 1 to 2 cavity spots per root, Average interior blending uneven, White in cores (10%), Translucent core dead center (50%), Average core size, Okay to average Packer a few short, Okay Jumbo more weight.
- Calantis:** *Enza Zaden*, Average length a little uneven, Average to good width a little uneven, Uniformity of shape even, Full tips matured, Odd lenticel noticeable, Average appearance, Average weight a little uneven, Fairly good smoothness, Fair exterior colour slightly uneven, 1 to 2 cavity spots per root, Good interior blending even, Translucent core dead center (30%), Average core size, Slicer potential on larger carrots, Average Packer, Okay Jumbo more weight.
- Calibra:** *Enza Zaden*, Average length slightly uneven, Average to good width slightly uneven, Uniformity of shape even, Odd carrot with bends and curves, Blunt tips matured, Average appearance, Odd ringy carrot, Average weight a little uneven, Smoothness a little rough, Fair exterior colour slightly even, 1 to 2 cavity spots per root, Poor interior blending slightly uneven, Translucent through core (30%), Green ring around core (10%), Average core size, Average Packer, Jumbo is an oversized packer.
- Viva:** *Enza Zaden*, Average length uneven, Average width uneven, Uniformity of shape a little even, Odd carrot with bends and curves, Full tips matured, Average appearance, Average weight uneven, Fairly smooth, Fair exterior colour slightly uneven, 1 to 2 cavity spots per root, Good interior blending even, Translucent core dead center (30%), Average core size, Okay to average Packer a few short, Okay Jumbo more weight.

**LONG TERM AVERAGES OF CARROT CULTIVAR TRIALS**

CULTIVAR	SOURCE	# Years Tested	Length (cm)	Length (Inches)	Width (cm)	Marketable t/ha	Marketable bu/A	% Marketable	Avg Leaf Length (cm)
ACHIEVE	Sto	7	23.8	9.4	5.2	98.0	1578	82.8	53.6
ORANGE PAK	Nor	7	23.7	9.3	3.5	85.1	1369	87.1	--
CANADA SUPER X	Sol	14	23.3	9.2	3.4	80.8	1376	82.7	--
ENTERPRISE	Sto	21	23.2	9.1	3.4	76.2	1234	79.6	51.7
SV 2384	Sem	13	23.1	9.1	3.3	77.2	1250	78.6	50.1
SIX PAK	HM	20	23.0	9.1	3.5	79.0	1273	85.5	--
SUNRISE	Cro	15	23.0	9.1	3.5	86.0	1438	85.6	--
FONTANA	Bejo	13	22.4	8.8	5.1	108.7	1750	88.5	46.9
CELLOBUNCH	Sem	36	22.3	8.8	3.5	89.4	1462	82.0	48.7
ENVY	Sem	19	21.9	8.6	3.8	89.2	1436	82.5	51.8
OLYMPUS	Sto	5	21.8	8.6	3.4	73.8	1188	73.9	45.8
BASTIA	Bejo	20	21.7	8.5	5.3	94.3	1518	82.4	48.2
ISTANBAL	Bejo	9	21.6	8.5	3.5	67.4	1085	73.6	50.1
ORANGE SHERBET	Sto	10	21.2	8.3	--	73.4	1310	84.0	--

Listed in order of length.

\* 10.0 = Most Desirable, 7.5 = Good, 6.0 = Average

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**LONG TERM AVERAGES OF CARROT CULTIVAR TRIALS - continued**

CULTIVAR	SOURCE	# Years Tested	Length (cm)	Length (Inches)	Width (cm)	Marketable t/ha	Marketable bu/A	% Marketable	Avg Leaf Length (cm)
VOLCANO	Vil	6	21.0	8.3	4.5	73.3	1181	85.9	49.3
CAROPAK	Sem	8	20.9	8.2	--	74.1	1323	85.0	--
BELGRADO	Bejo	17	20.9	8.2	5.4	102.7	1654	80.1	468.8
BLANES	Bejo	5	20.7	8.1	5.3	93.9	1512	80.2	48.2
PARAMOUNT	Sem	7	20.6	8.1	--	82.1	1467	85.0	--
ORANGE BLAZE	Sem	5	20.6	8.1	3.5	62.2	1001	80.6	56.0
NAVEDO	Bejo	7	20.6	8.1	3.6	89.3	1437	79.7	52.2
BRAVA	Bejo	7	20.2	8.0	5.6	84.5	1361	82.0	54.3
BERLIN	Bejo	14	20.1	7.9	5.5	97.8	1575	79.8	47.8
DOMINATOR	Nun	13	19.7	7.8	--	63.9	1141	85.0	--
BRILLYANCE	Sto	6	19.1	7.5	3.7	86.8	1398	82.7	52.3
NEW HALL - Cello	Bejo	9	18.7	7.4	3.5	66.6	1071	70.9	46.0
NAVAL	Bejo	15	18.1	7.1	3.6	80.0	1287	80.1	45.0
NARVIK	Bejo	6	18.0	7.1	3.6	73.5	1183	79.0	44.4

Listed in order of length.

\* 10.0 = Most Desirable, 7.5 = Good, 6.0 = Average

.../ continued

## LONG TERM AVERAGES OF CARROT CULTIVAR TRIALS - continued

CULTIVAR	SOURCE	# Years Tested	Blight Rating *	% Cavity Spots	SCORE *	% Weevil Damage	% Rust Fly Damage	Avg # of Seeders
ACHIEVE	Sto	7	7.4	74.1	6.74	4.3	4.7	2.8
ORANGE PAK	Nor	7	6.9	--	6.82	--	--	--
CANADA SUPER X	Sol	14	7.0	--	6.95	--	--	--
ENTERPRISE	Sto	21	8.2	55.0	6.56	7.6	6.2	0.4
SV 2384	Sem	13	8.3	65.0	6.21	9.5	7.1	0.3
SIX PAK	HM	20	7.9	--	6.98	--	--	--
SUNRISE	Cro	15	8.4	--	6.82	--	--	--
FONTANA	Bejo	13	5.6	51.0	6.33	4.8	3.8	1.3
CELLOBUNCH	Sem	36	7.4	55.6	6.49	7.0	5.2	1.9
ENVY	Sem	19	7.7	68.9	6.56	7.3	8.9	1.0
OLYMPUS	Sto	5	8.3	86.0	6.31	15.8	4.5	1.1
BASTIA	Bejo	20	7.7	77.6	6.81	5.9	5.7	1.2
ISTANBAL	Bejo	9	7.5	57.0	6.77	5.1	13.8	0.0
ORANGE SHERBET	Sto	10	--	--	6.75	--	--	--

Listed in order of length.

\* 10.0 = Most Desirable, 7.5 = Good, 6.0 = Average

.../ continued

LONG TERM AVERAGES OF CARROT CULTIVAR TRIALS - continued

CULTIVAR	SOURCE	# Years Tested	Blight Rating *	% Cavity Spots	SCORE *	% Weevil Damage	% Rust Fly Damage	Avg # of Seeders
VOLCANO	Vil	6	8.6	28.0	7.08	12.2	13.9	0.4
CAROPAK	Sem	8	--	--	6.85	--	--	--
BELGRADO	Bejo	17	7.2	71.0	6.37	7.1	6.6	1.3
BLANES	Bejo	5	8.3	59.0	6.41	10.7	22.0	0.0
PARAMOUNT	Sem	7	--	--	6.75	--	--	--
ORANGE BLAZE	Sem	5	8.2	68.0	6.03	1.7	14.2	7.5
NAVEDO	Bejo	7	7.7	45.3	6.60	1.3	13.6	0.0
BRAVA	Bejo	7	7.6	51.9	6.44	0.9	14.7	0.0
BERLIN	Bejo	14	8.5	69.0	6.53	6.6	8.8	0.5
DOMINATOR	Nun	13	--	--	6.80	--	--	--
BRILLYANCE	Sto	6	9.2	29.7	7.28	0.1	0.3	0.1
NEW HALL	Bejo	9	7.7	66.0	6.29	11.7	10.6	2.7
NAVAL	Bejo	15	8.0	49.3	7.11	7.9	7.2	0.2
NARVIK	Bejo	6	8.3	39.7	7.35	0.3	0.5	0.2

Listed in order of length.

\* 10.0 = Most Desirable, 7.5 = Good, 6.0 = Average

**CARROT CULTIVAR STORAGE TRIAL - 2024 - 2025**

Cultivar	Source	% Marketable	% Weight Loss	% Decay	Degree of Rot *	% Root Sprouts	% Top Sprouts
ORCHETSRO	Vil	63.1 a*	12.8 abc	36.9 e	6.3 a	17 bcd	34 abc
CELLOBUNCH	Sto	54.8 ab	11.9 bc	45.1 de	6.0 ab	2 d	18 c-f
ISTANBUL	Bejo	49.7 abc	14.3 abc	50.3 cde	6.0 ab	0 d	17 c-f
JEFFERSON	Bejo	43.3 a-d	11.5 c	56.6 b-e	5.7 abc	65 a	48 a
ORANGE FANCY	Sem	38.6 a-e	14.5 abc	61.4 a-e	5.3 a-d	1 d	8 ef
NAVEDO - JUMBO	Bejo	34.7 a-e	14.2 abc	65.3 a-e	5.0 a-d	12 bcd	43 ab
NAVEDO - CELLO	Bejo	34.2 a-e	13.8 abc	66.0 a-e	5.3 a-d	0 d	5 ef
BRAVA	Bejo	34.0 a-e	12.6 abc	65.8 a-e	4.3 a-e	7 cd	33 a-d
BALDIO	Bejo	33.4 a-e	16.4 abc	66.6 a-e	6.3 a	1 d	17 c-f
EXP 3497	Bejo	33.0 a-e	13.8 abc	66.9 a-e	5.0 a-d	5 cd	7 ef
COPPERHEAD	ILL	30.8 a-e	17.7 abc	69.1 a-e	5.0 a-d	0 d	2 f
ARPEGGIO	Vil	27.7 b-e	20.0 ab	72.1 a-e	3.0 def	1 d	10 def
NAVAL	Bejo	26.1 b-e	14.2 abc	74.1 a-d	5.0 a-d	0 d	12 c-f
FORTEDO	Vil	25.9 b-e	13.0 abc	74.2 a-d	4.3 a-e	0 d	2 f
TANGERINA	Tak	24.7 b-e	15.8 abc	75.3 a-d	3.0 def	22 bc	20 b-f
CANBERRA	Bejo	22.7 b-e	16.1 abc	77.2 a-d	4.3 a-e	0 d	1 f

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

\*\* 10.0 = No Disease, 6.0 = Moderate, 1.0 = Severe (liquified) ... / continued

**CARROT CULTIVAR STORAGE TRIAL - 2024 - 2025 continued**

Cultivar	Source	% Marketable	% Weight Loss	% Decay	Degree of Rot **	% Root Sprouts	% Top Sprouts
TRALLYANCE	Sto	22.2 b-e*	14.0 abc	77.6 a-d	4.0 a-f	2 d	14 c-f
NARVIK	Bejo	18.8 cde	12.7 abc	81.0 abc	3.7 b-f	0 d	2 f
JUNCTION	Bejo	18.3 cde	20.4 a	81.5 abc	4.0 a-f	0 d	4 f
ENTERPRISE	Sto	17.0 cde	11.5 c	82.9 abc	4.7 a-e	1 d	12 c-f
ORANGE SLICE	Sem	15.0 cde	13.0 abc	85.5 abc	3.3 c-f	5 d	18 c-f
CALINDOR	ILL	14.6 cde	17.5 abc	85.4 abc	3.0 def	1 d	2 f
SV 2384	Sto	14.4 cde	17.3 abc	85.7 ab	4.0 a-f	0 d	1 f
BELGRADO	Bejo	14.2 de	12.8 abc	85.6 abc	3.7 b-f	0 d	1 f
BRILLYANCE	Sto	10.3 de	11.6 c	89.7 ab	4.3 a-e	1 d	6 ef
BASTIA	Bejo	9.4 de	16.7 abc	90.5 ab	3.3 c-f	0 d	1 f
SONETO	Vil	8.8 de	17.9 abc	91.0 ab	3.0 def	0 d	9 ef
ENVY	Sto	7.3 e	16.1 abc	92.6 a	3.3 c-f	1 d	7 ef
BERLIN	Bejo	5.6 e	12.7 abc	94.3 a	3.3 c-f	29 b	28 a-e
TROPHY PAK	Sto	4.6 e	16.2 abc	95.5 a	1.7 f	0 d	0 f
SILVER STAR	Sem	3.6 e	14.5 abc	96.5 a	2.3 ef	0 d	3 f
<b>Trial Average</b>		<b>24.5</b>	<b>14.8</b>	<b>75.4</b>	<b>4.2</b>	<b>6</b>	<b>13</b>

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

\*\* 10.0 = No Disease, 6.0 = Moderate, 1.0 = Severe (liquified)

## MAIN CARROT CULTIVAR STORAGE TRIAL EVALUATION NOTES 2024-2025

- Orchestro:** *Vilmorin sample*, Top sprouts just starting 0-1cm, Root sprouts just starting 0-1cm, Canker & tip rot, Rot is moderately established, Rot is moist, Rot is a concern, Stored fair to good.
- Cellobunch:** *Stokes sample*, Top & root sprouts just starting 0-1cm, Majority canker rot, Odd tip or crown rot, Rot is lightly to moderately established, Rot is moist, Rot is a slight concern, Type of rot botrytis, Stored poor to good.
- Istanbul:** *Bejo sample*, Top sprouts just starting 0-1cm, Majority canker rot, Odd crown or tip rot, Rot is lightly to moderately establish, Rot is moist, Rot is a concern, Type of rot sclerotinia or botrytis, Stored fair to good.
- Jefferson:** *Bejo sample*, Top & root sprouts just starting 0-1cm, Majority canker rot, A few tip rot, Rot is lightly to moderately established, Rot is moist, Rot is a concern, Stored fair.
- Orange Fancy:** *Seminis sample*, Top sprouts just starting 0-1cm, Majority canker rot, A few tip rot, Rot is moderate to heavily established, Rot is moist, Rot is a big concern, Type of rot sclerotinia or botrytis, Stored poor to good.
- Navedo:** *Bejo sample*, Top & root sprouts just starting 0-1cm, Tip or canker rot, Rot is lightly to heavily established, Rot is moist, Rot is a concern, Type of rot sclerotinia or botrytis, Stored a little poor to fair.  
Jumbo
- Navedo:** *Bejo sample*, Top sprouts just starting 0-1cm, Majority tip rot, A few canker rot, Rot is moderately established, Rot is moist, Rot is a concern, Type of rot sclerotinia, Stored poor to fair.  
Cello
- Brava:** *Bejo sample*, Top & root sprouts just starting 0-1cm, Canker or crown rot, A few tip rot, Rot is moderately to heavily established, Rot is moist to liquefied, Rot is a big concern, Type of rot sclerotinia, Stored poor.

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**MAIN CARROT CULTIVAR STORAGE TRIAL EVALUATION NOTES 2024-2025 - continued**

- Baldio:** *Bejo sample*, Top & root sprouts just starting 0-1cm, Majority canker rot, A few tip rot, Rot is lightly to moderately established, Rot is dry or moist, Type of rot botrytis, Stored poor to good.
- EXP 3497:** *Bejo sample*, Top sprouts just starting 0-1cm, Majority canker rot, Odd tip rot, Rot is just starting to heavily established, Rot is dry or moist, Type of rot sclerotinia or botrytis, Stored poor to excellent.
- Copperhead:** *Illinois sample*, Top sprouts just starting 0-1cm, Canker, tip or crown rot, Rot is lightly to moderately established, Rot is dry or moist, Rot is a concern, Stored poor.
- Arpeggio:** *Vilmorin sample*, Top & root sprouts just starting 0-1cm, Majority canker rot, A few crown rot, Rot is moderately established, Rot is dry or moist, Rot is a concern, Type of rot sclerotinia, Stored poor to fair.
- Naval:** *Bejo sample*, Top sprouts just starting 0-1cm, Majority canker rot, A few tip rot, Odd crown rot, Rot is moderately established, Rot is moist, Rot is a concern, Type of rot sclerotinia, Stored poor to fair.
- Fortedo:** *Vilmorin sample*, Top sprouts just starting 0-1cm, Tip or canker rot, Rot is just starting to moderately established, Rot is dry or moist, Rot is a big concern, Type of rot sclerotinia or botrytis, Stored very poor to good.
- Tangerina:** *American Takii sample*, Top & root sprouts just starting 0-1cm, Majority canker rot, Odd tip rot, Rot is moderately to heavily established, Rot is moist, Rot is a big concern, Type of rot sclerotinia, Stored very poor to fair.
- Canberra:** *Bejo sample*, Top sprouts just starting 0-1cm, Majority canker rot, A few tip rot, Rot is moderately to heavily established, Rot is dry or moist, Type of rot sclerotinia or botrytis, Stored very poor to fair.

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### MAIN CARROT CULTIVAR STORAGE TRIAL EVALUATION NOTES 2024-2025 - continued

- Trallyance:** *Stokes sample*, Top sprouts just starting 0-1cm, Majority canker rot, A few crown rot, Odd tip rot, Rot is moderately to heavily established, Rot is moist, Rot is a big concern, Type of rot sclerotinia, Stored very poor to fair.
- Narvik:** *Bejo sample*, Top sprouts just starting 0-1cm, Majority canker rot, Odd tip rot, Rot is moderately to heavily established, Rot is moist, Rot is big concern, Type of rot sclerotinia or botrytis, Stored very poor to fair.
- Junction:** *Bejo sample*, Top sprouts just starting 0-1cm, Majority canker rot, Odd tip rot, Rot is moderately to heavily established, Rot is dry or moist, Type of rot sclerotinia, Stored very poor to poor.
- Enterprise:** *Stokes sample*, Top & root sprouts just starting 0-1cm, Mostly canker rot, A few tip rot, Rot is lightly to moderately established, Rot is moist or liquefied, Stored poor.
- Orange Slice:** *Seminis sample*, Top & root sprouts just starting 0-1cm, Tip or canker rot, Odd crown rot, Rot is moderately to heavily established, Rot is moist, Rot is a big concern, Type of rot sclerotinia, Stored very poor.
- Calindor:** *Illinois sample*, Top sprouts just starting 0-1cm, Majority canker rot, Odd tip rot, Rot is just starting to heavily established, Rot is dry or moist, Rot is a big concern, Stored very poor.
- SV 2384:** *Stokes sample*, Top sprouts just starting 0-1cm, Majority canker rot, A few tip rot, Rot is lightly to heavily established, Rot is moist, Rot is a big concern, Type of rot sclerotinia, Stored very poor.
- Belgrado:** *Bejo sample*, Top sprouts just starting 0-1cm, Majority canker rot, Odd crown rot, Rot is moderately to heavily to established, Rot is moist, Type of rot sclerotinia or botrytis, Stored very poor to fair.

.../continued

## MAIN CARROT CULTIVAR STORAGE TRIAL EVALUATION NOTES 2024-2025 - continued

- Brilliance:** *Stokes sample*, Top sprouts just starting 0-1cm, Majority canker rot, Odd tip rot, Rot is lightly to moderately established, Rot is moist, Type of rot botrytis, Stored very poor.
- Bastia:** *Bejo sample*, Majority canker rot, A few tip rot, Rot is moderately to heavily established, Rot is moist, Type of rot sclerotinia, Stored very poor.
- Soneto:** *Vilmorin sample*, Top sprouts just starting 0-1cm, Majority canker rot, Odd tip rot, Rot is moderately to heavily established, Rot is moist or liquefied, Type of rot sclerotinia or botrytis, Stored very poor.
- Envy:** *Stokes sample*, Top sprouts just starting 0-1cm, Tip or canker rot, Rot is moderately to heavily established, Rot is moist, Type of rot sclerotinia or botrytis, Stored very poor.
- Berlin:** *Bejo sample*, Top & roots sprouts just starting 0-1cm, Majority canker rot, A few tip rot, Rot is moderately to heavily established, Rot is moist or liquefied, Rot is a big concern, Type of rot sclerotinia or botrytis, Stored very poor.
- Trophy Pak:** *Stokes sample*, Tip, crown and canker rot, Rot is heavily established, Rot is moist or liquefied, Rot is a big concern, Type of rot sclerotinia, Stored very poor.
- Silver Star:** *Seminis sample*, Top sprouts just starting 0-1cm, Majority canker rot, A few tip rot, Rot is moderately to heavily established, Rot is moist or liquefied, Rot is a big concern, Type of rot sclerotinia or botrytis, Stored very poor.

## LONG TERM AVERAGES - CARROT CULTIVAR STORAGE TRIALS

CULTIVAR	SOURCE	# YEARS TESTED	% MARKETABLE	% WEIGHT LOSS		DEGREE* OF DECAY
				IN STORAGE	% DECAY	
SPARTAN CLASSIC 80	Sto	4	97.6	6.8	2.4	5.5
PAK MOR	HM	6	93.5	11.5	6.5	4.2
ORANGETTE	Sto	5	92.4	16.8	7.6	6.3
ORANGE SHERBET	Sto	6	91.9	9.0	8.1	4.5
AVENGER	Sem	7	91.3	11.5	8.7	7.0
CANADA SUPER X	Sol	14	90.8	11.9	9.2	5.5
CARO-CHIEF	Sem	5	89.0	10.1	11.0	5.0
ORLANDO GOLD	Sto	6	87.9	12.7	12.1	4.2
NEW HALL	Bejo	10	87.8	11.5	4.2	7.6
SIX PAK II	HM	15	87.7	12.3	12.3	5.5
VOLCANO	Vil	5	87.2	12.6	10.9	8.4
CHANCELLOR	Sem	7	86.7	11.3	13.3	4.2
CROFTON	RZ	6	84.8	11.5	3.0	7.5
INFINITY	Bejo	5	83.4	11.4	4.9	7.8
ISTANBUL	Bejo	7	83.3	14.6	12.7	7.1
BRADFORD	Bejo	5	82.1	10.0	7.9	7.8
SIX PAK	HM	20	79.8	11.5	8.6	5.8
WARMIA	RZ	5	79.1	13.6	6.9	7.1

Listed in order of % Marketable.

\* 10.0 = No Disease, 6.0 = Moderate, 1.0 = Severe (liquified)

Storage period is approximately 9 months.  
... / continued

**LONG TERM AVERAGES - CARROT CULTIVAR STORAGE TRIALS - continued**

CULTIVAR	SOURCE	# YEARS TESTED	% MARKETABLE	% WEIGHT LOSS		DEGREE * OF DECAY
				IN STORAGE	DECAY	
ORANGE PAK	Nor	8	78.6	13.2	8.1	6.8
SUNRISE	Cro	15	78.6	12.8	8.2	6.8
CELLOBUNCH	Sem	32	77.7	13.1	9.7	6.8
ENTERPRISE	Sem	18	77.2	11.3	15.8	6.5
INDIANA	Bejo	7	75.7	15.4	8.5	7.0
NAVAL	Bejo	13	75.6	11.0	18.3	7.3
FONTANA	Bejo	14	75.5	11.2	13.0	6.7
2384	Sem	13	75.3	13.9	17.5	6.4
DOMINION	Sem	4	74.9	13.7	11.1	5.8
BELGRADO	Bejo	15	74.6	10.8	19.5	6.8
BLANES	Bejo	5	73.4	12.3	22.1	6.3
ACHIEVE	Sem	8	73.0	13.0	13.6	6.4
SIX SHOOTER	HM	5	71.5	11.0	17.5	6.0
BERLIN	Bejo	12	70.0	12.3	24.3	6.7
BASTIA	Bejo	19	69.1	13.7	21.5	6.4
ENVY	Sem	18	67.3	12.6	22.7	6.4
NEVADA	Bejo	5	67.3	11.3	29.7	6.6
EXTREMO	Vil	5	65.6	16.0	31.6	5.9

Listed in order of % Marketable.

Storage period is approximately 9 months.

\* 10.0 = No Disease, 6.0 = Moderate, 1.0 = Severe (liquified)

### ONION CULTIVAR TRIAL SEASON SUMMARY – 2025

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for September (16.6°C) and below average for May (12.8°C) and August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C. Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

Above seasonal temperatures from 17 April on allowed for the ground frost to thaw and by the end of April the soil was satisfactory for seeding. A rainfall on 1 May (16.3 mm) prior to seeding slowed land preparation but created good soil moisture levels. Onion seeding in the Holland Marsh began the last week of April and was pretty much completed by the 9<sup>th</sup> of May. The trial was seeded on 8 May. The daytime air temperatures the firsts week after seeding were in the low to high twenties, with a mix of sun and cloud, and nighttime air temperatures were in the low single digits. Soil temperatures were in the low teens before seeding and climbed to mid teens after seeding. A soaking rainfall of 39.4 mm occurred on 17 May, 10 days after seeding. A couple more light rain showers on 22 and 23 May created wet soil conditions. A drop in both day and nighttime temperatures occurred ten to eighteen days after seeding. This was just as the onion seedlings were in the loop stage. Plant vigor and stand were affected in a negative way with flag leaf and first true leaf slower than expected. More seasonal air temperatures returned in the final few days of May and the month of June. A few light rain showers provided moisture that encourage onion seedling growth. The first true leaf was fully grown, and the second true leaf was approximately 1 inch in length on 10 June. Two herbicide applications of Prowl H2O were applied at the recommended rate on 26 May and 28 June when there was good soil moisture. Three herbicide applications of Goal and Pardner were applied at the recommended rate on 4, 6 and 12 June to cleaned up broadleaf weeds. Weed pressure decreased as the season progressed, however a couple of hand weeding events were required to keep the trial free from weeds. Even with the below average rainfall amount in June and average rainfall in July, the onions maintained steady growth. One inch of irrigation water was applied twice on 15 July and 6 August to encourage growth. When leaf lengths were recorded in the week of 21 July, the average leaf length was 57 cm, a 11 cm decrease in length compared to the 2024 trial average heights.

On-station monitoring for onion maggot fly emergence began on 20 May with 0.06 flies/trap/day. There were no distinctive peaks in onion maggot fly numbers during the monitoring period. The highest count was reached on 31 July of 4.25 flies/trap/day. For the entire monitoring period, onion maggot fly numbers continually had small waves of increasing and decreasing populations. Onion maggot populations were extremely low for the entire season. At evaluation there was a trial average of 0.2% onion maggot damage. This was a 0.6 % drop from 2024 and a record low for damage in the main onion variety trial. The onions with the Sepresto seed treatment has certainly lowered onion maggot damage.

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## ONION CULTIVAR TRIAL SEASON SUMMARY - 2025 – continued

Thrips were first found on 3 July and were present throughout the rest of the growing season. Onion thrips numbers in the variety trial never reached above 0.25 thrips/leaf, well below the spray threshold of 3.0 thrips/leaf. The highest thrips count was 0.17 thrips/leaf on 16 July. Two insecticide applications of Movento on 1 and 12 July kept the thrips numbers low for the following 4 weeks. Additional Delegate and Agri-mek applications kept thrips below 1.0 thrips/leaf for the rest of the season. Rainfall and irrigation water also aided in keeping thrips levels very low for the growing season. Environmental conditions were low to moderate for fungal diseases to develop in June and August with above average and July average seasonal precipitation. Stemphylium leaf blight was found in the cultivar trial on 16 July and several fungicide applications (see Onion Management Procedures) kept severity low to moderate until late August. When tip burn began in late July the percentage of leaf damage increased each week in August. A rating of tip burn was evaluated and recorded on 1 August. Tip burn was at an elevated level for a third season in a row. Botrytis was not observed in the trial.

Bulb development started as expected in late July. Most bulb sizing occurred in early August. Cultivars Highlander (25 July) and Switchback (25-31 July) were the first to lodge. It took approximately three weeks for 75% of the cultivars to reach 85% lodged. Approximately two thirds of the cultivars reached full maturity by 13 August when at least 85% of the onions had lodged. The average days to harvest (98 days) decreased by 4 and 12 days compared to the 2023 and 2024 season, respectively. The onion tops dried down in a satisfactory time frame. No seeders were present in the trial. On 5 September, a sample from each cultivar was pulled for judging and comparison during Grower Field Day. By this time, most cultivars had lodged but leaves were 60-100% desiccated. All cultivars matured naturally resulting in acceptable neck finishes when yield samples were harvested on 8, 9 and 10 September. Harvest samples from each cultivar were placed in storage on 10 October and cured artificially for approximately 48 hours.

At evaluation in early December, quality was good in most of the cultivars and yields varied between a high of 1188 to a low of 466 bushels per acre. The trial yield average was a low of 1080 bu/A. This is a decrease of approximately 155 bu/A from last year. The trial had smaller yields with all the of the cultivars having the highest number of onions in the 1 3/4 -2 1/2" size range.

The trial average for the percentage of jumbos (>3" diameter) was 3.5%, which is a decrease from 2024 (10%) and comparable to the 2023 trial. A third of the cultivars had a percentage of jumbos greater than 5%. Uniformity of size varied between replicates and cultivars. Uniformity of size rating was only an average 6.3. Cultivars Skyline and TTA 706 received the best uniformity of size rating of 7.3, while twenty five percent of the cultivars had a below average rating. The uniformity of shape had a below average rating of 5.7. During evaluation shapes were highly variable within the individual samples. Only five cultivars had a rating of 7.0 or greater for

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### ONION CULTIVAR TRIAL SEASON SUMMARY - 2025 – continued

uniformity of shape and 50% of the cultivars had a rating below average for uniformity of shape. The average stand count was 8.9 plants/ft up from 7.0 plants/ft in 2024. Stand counts were below 8.0 plants/ft for six cultivars. The vast majority of unmarketable onions (culls) were undersized onions (pee-wees). There were very few double onions or rot issues found in the trial. The trial average for marketable onions was 83.2%, which is a 10% decrease from the 2024 trial. Eight cultivars had a percent marketable below 80%. Percent marketable was significantly lower in the third replicate compared to the first and second replicate. Skin quality was more average with a slight increase in skin cracking than the last couple of years, but still satisfactory. Skin thickness had an average trial rating of 6.4. The second replicate was significantly poorer than the third replicate. Skins generally felt thinner to the touch. Skin attachment had a good rating of 7.6 with a slight increase in minor skin cracking on most cultivars. The second replicate had significantly lower skin attachment than the first and third replicate. There was no skin rot found in the trial; however, Botrytis was found on some onion skins. Exterior colour was fair and a bit uneven in most cultivars. There were seven cultivars with a below average rating of 6.0 or lower. There were no onions with mechanical damage. Greening of the outer scales and yellow or white speckling on the outer skins was present but very limited. When onions were cut in half for interior colour evaluation, it was noted that 61% of the cultivars had a high percentage of double or multiple centers which was a decrease of approximately 12% from 2024. Cultivars Yakama and Traverse had the highest percentage of single centers at 93 and 80%, respectively. Neck finish was good with a trial average of 7.8. There were limited rough finishes and most were found in the longer to mature cultivars. Cultivar Highlander had a perfect rating of 10. Six other cultivars had a neck finish rating of 8.7. Most onions had a smaller sized neck than previous years. At evaluation all cultivars had maintained fair firmness. Firmness was a little less than what was expected considering how close to harvest the onions were evaluated, but still satisfactory. Cultivars E61L 11216, Fortress and Safrane had the best firmness with a great rating of 9.3, 9.2 and 9.0, respectively. Maggot damage in the evaluation samples ranged from 0 – 1.7%, with a trial average of 0.2%. This is the lowest average percent onion maggot damage ever. Ten cultivars had no onion maggot damage. Cultivar Ridge Line had the highest percentage of onion maggot damage. The seed treatment of Sepresto has significantly increased onion maggot control and decreased damage. When the onions were cut in half horizontally, a very small hole was observed near the heart of the onion. Center hollowness was found in all cultivars, with a trial average of 62.5%. This was a 20% increase compared to the 2024 trial. A significantly lower amount of hollowness in the center was found between the second replicate and first and third replicates. The second replicate had 10% fewer onions with hollowness in the center. Odd top sprouting and some root sprouting was found at evaluation.

## ONION CULTIVAR TRIAL – 2025

### MANAGEMENT PROCEDURES

#### Fertilizer:

90 kg/ha Nitrogen (Calcium Ammonium Nitrate 27-0-0) + 90 kg/ha Phosphorous (MESZ 10-40-0) + 175 kg/ha Potassium (ASPIRE 0-0-58) + 125 kg/ha K-Mag (0-0-22) + 35 kg/ha Manganese + 7 kg/ha Copper (99% Cu) + 100 kg/ha of Gypsol and 3.5 kg/ha Boron was worked into the soil on 30 April.

A side dressing blend of 200 kg/ha Potassium was applied on 14 July.

#### Seeded:

All trials were seeded on 8 May. Pelletized onion seed was seeded with a Stanhay Precision Seeder. Raw onion seed was seeded with a V-Belt seeder equipped with a 5 cm wide scatter shoe. Row spacing was 43 cm. The Main Trial was replicated three times and the Adaptation Trial was not replicated.

#### Weed Control:

Pre-emergence: 1 application: **PARDNER** at 350 ml/ha on 15 May.

Post-emergence: 1 application: **PARDNER** at 70 ml/ha and **GOAL** at 70 ml/ha and Manganese at 1.0 kg/ha on 4 June.  
2 applications: **PROWL H2O** 6.0 L/ha on 26 May and 28 June.  
2 applications: **GOAL** at 140 ml/ha and **PARDNER** at 70 ml/ha and Manganese at 2.0 kg/ha on 6 and 12 June.

#### Minor Elements:

Eight foliar sprays: Calcimax on 10 & 21 June and 1 July (2.0 L/ha) and 12, 18 & 25 July and 1 & 8 August (3.0 L/ha)  
Seven foliar sprays: Zinc Max on 10 & 21 June (2.0 L/ha) and 12, 18 & 25 July and 1 & 8 Aug (3.0 L/ha)  
Seven foliar sprays: Mag Max on 21 June and 1 July (2.0 L/ha) and 12, 18 & 25 July and 1 & 8 August (3.0 L/ha)

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## ONION CULTIVAR TRIAL - 2025 - continued

### Minor Elements continued:

Seven foliar sprays: Manganese Sulfate on 21 June and 1, 12, 18 & 25 July, 1 & 8 August (2.0 kg/ha)  
 Seven foliar sprays: Alexin on 1 July (2.0 L/ha) and 12, 18 & 25 July and 1, 8, & 15 August (3.0 L/ha)  
 Five foliar sprays: Suprafeed on 18, & 25 July and 1, 8 & 15 August (3.0 kg/ha)  
 Four foliar sprays: 20-20-20 on 10 & 21 June and 1 & 12 July (2.0 kg/ha)  
 Two foliar sprays: Nutri Bor on 1 & 15 August (1.0 L/ha)  
 Two foliar sprays: Copper Max 1 & 15 August (1.0 L/ha)

### Insect and Disease Control:

According to IPM recommendations.

**MIRAVIS DUO** at 1.0 L/ha + **MOVENTO** at 365 ml/ha and Minor Elements on 1 July.  
**MIRAVIS DUO** at 1.0 L/ha + **MOVENTO** at 365 ml/ha and Minor Elements on 12 July.  
**LUNA TRANQUILITY** at 1.2 L/ha + **DELEGATE** at 336 g/ha and Minor Elements on 18 July.  
**QUADRUS TOP** at 1.0 L/ha + **DITHANE DG** 3.0 kg/ha and Minor Elements on 25 July.  
**ALLEGRO 500F** at 1.16 L/ha + **DELEGATE** at 336 g/ha and Minor Elements on 1 August.  
**MIRAVIS DUO** at 1.0 L/ha + **AGRI-MEK SC** 270 ml/ha and Minor Elements on 8 August.  
**DITHANE DG** 3.0 kg/ha and Minor Elements on 15 August.

### Harvest:

The Main Trial was pulled on 8, 9 and 10 September and topped. The trial was placed in a forced air and temperature-controlled storage on 10 October. The trial was cured for 48 hours (25°C, minimum 65% RH). After curing the temperature was lowered 5°C per week until 0°C was attained.

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**ONION CULTIVAR TRIAL – 2025 - continued**

**Sprout Inhibition:**

Royal MH 30 XTRA at 8.63 L/ha in 550 L/ha water on:

August 4	August 11		August 15		August 22	August 29
Highlander	TTA-746	TTA-706	Fortress	Sumo	Bradley	Crockett
Switchback	Overlook	37-346B	Gunnison	Skyline	Hamilton	
Killington	EXP 378	Y 604	Venecia	Frontier	Lodestar	
	Medusa Jumbo	Saddleback	Yakama	SVNY 2666	Milestone	
	SVNY 2297	La Salle	E61L.11216	Sat-1		
			Cartier	37 136		
			Samari	Oneida		
			Catskill	Medusa		
			Safrane	Traverse		
			Stanley	Ridge Line		

**EVALUATION PROCEDURES**

The cultivars were evaluated 1 through 12 December after 7 weeks in storage.

**#Bulbs Harvested:**

Total number of onions harvested from 4.66 m of row.

**Harvest Weight:**

Weights from the harvested 4.66 m of row.

**Average Weight/Bulb (g):**

The total weight in grams of all bulbs divided by the total number of bulbs. A bulb 51 mm (2") in diameter weighs approximately 70 g. A bulb 57 mm (2¼") in diameter weighs approximately 100 g. A bulb 64 mm (2½") in diameter weighs approximately 135 g.

**Marketable Yield bu/A:**

Number of onions > 76 mm (> 3"), 76 mm to 64 mm (3" to 2 ½") and 64 mm to 32 mm (2 ½" to 1¼").

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## ONION CULTIVAR TRIAL - 2025 - continued

**Majority of Culls:**

D = Double      PW = Pee Wee      R = Rot      OC = Off Colours      S = Seeders      SP = Sprouts

**Shape:**

HG = High Globe      FG = Flattened Globe      G = Globe      Sp = Spindle      TD = Tear Drop      T = Top

**Skin Thickness:**

10.0 = Most Desirable      7.5 = Good      6.0 = Average

**Skin Attachment:**

10.0 = Most Desirable, skins well attached      7.5 = Good, skins have a few small cracks      6.0 = Average, skins have cracks but still attached

**Neck Finish:**

10.0 = Most Desirable, small tight neck      6.0 = Average, neck closed,      4.0 = Poor, neck bit rough and open

**Overall Score:**

Based on quality and general appearance.

**Score:**

The average of eight evaluation ratings taken from Uniformity of Shape to Firmness.

**Firmness:**

10 = Desirable (solid and firm),      6.0 = Average (firm but some elasticity)      1.0 = Poor (spongy)

**Interior Colour:**

G = Green      W = White      C = Cream      R = Red      DR = Dark Red

**Exterior Colour:**

LG = Light Golden      G = Golden      DG = Dark Golden      LC = Light Copper      C = Copper      DC = Dark Copper

.../continued

## ONION CULTIVAR TRIAL - 2025 - continued

**Days to Harvest:**

Numbers of days from seeding until 85% of the tops were down.

**Seed Treatments:**

SE = Sepresto & Evergol Prime  
S = Sepresto

SP = Spinosad  
F = Fungicide

SF = FI400 & Spinosad  
TP = Trigard & ProGro

LD = Lorsban & Dithane  
TF = Trigard FI500

**Percent Onion Maggot Damage:**

Percentage of onions damaged by onion maggot ranging from pin hole to completely unmarketable that were found in the 4.66 m harvest sample.

**Seeders:**

Average number of seeders found in each cultivar of 20 m of row.

**% Single Centers:**

Percentage of onions with only one heart.

**% Double Centers:**

Percentage of onions with two hearts.

**% Multiple Centers:**

Percentage of onions with three or more hearts.

**% Hollowness in Centers:**

Percentage of onions with a small hollow pocket at the heart of the onion.

**Top Height (cm):**

The average length of 20 randomly chosen onion tops from all three replicates from the ground to the tips as taken on 21 and 22 July. 50 cm is equal to 20 inches.

.../continued

**ONION CULTIVAR TRIAL - 2025 - continued**

**Leaf Shape:**

B = Leaves are bent or hanging

U = Up right leaves, straight

**Leaf Colour:**

LG = Light Green,

G = Green,

BG = Blue Green,

DG = Dark Green

**Tip Burn:**

VL = Very light

L = Low

M = Moderate

H = Heavy

S = Severe

**Irrigation:**

Irrigation water was applied twice during the 2025 season:

1 inch on 15 July

1 inch on 6 August

## ONION CULTIVAR MAIN TRIAL - 2025

Cultivar	Source	# Bulbs Harvested	# Bulbs Jumbos > 89 mm	# Bulbs Lrg 89 - 76 mm	# Bulbs Med 76 - 64 mm	# Bulbs Small 64 - 32 mm	Stand/Foot	Average Weight/Bulb (g)
MILESTONE	Sto	129 c-j*	0 ab	6 b-e	56 a	62 g-m	8.4 c-k	124.0 a
TRAVERSE	Tak	148 abc	0 b	3 e-h	48 a-d	86 a-f	9.7 abc	105.8 a-g
SWITCHBACK	Tak	116 hij	0 ab	6 b-f	36 c-j	64 f-m	7.6 ijk	110.8 a-f
MEDUSA <small>JUMBO</small>	Tak	144 a-d	0 b	14 a	50 abc	66 e-m	9.4 a-e	113.1 a-d
RIDGE LINE	Tak	109 jk	0 ab	6 b-g	35 c-j	57 j-m	7.1 kl	121.2 ab
YAKAMA	Bejo	140 a-e	1 ab	4 c-h	38 b-i	82 a-h	9.1 a-f	102.0 b-h
TTA-706	Tak	144 a-d	0 b	3 e-h	30 f-m	97 abc	9.4 a-e	92.8 e-k
HIGHLANDER	Tak	130 b-i	1 ab	7 b-e	33 d-l	76 c-l	8.5 b-j	100.5 c-i
BRADLEY	Bejo	138 a-g	1 a	9 bcd	48 a-d	66 e-m	9.0 a-h	121.1 ab
SVNY 2666	Sem	148 abc	0 b	7 b-e	44 a-f	80 a-j	9.7 abc	108.4 a-f
SVNY 2297	Sem	150 abc	0 b	3 e-h	38 b-i	92 a-d	9.8 abc	100.5 c-i
CROCKETT	Bejo	115 ij	0 b	5 b-h	37 c-j	60 h-m	7.5 jk	115.0 a-d
TTA-746	Tak	90 k	0 b	2 e-h	27 h-n	51 m	5.9 l	102.4 b-h
MEDUSA	Tak	138 a-f	1 a	9 abc	52 ab	59 i-m	9.0 a-h	120.1 abc

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## ONION CULTIVAR MAIN TRIAL - 2025 - continued

Cultivar	Source	# Bulbs Harvested	# Bulbs Jumbos > 89 mm	# Bulbs Lrg 89 - 76 mm	# Bulbs Med 76 - 64 mm	# Bulbs Small 64 - 32 mm	Stand/Foot	Average Weight/Bulb (g)
HAMILTON	Bejo	138 a-f*	0 b	4 c-h	32 e-l	84 a-g	9.0 a-g	102.6 b-h
KILLINGTON	Sem	152 a	0 b	6 b-e	36 c-j	89 a-e	9.9 a	97.8 d-j
FORTRESS	Sem	135 a-i	0 b	0 h	17 m-p	100 ab	8.9 a-j	86.6 g-k
CATSKILL	Sto	138 a-g	0 b	9 abc	40 b-h	70 d-m	9.0 a-h	110.1 a-f
SAT-1	SN	143 a-e	0 b	4 d-h	44 a-g	75 c-l	9.3 a-f	100.7 c-i
Y-604	SN	137 a-h	0 b	7 b-e	37 c-j	74 c-m	9.0 a-i	98.6 d-j
LA SALLE	Sem	151 ab	0 b	5 b-g	40 b-h	84 a-g	9.9 ab	100.6 c-i
LODESTAR	Tak	118 f-j	0 ab	6 b-f	39 b-h	56 klm	7.7 g-k	115.5 a-d
SUMO	CF	117 g-j	1 a	10 ab	35 d-j	53 lm	7.6 h-k	111.7 a-e
VENECIA	Bejo	137 a-h	0 b	3 e-h	27 h-n	85 a-g	8.9 a-i	92.0 e-k
SAFRANE	Bejo	137 a-g	0 b	3 e-h	30 f-m	81 a-i	9.0 a-i	91.9 f-k
SADDLEBACK	Sto	149 abc	0 b	9 abc	46 a-e	69 d-m	9.8 abc	109.0 a-f
E61L.11216	EZ	146 a-d	0 b	0 h	18 l-p	101 a	9.6 a-d	83.7 h-l
STANLEY	CF	122 e-j	0 b	6 b-g	34 d-k	58 i-m	8.0 f-k	104.5 a-g

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## ONION CULTIVAR MAIN TRIAL - 2025 - continued

Cultivar	Source	# Bulbs Harvested	# Bulbs Jumbos > 89 mm	# Bulbs Lrg 89 - 76 mm	# Bulbs Med 76 - 64 mm	# Bulbs Small 64 - 32 mm	Stand/Foot	Average Weight/Bulb (g)
GUNNISON	Bejo	125 d-j*	0 b	1 fgh	23 i-o	75 c-l	8.2 e-k	82.3 i-l
SKYLINE	Tak	139 a-f	0 b	0 h	19 l-p	89 a-e	9.1 a-f	81.2 i-l
OVERLOOK	Sto	148 abc	1 a	6 b-g	29 g-m	77 c-l	9.7 abc	92.1 e-k
37-136	SN	136 a-i	0 b	3 e-h	20 k-p	78 b-k	8.9 a-i	74.4 k-n
SAMARI	CF	156 a	0 b	2 e-h	22 j-o	87 a-f	10.2 a	79.8 j-m
FRONTIER	Tak	126 d-j	0 b	1 gh	9 op	81 a-i	8.2 d-k	66.4 lmn
37-346B	SN	143 a-e	0 b	0 h	9 op	82 a-h	9.4 a-f	59.4 n
CARTIER	Bejo	140 a-e	0 b	0 h	5 p	82 a-i	9.1 a-f	54.8 n
ONEIDA	Bejo	143 a-e	0 b	0 h	13 nop	66 e-m	9.4 a-f	61.1 mn
<b>TRIAL AVERAGE</b>		<b>136</b>	<b>0</b>	<b>5</b>	<b>32</b>	<b>75</b>	<b>8.9</b>	<b>97.1</b>

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## ONION CULTIVAR MAIN TRIAL - 2025 - continued

Cultivar	Source	Total Harvest Weight (kg)	Wgt. Jumbo > 89 mm (kg)	Wgt. Large 89 - 76 mm (kg)	Wgt. Medium 76-64 mm (kg)	Wgt. Small 64-45 mm (kg)	Marketable Yield bu/A	% Marketable	Majority of Culls
MILESTONE	Sto	15.91 abc*	0.10 bc	1.43 b-e	8.61 a	5.62 g-k	1188 a	96.2 a	PW
TRAVERSE	Tak	15.73 a-d	0.00 c	0.59 e-h	7.11 abc	7.67 a-d	1159 abc	92.0 ab	PW
SWITCHBACK	Tak	12.84 e-h	0.11 bc	1.34 b-f	5.41 b-g	5.63 g-k	942 c-h	91.4 ab	PW
MEDUSA JUMBO	Tak	16.24 ab	0.00 c	3.11 a	7.20 abc	5.31 h-k	1178 ab	90.6 ab	PW
RIDGE LINE	Tak	13.11 d-h	0.11 bc	1.37 b-f	5.84 b-f	5.44 g-k	962 b-h	90.3 ab	PW
YAKAMA	Bejo	14.06 a-g	0.20 abc	0.96 c-h	5.82 b-f	6.58 b-j	1022 a-g	89.9 ab	PW
TTA-706	Tak	13.39 c-h	0.00 c	0.60 e-h	4.30 e-j	8.01 abc	973 a-h	89.8 ab	PW
HIGHLANDER	Tak	13.04 e-h	0.20 abc	1.46 b-e	4.53 d-i	6.19 c-k	934 d-h	89.6 ab	PW
BRADLEY	Bejo	16.52 a	0.32 ab	2.04 abc	7.57 ab	5.77 e-k	1184 a	89.6 ab	PW
SVNY 2666	Sem	15.92 abc	0.00 c	1.68 b-e	6.80 a-d	6.92 a-i	1161 abc	89.2 abc	PW
SVNY 2297	Sem	15.14 a-e	0.00 c	0.76 e-h	5.66 b-g	8.18 ab	1100 a-e	88.8 abc	PW
CROCKETT	Bejo	13.19 d-h	0.00 c	1.13 b-h	5.93 b-f	5.57 g-k	952 c-h	88.8 abc	PW
TTA-746	Tak	9.24 jk	0.00 c	0.49 e-h	3.90 f-j	4.47 k	668 klm	88.1 a-d	PW
MEDUSA	Tak	16.37 a	0.29 ab	2.00 a-d	7.72 ab	5.07 ijk	1137 a-d	87.9 a-d	D PW

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## ONION CULTIVAR MAIN TRIAL - 2025 - continued

Cultivar	Source	Total Harvest Weight (kg)	Wgt. Jumbo > 89 mm (kg)	Wgt. Large > 76 mm (kg)	Wgt. Medium 76-64 mm (kg)	Wgt. Small 64-45 mm (kg)	Marketable Yield bu/A	% Marketable	Majority of Culls
HAMILTON	Bejo	14.18 a-g*	0.00 c	0.98 c-h	4.97 c-h	7.56 a-f	1019 a-g	87.4 a-d	PW
KILLINGTON	Sem	14.58 a-f	0.00 c	1.36 b-f	5.43 b-g	7.06 a-h	1045 a-g	87.2 a-d	PW
FORTRESS	Sem	11.73 g-j	0.00 c	0.00 h	2.33 i-l	8.74 a	835 g-k	86.3 a-d	PW
CATSKILL	Sto	15.18 a-e	0.00 c	2.11 abc	6.13 b-f	6.35 b-j	1100 a-e	86.0 a-d	PW
SAT-1	SN	14.35 a-g	0.00 c	0.82 d-h	6.53 a-e	6.27 c-k	1027 a-g	85.9 a-d	PW
Y-604	SN	13.55 c-h	0.00 c	1.55 b-e	5.59 b-g	5.73 f-k	970 a-h	85.7 a-d	PW
LA SALLE	Sem	15.16 a-e	0.00 c	1.18 b-h	6.07 b-f	7.22 a-g	1091 a-f	85.4 a-e	PW
LODESTAR	Tak	13.67 b-h	0.11 bc	1.38 b-f	6.62 a-e	4.92 jk	983 a-h	85.3 a-e	PW
SUMO	CF	13.04 e-h	0.37 a	2.27 ab	5.44 b-g	4.45 k	945 c-h	85.0 a-e	PW
VENECIA	Bejo	12.60 e-i	0.00 c	0.69 e-h	4.06 f-j	6.90 a-i	879 f-k	83.6 b-f	PW
SAFRANE	Bejo	12.67 e-i	0.00 c	0.73 e-h	4.51 d-i	6.60 b-j	893 e-j	83.4 b-f	PW
SADDLEBACK	Sto	16.30 a	0.00 c	2.03 abc	7.31 abc	6.05 d-k	1161 abc	83.2 b-f	PW
E61L.11216	EZ	12.27 f-i	0.00 c	0.00 h	2.57 h-l	8.69 a	849 g-k	81.6 b-g	PW
STANLEY	CF	12.65 e-i	0.00 c	1.30 b-g	5.32 b-g	5.13 ijk	886 e-k	81.1 b-g	PW

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## ONION CULTIVAR MAIN TRIAL - 2025 - continued

Cultivar	Source	Total Harvest Weight (kg)	Wgt. Jumbo > 89 mm (kg)	Wgt. Large > 76 mm (kg)	Wgt. Medium 76-84 mm (kg)	Wgt. Small 64-32 mm (kg)	Marketable Yield bu/A	% Marketable	Majority of Culls
GUNNISON	Bejo	10.17 ijk*	0.00 c	0.21 fgh	3.33 g-k	5.86 d-k	709 i-l	80.2 b-g	PW
SKYLINE	Tak	11.35 hjj	0.00 c	0.00 h	2.71 h-l	7.62 a-e	778 h-k	77.2 c-g	PW
OVERLOOK	Sto	13.25 d-h	0.31 ab	1.38 b-f	4.27 e-j	6.18 c-k	915 e-i	76.2 d-g	PW
37-136	SN	10.15 ijk	0.00 c	0.58 e-h	2.81 h-l	5.75 e-k	689 jkl	73.2 e-h	PW
SAMARI	CF	12.35 f-i	0.00 c	0.55 e-h	3.33 g-k	7.08 a-h	826 g-k	71.6 fgh	PW
FRONTIER	Tak	8.43 k	0.00 c	0.14 gh	1.24 kl	5.98 d-k	556 lm	70.9 gh	PW
37-346B	SN	8.51 k	0.00 c	0.00 h	1.21 kl	5.82 d-k	530 lm	63.2 hi	PW
CARTIER	Bejo	7.71 k	0.00 c	0.00 h	0.61 l	5.56 g-k	466 m	61.3 hi	PW
ONEIDA	Bejo	8.60 k	0.00 c	0.00 h	1.93 jkl	4.92 jk	517 lm	56.9 i	PW
<b>TRIAL AVERAGE</b>		<b>13.06</b>	<b>0.06</b>	<b>1.03</b>	<b>4.88</b>	<b>6.29</b>	<b>925</b>	<b>83.2</b>	<b>PW</b>

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## ONION CULTIVAR MAIN TRIAL - 2025 - continued

Cultivar	Source	Shape	Uniformity of Shape	Uniformity of Size	Skin Thickness	Skin Attachment	Neck Finish	Overall Score	Score
MILESTONE	Sto	G	6.7 abc*	7.0 ab	6.3 cde	7.0 efg	7.0 efg	6.3 def	6.75 g-k
TRAVERSE	Tak	G	7.3 a	7.0 ab	7.0 abc	8.3 bcd	8.0 bcd	8.0 a	7.79 a
SWITCHBACK	Tak	G	6.0 b-e	5.7 cde	6.7 bcd	6.3 fg	7.3 def	6.0 ef	6.38 k-o
MEDUSA <small>JUMBO</small>	Tak	FG	6.0 b-e	7.0 ab	6.3 cde	8.3 bcd	7.3 def	6.7 cde	6.96 e-i
RIDGE LINE	Tak	HG	7.0 ab	6.3 a-d	7.7 a	6.3 fg	8.3 bc	6.3 def	7.04 d-i
YAKAMA	Bejo	SpG	6.3 a-d	6.0 bcd	5.3 fg	6.7 efg	7.7 cde	6.0 ef	6.25 l-p
TTA-706	Tak	G	5.7 c-f	7.3 a	7.3 ab	7.0 efg	8.0 bcd	7.0 bcd	7.29 b-e
HIGHLANDER	Tak	G	5.0 e-h	6.3 a-d	4.7 g	3.0 i	10.0 a	4.7 h	6.08 m-p
BRADLEY	Bejo	SpG	5.3 d-g	6.3 a-d	6.3 cde	9.0 ab	6.3 g	7.0 bcd	6.83 f-j
SVNY 2666	Sem	HG	4.3 gh	6.3 a-d	6.3 cde	7.0 efg	7.7 cde	6.0 ef	6.38 k-o
SVNY 2297	Sem	G	4.3 gh	6.0 bcd	6.7 bcd	7.7 cde	8.0 bcd	6.3 def	6.63 i-l
CROCKETT	Bejo	SpG	6.0 b-e	6.7 abc	7.0 abc	10.0 a	6.3 g	7.3 abc	7.44 a-d
TTA-746	Tak	G	7.3 a	6.3 a-d	7.3 ab	6.7 efg	8.0 bcd	6.3 def	7.08 d-h
MEDUSA	Tak	G	7.3 a	7.0 ab	7.0 abc	9.3 ab	7.0 efg	7.7 ab	7.54 abc

Listed in order of % Marketable.

10.0 = Most Desirable, 8.0 = Good, 6.0 = Average

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## ONION CULTIVAR MAIN TRIAL - 2025 - continued

Cultivar	Source	Shape	Uniformity of Shape	Uniformity of Size	Skin Thickness	Skin Attachment	Neck Finish	Overall Score	Score
HAMILTON	Bejo	SpG	6.3 a-d*	5.3 de	5.7 ef	10.0 a	6.7 fg	7.3 abc	7.23 c-f
KILLINGTON	Sem	MIX	4.0 h	5.7 cde	5.7 ef	4.7 h	8.7 b	5.0 gh	5.83 p
FORTRESS	Sem	G	5.0 e-h	6.7 abc	6.0 def	9.0 ab	7.0 efg	6.7 cde	7.17 c-g
CATSKILL	Sto	MIX	4.0 h	6.0 bcd	7.0 abc	8.3 bcd	7.3 def	6.7 cde	6.71 h-k
SAT-1	SN	G	6.7 abc	6.0 bcd	6.3 cde	6.0 g	8.7 b	6.0 ef	6.69 h-k
Y-604	SN	G	4.3 gh	5.3 de	5.7 ef	6.0 g	7.3 def	6.0 ef	6.00 nop
LA SALLE	Sem	HG	5.0 e-h	6.0 bcd	6.7 bcd	7.3 def	8.3 bc	6.3 def	6.73 h-k
LODESTAR	Tak	G	6.3 a-d	6.3 a-d	7.3 ab	8.7 bc	6.7 fg	7.0 bcd	7.21 c-f
SUMO	CF	FG	5.3 d-g	5.3 de	6.7 bcd	6.3 fg	8.0 bcd	6.0 ef	6.38 k-o
VENECIA	Bejo	SpG	5.0 e-h	5.7 cde	6.0 def	7.3 def	8.7 b	7.0 bcd	6.77 g-k
SAFRANE	Bejo	G	5.7 c-f	6.0 bcd	7.3 ab	9.0 ab	7.3 def	6.7 cde	7.23 c-f
SADDLEBACK	Sto	HG	4.7 fgh	6.3 a-d	5.8 ef	6.3 fg	7.8 b-e	6.0 ef	6.42 j-n
E61L.11216	EZ	G	6.0 b-e	7.0 ab	6.7 bcd	8.7 bc	7.7 cde	7.7 ab	7.67 ab
STANLEY	CF	G	5.7 c-f	5.3 de	6.0 def	8.3 bcd	6.7 fg	6.3 def	6.67 h-l

Listed in order of % Marketable.

10.0 = Most Desirable, 8.0 = Good, 6.0 = Average

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## ONION CULTIVAR MAIN TRIAL - 2025 - continued

Cultivar	Source	Shape	Uniformity of Shape	Uniformity of Size	Skin Thickness	Skin Attachment	Neck Finish	Overall Score	Score
GUNNISON	Bejo	Top	5.0 e-h*	6.3 a-d	6.0 def	9.0 ab	7.3 def	7.3 abc	7.08 d-h
SKYLINE	Tak	G	7.0 ab	7.3 a	6.7 bcd	9.3 ab	8.0 bcd	7.7 ab	7.81 a
OVERLOOK	Sto	MIX	4.3 gh	4.7 e	5.7 ef	7.7 cde	7.8 b-e	6.0 ef	5.98 op
37-136	SN	FG	6.3 a-d	5.3 de	5.3 fg	9.3 ab	8.3 bc	7.0 bcd	7.08 d-h
SAMARI	CF	G	6.0 b-e	6.0 bcd	6.3 cde	6.7 efg	8.7 b	5.7 fg	6.46 j-m
FRONTIER	Tak	G	5.7 c-f	7.0 ab	6.0 def	7.3 def	8.3 bc	7.3 abc	7.08 d-h
37-346B	SN	G	6.7 abc	7.0 ab	6.3 cde	7.3 def	8.7 b	6.0 ef	7.08 d-h
CARTIER	Bejo	G	6.7 abc	7.0 ab	5.7 ef	7.7 cde	8.7 b	6.7 cde	7.29 b-e
ONEIDA	Bejo	G	5.7 c-f	7.0 ab	6.3 cde	8.3 bcd	8.0 bcd	6.3 def	7.02 d-i
<b>TRIAL AVERAGE</b>			<b>5.7</b>	<b>6.3</b>	<b>6.4</b>	<b>7.6</b>	<b>7.8</b>	<b>6.5</b>	<b>6.87</b>

Listed in order of % Marketable.

10.0 = Most Desirable, 8.0 = Good, 6.0 = Average

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## ONION CULTIVAR MAIN TRIAL - 2025 - continued

Cultivar	Source	Firmness at Harvest	Firmness at Evaluation	Interior Colour	Exterior Colour	Exterior Colour Rating	Days to Harvest	Seed Treatment	% Onion Maggot Damage	% Jumbo > 76 mm
MILESTONE	Sto	9.8 ab*	7.7 f-i	W	G	6.0 fgh	103 b-f	SE	0.3 a	5.1 b-e
TRAVERSE	Tak	9.8 ab	8.3 b-g	W	G	8.3 ab	99 f-j	SE	0.2 a	1.7 e-h
SWITCHBACK	Tak	9.7 abc	7.0 ijk	W	G	6.0 fgh	89 no	SE	0.6 a	5.2 b-e
MEDUSA <small>JUMBO</small>	Tak	9.7 abc	7.7 f-i	W	DG	6.3 efg	97 g-k	SE	0.0 a	10.4 a
RIDGE LINE	Tak	10.0 a	8.0 d-h	W	G	6.3 efg	98 g-j	SE	1.7 a	5.2 b-e
YAKAMA	Bejo	9.3 cd	7.0 ijk	W	LG	5.0 h	106 b	SE	0.2 a	3.4 c-h
TTA-706	Tak	9.8 ab	8.3 b-g	C	G	7.7 a-d	94 j-m	SE	0.0 a	1.9 e-h
HIGHLANDER	Tak	8.3 e	6.3 k	W	LG	8.7 a	86 o	SE	0.0 a	5.4 b-e
BRADLEY	Bejo	9.8 ab	8.7 a-e	W	G	5.7 gh	104 b-e	SE	0.2 a	6.6 abc
SVNY 2666	Sem	9.8 ab	7.7 f-i	W	G	5.7 gh	97 g-j	SE	0.7 a	5.1 b-e
SVNY 2297	Sem	9.8 ab	8.0 d-h	W	G	6.0 fgh	96 h-k	SE	0.7 a	2.3 d-h
CROCKETT	Bejo	9.8 ab	8.5 a-f	W	DG	7.7 a-d	113 a	SE	0.3 a	4.4 c-g
TTA-746	Tak	9.8 ab	8.0 d-h	W	G	6.7 d-g	91 l-o	SE	0.0 a	2.5 d-h
MEDUSA	Tak	9.7 abc	8.0 d-h	W	G	7.0 c-f	98 g-j	SE	0.0 a	6.8 abc

Listed in order of % Marketable.

10.0 = Most Desirable, 8.0 = Good,

6.0 = Average

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## ONION CULTIVAR MAIN TRIAL - 2025 - continued

Cultivar	Source	Firmness at Harvest	Firmness at Evaluation	Interior Colour	Exterior Colour	Exterior Colour Rating	Days to Harvest	Seed Treatment	% Onion Maggot Damage	% Jumbo > 76 mm
HAMILTON	Bejo	10.0 a*	8.5 a-f	W	DG	8.0 abc	105 bc	SE	0.0 a	3.1 c-h
KILLINGTON	Sem	9.2 d	6.7 jk	W	LG	6.3 efg	90 mno	SE	0.0 a	4.5 c-g
FORTRESS	Sem	9.8 ab	9.0 abc	W	G	8.0 abc	101 c-g	SE	0.3 a	0.0 h
CATSKILL	Sto	9.8 ab	8.3 b-g	W	G	6.0 fgh	99 e-i	SE	0.0 a	6.8 abc
SAT-1	SN	9.7 abc	7.8 e-i	C	LG	6.0 fgh	97 g-j	SE	0.2 a	2.6 d-h
Y-604	SN	9.8 ab	7.7 f-i	C	LG	5.7 gh	95 i-l	SE	0.0 a	5.1 b-e
LA SALLE	Sem	10.0 a	8.2 c-h	W	G	6.0 fgh	96 h-k	SE	0.2 a	3.5 c-h
LODESTAR	Tak	10.0 a	8.7 a-e	W	DG	6.7 d-g	104 bcd	SE	0.3 a	5.2 b-e
SUMO	CF	9.5 bcd	7.7 f-i	W	G	5.7 gh	98 g-j	SE	0.3 a	8.6 ab
VENECIA	Bejo	9.3 cd	8.2 c-h	W	G	6.3 efg	99 f-i	SE	0.0 a	2.2 d-h
SAFRANE	Bejo	9.8 ab	9.2 ab	W	G	6.7 d-g	100 d-h	SE	0.0 a	2.4 d-h
SADDEBACK	Sto	9.8 ab	7.7 f-i	W	G	6.7 d-g	92 k-n	SE	0.0 a	6.0 bcd
E61L.11216	EZ	9.8 ab	9.3 a	G	G	8.3 ab	98 g-j	SE	0.0 a	0.0 h
STANLEY	CF	9.8 ab	9.0 abc	CW	G	6.0 fgh	101 c-g	SE	0.6 a	4.5 c-f

Listed in order of % Marketable.

10.0 = Most Desirable, 8.0 = Good,

6.0 = Average

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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**ONION CULTIVAR MAIN TRIAL - 2025 - continued**

Cultivar	Source	Firmness at Harvest	Firmness at Evaluation	Interior Colour	Exterior Colour	Exterior Colour Rating	Days to Harvest	Seed Treatment	% Onion Maggot Damage	% Jumbo > 76 mm
GUNNISON	Bejo	9.7 abc*	8.3 b-g	W	G	7.3 b-e	97 g-j	SE	0.0 a	0.9 fgh
SKYLINE	Tak	9.8 ab	8.8 a-d	W	G	7.7 a-d	98 g-j	SE	0.2 a	0.0 h
OVERLOOK	Sto	9.5 bcd	6.7 jk	W	G	5.0 h	97 g-j	SE	0.0 a	4.2 c-g
37-136	SN	9.5 bcd	8.3 b-g	C	LG	6.7 d-g	99 f-j	SE	0.0 a	2.0 d-h
SAMARI	CF	9.5 bcd	7.3 hij	W	G	5.0 h	99 e-i	SE	0.0 a	1.6 e-h
FRONTIER	Tak	10.0 a	8.0 d-h	C	G	7.0 c-f	98 g-j	SE	0.0 a	0.5 gh
37-346B	SN	9.8 ab	8.3 b-g	W	G	6.3 efg	97 g-k	SE	0.0 a	0.0 h
CARTIER	Bejo	10.0 a	8.3 b-g	C	G	7.7 a-d	98 g-j	SE	0.2 a	0.0 h
ONEIDA	Bejo	9.7 abc	7.5 g-j	W	G	7.0 c-f	111 a	SE	0.0 a	0.0 h
<b>TRIAL AVERAGE</b>		<b>9.7</b>	<b>8.0</b>			<b>6.6</b>	<b>98</b>		<b>0.2</b>	<b>3.5</b>

Listed in order of % Marketable.

10.0 = Most Desirable, 8.0 = Good, 6.0 = Average

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## ONION CULTIVAR MAIN TRIAL - 2025 - continued

Cultivar	Source	Seeders	% Single Centers	% Double Centers	% Multiple Centers	% Hollowness in Centers	Top Height (cm)	Leaf Shape	Leaf Colour	Tip Burn Avg 1
MILESTONE	Sto	0.0 a*	37 f-l	63 b-h	0 d	70 b-i	60.3 a-e	U	BG	8.3 abc
TRAVERSE	Tak	0.0 a	80 ab	20 lm	0 d	57 e-k	59.6 a-f	U	BG	7.7 bcd
SWITCHBACK	Tak	0.0 a	13 l-o	73 a-e	13 bc	87 a-d	53.3 klm	U	BG	8.7 ab
MEDUSA JUMBO	Tak	0.0 a	7 mno	80 abc	13 bc	87 a-d	53.7 j-m	U	G	8.0 a-d
RIDGE LINE	Tak	0.0 a	27 i-o	73 a-e	0 d	97 ab	53.4 klm	U	BG	8.7 ab
YAKAMA	Bejo	0.0 a	93 a	7 m	0 d	27 lmn	61.4 abc	B	LG	8.7 ab
TTA-706	Tak	0.0 a	0 o	97 a	3 cd	70 b-i	52.1 lm	U	BG	7.0 de
HIGHLANDER	Tak	0.0 a	0 o	63 b-h	37 a	100 a	54.4 h-m	B	G	8.3 abc
BRADLEY	Bejo	0.0 a	20 k-o	63 b-h	17 b	40 j-n	64.3 a	B	G	8.3 abc
SVNY 2666	Sem	0.0 a	30 h-n	70 a-f	0 d	60 d-k	59.9 a-e	U	BG	7.7 bcd
SVNY 2297	Sem	0.0 a	63 b-f	33 i-l	3 cd	73 a-h	60.2 a-e	B	BG	8.3 abc
CROCKETT	Bejo	0.0 a	40 e-l	57 b-j	3 cd	40 j-n	56.7 c-l	U	BG	9.0 a
TTA-746	Tak	0.0 a	13 l-o	77 a-d	10 bcd	80 a-f	50.4 m	U	G	8.3 abc
MEDUSA	Tak	0.0 a	3 no	83 ab	13 bc	100 a	53.8 j-m	U	G	7.7 bcd

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## ONION CULTIVAR MAIN TRIAL - 2025 - continued

Cultivar	Source	Seeders	% Single Centers	% Double Centers	% Multiple Centers	% Hollowness in Centers	Top Height (cm)	Leaf Shape	Leaf Colour	Tip Burn Avg 1
HAMILTON	Bejo	0.0 a*	77 abc	23 klm	0 d	15 n	58.8 b-i	U	G	8.0 a-d
KILLINGTON	Sem	0.0 a	37 f-1	60 b-i	3 cd	83 a-e	59.7 a-f	U	G	9.0 a
FORTRESS	Sem	0.0 a	50 c-j	47 e-1	3 cd	60 d-k	58.0 b-k	U	BG	8.0 a-d
CATSKILL	Sto	0.0 a	53 b-i	43 f-1	3 cd	50 g-1	57.5 b-k	U	BG	7.7 bcd
SAT-1	SN	0.0 a	27 i-o	60 b-i	13 bc	80 a-f	59.8 a-f	U	BG	7.7 bcd
Y-604	SN	0.0 a	23 j-o	77 a-d	0 d	57 e-k	59.3 b-h	U	BG	7.3 cde
LA SALLE	Sem	0.0 a	63 b-f	37 h-1	0 d	53 f-1	59.3 b-h	U	BG	8.0 a-d
LODESTAR	Tak	0.0 a	40 e-1	53 c-j	7 bcd	33 k-n	61.2 a-d	U	BG	9.0 a
SUMO	CF	0.0 a	27 i-o	63 b-h	10 bcd	73 a-h	54.9 f-m	B	BG	7.7 bcd
VENECIA	Bejo	0.0 a	37 f-1	60 b-i	3 cd	43 i-m	56.6 c-1	U	G	7.0 de
SAFRANE	Bejo	0.0 a	53 b-i	43 f-1	3 cd	90 abc	59.7 a-f	U	BG	8.7 ab
SADDLEBACK	Sto	0.0 a	30 h-n	70 a-f	0 d	70 b-i	62.0 ab	U	BG	7.3 cde
E61L.11216	EZ	0.0 a	67 a-e	33 i-1	0 d	70 b-i	56.5 d-1	U	BG	7.3 cde
STANLEY	CF	0.0 a	20 k-o	73 a-e	7 bcd	57 e-k	58.8 b-i	U	BG	9.0 a

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## ONION CULTIVAR MAIN TRIAL - 2025 - continued

Cultivar	Source	Seeders	% Single Centers	% Double Centers	% Multiple Centers	% Hollowness in Centers	Top Height (cm)	Leaf Shape	Leaf Colour	Tip Burn Avg 1
GUNNISON	Bejo	0.0 a*	70 a-d	30 j-m	0 d	77 a-g	58.5 b-j	U	BG	7.7 bcd
SKYLINE	Tak	0.0 a	33 g-m	67 b-g	0 d	22 mn	52.3 lm	U	BG	7.7 bcd
OVERLOOK	Sto	0.0 a	50 c-j	47 e-l	3 cd	53 f-l	59.5 a-g	U	BG	8.3 abc
37-136	SN	0.0 a	43 d-k	47 e-l	10 bcd	57 e-k	53.5 jklm	U	BG	7.7 bcd
SAMARI	CF	0.0 a	57 b-h	43 f-l	0 d	57 e-k	55.6 e-l	U	BG	9.0 a
FRONTIER	Tak	0.0 a	27 i-o	73 a-e	0 d	67 c-j	53.3 klm	U	BG	7.0 de
37-346B	SN	0.0 a	23 j-o	73 a-e	0 d	60 d-k	52.1 lm	U	BG	6.3 ef
CARTIER	Bejo	0.0 a	60 b-g	40 g-l	0 d	53 f-l	54.6 g-m	U	BG	5.7 f
ONEIDA	Bejo	0.0 a	50 c-j	50 d-k	0 d	47 h-m	54.0 i-m	U	G	6.3 ef
<b>TRIAL AVERAGE</b>		<b>0.0</b>	<b>39.0</b>	<b>56.0</b>	<b>4.9</b>	<b>62.5</b>	<b>57.0</b>			<b>7.9</b>

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

## ONION CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025

### **Milestone:**

*American Takii sample*, Average appearance, Average tight neck finish, Small sized necks, Thin to average skin thickness, Fair to average skin quality, A few with skin cracking, Exterior colour a little uneven, A few with greening on skins, Interior colour white a little even, Good interior blending, Dead centers white and green (80/20), Green colour in rings (30-50%), Average packer, Uniformity of shape a little uneven, Good firm onion, Firmness a little uneven, Medium run size a little even, Mid term storage onion.

### **Traverse:**

*American Takii sample*, Nice appearance, Good tight neck finish, Small to medium sized necks, Average to thick skin thickness, Pretty good to nice skin quality, Odd one with skin cracking, Nice exterior colour even, Interior colour white a little even, Good interior blending a little even, Dead centers white or green (70/30), Green colour in rings (20%), Good to nice packer, Uniformity of shape a little even, Solid good to nice firmness, Firmness even, Medium run size even, Mid to long term storage onion.

### **Switchback:**

*American Takii sample*, Average appearance, Good tight neck finish, Small sized necks, Average skin thickness, Average skin quality, Some skin cracking a little concern, Exterior colour uneven, Odd one with greening on skins, Interior color white even, Good to great interior blending even, Dead centers white or green (75/25), Average packer, Uniformity of shape a little uneven, Average firmness, Firmness a little uneven, Medium run size uneven, Early to mid term storage onion.

### **Medusa Jumbo:**

*American Takii sample*, Average to nice appearance, Good tight neck finish, Small to medium sized necks, Average to thick skin thickness, Pretty good to nice skin quality, Odd one with skin cracking, Fairly dark exterior colour a little uneven, Interior color white a little uneven, Average to good interior blending uneven, Dead centers white or green (70/30), Green colour in rings (10%), Average to nice packer, Uniformity of shape uneven, Good firm onion, Firmness a little uneven, Medium run size a little uneven, Mid to long term storage onion.

.../continued

## ONION CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025 – continued

### Ridgeline:

*American Takii sample*, Average to good appearance, Good to great tight neck finish, Small to medium sized necks, Thicker skins, Average to pretty good skin quality, Odd one with skin cracking a little concern, Slightly darker exterior colour a little uneven, Odd one with greening on skins, Interior colour white even, Good interior blending, Dead centers white or green (80/20), Green colour in rings (30%), Average to good packer, Uniformity of shape a little uneven, Average to good firmness, Firmness a little uneven, Medium run size a little uneven, Mid to long term storage onion.

### Yakama:

*Bejo sample*, Average appearance, Good tight neck finish, Small sized necks, Thin skins, Fair skin quality, Some with skin cracking a little concern, Exterior colour fairly light uneven, Odd one with greening on skins, Interior colour white even, Average to great interior blending even, Dead centers white or green (70/30), Okay to average packer, Uniformity of shape a little uneven, Average firmness, Firmness a little uneven, Small to medium run size uneven, Early to mid-term storage onion.

### TTA 706:

*American Takii sample*, Average to good appearance, Good to great tight neck finish, Small to medium sized necks, Average to thick skin thickness, Average to pretty good skin quality, Odd one with skin cracking, Good exterior colour even, Odd one with greening on skins, Interior colour cream a little uneven, Average to good interior blending a little uneven, Dead centers white or green (65/35), Green colour in rings (30%), Average to good packer, Uniformity of shape uneven, Good firm onion, Firmness a little uneven, Small to medium run size a little uneven, Mid to long term storage onion.

.../continued

## ONION CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025 – continued

### Highlander:

*American Takii sample*, Poor to okay appearance, Perfect tight neck finish, Very small sized necks, Thin skins, Poor skin quality, Most with skin cracking concern, Lightly pale exterior colour even, A lot with greening on skins, Interior colour white even, Average to good interior blending, Dead centers white, Green colour in rings (50-80%), Poor packer, Uniformity of shape uneven, Average firmness, Firmness a little uneven, Small to medium run size a little uneven, Suspicion of doubles, Odd double onion, Early storage onion.

### Bradley:

*Bejo sample*, Good to nice appearance, Average tight neck finish, Medium sized necks, Thicker skins, Nice skin quality, Exterior colour uneven, Odd one with yellowing or greening on skins, Interior colour white a little even, Good interior blending even, Dead centers white or green (40/60), Good to nice packer, Uniformity of shape uneven, Nice solid firm onion, Firmness a little even, Medium run size uneven, Odd one suspicion of doubles, Long term storage onion.

### SVNY 2666:

*Seminis sample*, Average to good appearance, Average to good tight neck finish, Small to medium sized necks, Average skin thickness, Average skin quality, Odd one with skin cracking, Exterior colour uneven, A few with greening on skins, Interior colour white or cream a little even, Good interior blending even, Dead centers white, or green (70/30), Green colour in rings (30%), Average packer, Uniformity of shape very uneven, Average firmness, Firmness a little uneven, Medium run size a little uneven, Mid-term storage onion.

### SVNY 2297:

*Seminis sample*, Fair to average appearance, Good to great tight neck finish, Small to medium sized necks, Thin to average skin thickness, Average skin quality, Odd one with skin cracking, Exterior colour uneven, Some with greening on skins, Interior colour white or cream (65/35), Average to good interior blending, Dead centers white, or green (60/40), Green colour in rings (20-50%), Okay to good packer, Uniformity of shape very uneven, Good firm onion, Firmness a little uneven, Medium run size a little uneven, Mid to long term storage onion.

.../continued

**ONION CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025 – continued**

- Crockett:** *Bejo sample*, Good appearance, Average tight neck finish, Medium sized necks, Thicker skins, Nice skin quality, Fairly dark exterior colour even, Odd one with yellowing on skins, Interior colour white, Great interior blending even, Dead centers white or green (50/50), Good packer, Uniformity of shape a little uneven, Good solid onion, Firmness a little uneven, Medium run size a little uneven, Long term storage onion.
- TTA 746:** *American Takii sample*, Good to nice appearance, Good to great tight neck finish, Small sized necks, Average skin thickness, Average skin quality, Some with skin cracking, Exterior colour a little uneven, Odd one with greening on skins, Interior colour white or cream (60/40) uneven, Average to good interior blending, Dead centers white, Green colour in rings (30%), Average packer, Uniformity of shape a little even, Good firm solid onion, Firmness a little uneven, Small to medium run size a little uneven, Mid to long term storage onion.
- Medusa:** *American Takii sample*, Good appearance, Good tight neck finish, Small to medium sized necks, Thicker skins, Nice skin quality, A little dark exterior colour a little uneven, Odd one with yellowing on skins, Interior color cream a little uneven, Good interior blending even, Dead centers white or green (70/30), Green colour in rings (25%), Good packer, Uniformity of shape a little even, Good firm solid onion, Firmness a little uneven, Medium run size a little even, Odd one suspicion of doubles, Long term storage onion.
- Hamilton:** *Bejo sample*, Good to nice appearance, Average to good tight neck finish, Medium sized necks, Thicker skins, Nice skin quality, Fairly dark exterior colour even, Odd one with yellowing on skins, Interior colour bright white even, Good to great interior blending even, Dead centers white or green (80/20), Good packer, Uniformity of shape a little uneven, Good solid onion, Firmness even, Small to medium run size uneven, Long term storage onion.

.../continued

## ONION CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025 – continued

### **Killington:**

*Seminis sample*, Okay to average appearance, Good to great tight neck finish, Small sized necks, Thinner skins, Poor skin quality, Most with skin cracking a concern, Lighter exterior colour a little uneven, Odd one with greening on skins, Interior colour white a little uneven, Average to good interior blending, Dead centers white or yellow (60/40), Green colour in rings (10-40%), Okay packer, Uniformity of shape very uneven, Average firmness, Firmness uneven, Small to medium run size a little uneven, Suspicion of doubles, Early term storage onion.

### **Fortress:**

*Seminis sample*, Good appearance, Average to good tight neck finish, Small sized necks, Average to thicker skins, Nice skin quality, Exterior colour even, Odd one with greening or yellowing on skins, Interior colour white or cream (50/50) a little uneven, Average to good interior blending even, Dead centers white, Green colour in rings (30-70%), Good packer, Uniformity of shape uneven, Nice solid onion, Firmness a little uneven, Small run size a little even, Long term storage onion.

### **Catskill:**

*Stokes sample*, Average to good appearance, Good tight neck finish, Small sized necks, Average skin thickness, Pretty good skin quality, Odd one with skin cracking, Exterior colour uneven, Odd one with greening on skins, Interior colour white a little uneven, Average blending a little even, Dead centers white, Green colour in rings (25%), Average to good packer, Uniformity of shape very uneven, Good to nice firm solid onion, Firmness a little uneven, Medium run size uneven, Mid to long term storage onion.

### **Sat-1:**

*Seminova sample*, Fair to good appearance, Good to great tight neck finish, Small sized necks, Thin to average skin thickness, Poor to average skin quality, Some with skin cracking a little concern, Fairly light exterior colour a little uneven, Some with greening on skins, Interior colour white or cream a little uneven, Average to good interior blending, Dead centers white, Green colour in rings (40%), Okay to average packer, Uniformity of shape a little even, Average firmness, Firmness uneven, Small to medium run size a little uneven, Early to mid-term storage onion. .../continued

**ONION CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025 – continued**

**Y 604:**

*Seminova sample*, Fair to average appearance, Average to great tight neck finish, Small sized necks, Thin to average skin thickness, Poor to average skin quality, Some with skin cracking a little concern, Fairly light exterior colour a little uneven, Some with greening on skins, Interior colour white or cream (70/30), Average to good interior blending, Dead centers white or green (60/40), Green colour in rings (25%), Okay to average packer, Uniformity of shape uneven, Average to good firmness, Firmness a little uneven, Small to medium size a little uneven, Mid-term storage onion.

**La Salle:**

*Seminis sample*, Average to good appearance, Good to great tight neck finish, Small sized necks, Average skin thickness, Average to pretty good skin quality, Odd one with skin cracking, Exterior colour a little uneven, Some with greening on skins, Interior colour white a little even, Average to good interior blending, Dead centers white, Green colour in rings (25%), Average to good packer, Uniformity of shape uneven, Good firm onion, Firmness a little uneven, Medium run size a little uneven, Mid to long term storage onion.

**Lodestar:**

*American Taktii sample*, Average to good appearance, Average tight neck finish, Medium sized necks, Thick skins, Pretty good skin quality, Odd one with skin cracking, Fairly dark exterior colour even, Odd one with yellowing or white spots on skins, Interior color white or cream uneven, Average to good interior blending even, Dead centers white or green (45/55), Green colour in rings (10%), Average to good packer, Uniformity of shape a little even, Good solid onion, Firmness even, Medium run size a little uneven, Long term storage onion.

.../continued

### ONION CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025 – continued

- Sumo:** *Clifton sample*, Average appearance, Good to great tight neck finish, Small to medium sized necks (80/20), Thin to average skin thickness, Average skin quality, Some with skin cracking a little concern, Slightly light exterior colour uneven, Odd one with greening on skins, Interior colour white or cream (75/25), Average to good interior blending, Dead centers white or green (60/40), Green colour in rings (30-60%), Okay to average packer, Uniformity of shape uneven, Average to good firmness, Firmness a little uneven, Medium run size uneven, Mid-term storage onion.
- Venecia:** *Bejo sample*, Average to good appearance, Good to great tight neck finish, Small sized necks, Average skin thickness, Average to pretty good skin quality, Odd one with skin cracking, Colour slightly uneven, Interior colour white, Average to good interior blending, Dead centers white or green, Green colour in rings (15%), Average packer, Uniformity of shape uneven, Good firm onion, Firmness a little even, Small to medium run size a little uneven, Suspicion of doubles an issue, Mid-term storage onion.
- Safrane:** *Bejo sample*, Good appearance, Average to good tight neck finish, Small to medium sized necks uneven, Average to thicker skin thickness, Pretty good to nice skin quality, Odd one with skin cracking, Exterior colour a little uneven, Odd one with greening on skins, Interior colour cream or white (25/75) a little uneven, Average to good interior blending, Dead centers white or green (60/40), Green colour in rings (15%), Good to nice packer, Uniformity of shape uneven, Nice solid onion, Firmness even, Small to medium run size a little uneven, Long term storage onion.

.../continued

## ONION CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025 – continued

- Saddleback:** *Stokes sample*, Average appearance, Good tight neck finish, Small to medium sized necks, Thin to average skin thickness, Fair skin quality, Some skin cracking, Slightly light exterior colour a little uneven, Odd one with greening on skins, Interior colour cream or white (30/70) a little uneven, Good interior blending, Dead centers white or green (60/40), Green colour in rings (35%), Average packer, Uniformity of shape uneven, Good firm onion, Firmness a little uneven, Medium run size a little uneven, Suspicion of doubles, Mid-term storage onion.
- E61L.11216:** *Enza Zaden sample*, Good to nice appearance, Average to good tight neck finish, Small to medium sized necks, Average skin thickness, Average to nice skin quality, Odd one with skin cracking, Good to nice exterior colour even, Odd one with greening on skins, Interior colour white or green (40/60) a little even, Average interior blending, Dead centers white or green (75/25), Green colour in rings (20-90%), Average to nice packer, Uniformity of shape a little uneven, Good solid onion, Firmness even, Small to medium run size even, Long term storage onion.
- Stanley:** *Clifton sample*, Average to good appearance, Average to good tight neck finish, Medium sized necks, Average to thick skin thickness, Average to nice skin quality, Odd one with skin cracking, Exterior colour a little uneven, Some with yellowing on skins, Interior colour white or cream a little uneven, Average interior blending uneven, Dead centers white or green (65/35), Green colour in rings (20%), Average to good packer, Uniformity of shape a little uneven, Nice solid firm onion, Firmness even, Run size uneven, Long term storage onion.
- Gunnison:** *Bejo sample*, Good to nice appearance, Average to good tight neck finish, Small to medium sized necks, Average to thick skin thickness, Pretty good to nice skin quality, Good exterior colour even, Interior colour white a little uneven, Good interior blending, Dead centers white, Green colour in rings (20%), Good to nice packer, Uniformity of shape uneven, Good firm onion, Firmness a little uneven, Small to medium run size a little uneven, Mid to long term storage onion.

.../continued

## ONION CULTIVAR MAIN TRIAL EVALUATION NOTES – 2024 – continued

### **Skyline:**

*American Taktii sample*, Good to nice appearance, Great tight neck finish, Small sized necks, Average to thick skin thickness, Pretty good to nice skin quality, Exterior colour even, A few with yellowing on skins, Interior colour white or cream (65/35) a little uneven, Average to good interior blending uneven, Dead centers white or green (80/20), Green colour in rings (30%), Good packer, Uniformity of shape a little even, Nice solid onion, Firmness even, Small to medium run size, Long term storage onion.

### **Overlook:**

*Stokes sample*, Average to good appearance, Great tight neck finish, Small to medium sized necks, Thin to average skin thickness, Average to pretty good skin quality, Odd one with skin cracking, Fairly light exterior colour uneven, Odd one with greening or yellowing on skins, Interior colour white a little uneven, Average to good interior blending uneven, Dead centers white or green (80/20), Green colour in rings (20-50%), Average packer, Uniformity of shape very uneven, Average firmness, Firmness uneven, Small to medium run size uneven, Early to mid-term storage onion.

### **37 136:**

*Seminova sample*, Good appearance, Good to great tight neck finish, Small sized necks, Thin to average skin thickness, Pretty good to nice skin quality, Fairly light exterior colour a little uneven, Some greening on skins, Interior colour cream or green (65/35) uneven, Average to good interior blending, Dead centers white or green (90/10), Good packer, Uniformity of shape a little uneven, Good solid onion, Firmness a little uneven, Small run size uneven, Mid to long term storage onion.

.../continued

## ONION CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025 – continued

- Samari:** *Clifton sample*, Fair to average appearance, Good to perfect tight neck finish, Small sized necks, Thin to average skin thickness, Average skin quality, Odd one with skin cracking, A little light exterior colour a little uneven, A few with greening on skins, Interior colour white or cream (70/30), Average to good interior blending even, Dead centers white or green (70/30), Green colour in rings (10-80%), Okay to average packer, Uniformity of shape a little uneven, Good firm onion, Firmness a little uneven, Small run size uneven, Mid-term storage onion.
- Frontier:** *American Takii sample*, Average to good appearance, Average to great tight neck finish, Small to medium sized necks, Average skin thickness, Average to pretty good skin quality, Odd one with skin cracking, Exterior colour even, Odd one with white spots or greening on skins, Interior colour cream a little even, Average to good interior blending, Dead centers white or green (45/55), Average to good packer, Uniformity of shape uneven, Good firm onion, Firmness even, Small run size a little uneven, Mid to long term storage onion.
- 37 346B:** *Seminova sample*, Average appearance, Good to great tight neck finish, Small sized necks, Thin to average skin thickness, Average skin quality, Odd one with skin cracking, Exterior colour uneven, Odd one with greening or yellowing on skins, Interior colour white a little uneven, Average to good interior blending, Dead centers white or green (90/10), Green colour in rings (20%), Okay to average packer, Uniformity of shape uneven, Good firm onion, Firmness even, Small run size, Mid to long term storage onion.
- Cartier:** *Bejo sample*, Average to good appearance, Great tight neck finish, Small sized necks, Thin to average skin thickness, Average to nice skin quality, Odd one with skin cracking, Good exterior colour even, Odd one with greening on skins, Interior colour cream a little uneven, Poor to good interior blending uneven, Dead centers white or green (80/20), Green colour in rings (10-70%), Okay to good packer, Uniformity of shape a little uneven, Good firm onion, Firmness even, Small run size even, Mid to long term storage onion.

.../continued

**ONION CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025 – continued**

**Oneida:** *Bejo sample*, Average to good appearance, Good to great tight neck finish, Small to medium sized necks, Average skin thickness, Pretty good skin quality, Odd one with skin cracking, Exterior colour even, Interior colour white even, Average to good interior blending, Dead centers white or green (25/75), Green colour in rings (10%), Average to nice packer, Uniformity of shape a little uneven, Good firm onion, Firmness even, Small run size, Mid to long term storage onion.

**ONION CULTIVAR ADAPTATION TRIAL - 2025**

Cultivar	Source	# Bulbs Harvested	# Bulbs Jumbos > 89 mm	# Bulbs Lrg 89 - 76 mm	# Bulbs Med 76 - 64 mm	# Bulbs Small 64 - 32 mm	Total Harvest Weight (kg)	Wgt. Jumbo > 89 mm (kg)	Wgt. Large 89 - 76 mm (kg)	Wgt. Medium 76-64 mm (kg)	Wgt. Small 64-32 mm (kg)	Marketable Yield bu/A	% Marketable	Majority of Culls
DISKO	Sto	107	1	11	29	51	12.46	0.31	2.61	4.55	4.51	903	86.0	PW
OLYX 13-990	Cro	144	0	1	10	71	9.43	0.00	0.29	1.53	5.74	570	56.9	PW
OLYX 13-164	Cro	97	0	5	12	38	6.74	0.00	1.26	1.67	2.74	428	56.7	PW

Listed in order of % Marketable.

**ONION CULTIVAR ADAPTATION TRIAL - 2025**

	Shape	Uniformity of Shape	Uniformity of Size	Skin Thickness	Skin Attachment	Neck Finish	Overall Score	Firmness at Evaluation	Interior Colour	Exterior Colour	Exterior Colour Rating	Score	% Jumbo > 76 mm	
DISKO	Sto	G	5.0	7.0	9.0	6.0	6.0	9.0	W	DG	7.0	6.75	10.3	
OLYX 13-990	Cro	SpG	6.0	6.0	8.0	8.0	6.0	7.0	W	G	7.0	6.75	0.7	
OLYX 13-164	Cro	SpG	4.0	6.0	8.0	7.0	7.0	7.0	W	G	7.0	6.38	5.2	
10.0 = Most Desirable, 8.0 = Good, 6.0 = Average														
Cultivar	Source	Seeders	Stand/Foot	Average Weight/Bulb (g)	Days to Harvest	% Onion Maggot Damage	% Single Centers	% Double Centers	% Multiple Centers	% Hollowness in Centers	Top Height (cm)	Leaf Shape	Leaf Colour	Tip Burn Avg 1
DISKO	Sto	0.0	7.0	116.4	114	0.0	70	10	20	20	55.4	U	G	9.0
OLYX 13-990	Cro	0.0	9.4	65.5	103	0.0	80	20	0	30	51.3	B	BG	6.0
OLYX 13-164	Cro	0.0	6.3	69.5	114	0.0	90	10	0	20	49.3	B	BG	7.0

## ONION CULTIVAR ADAPATION TRIAL EVALUATION NOTES – 2025

- Disko:** *Stokes Seeds*, Good appearance, Average to good tight neck finish uneven, Odd neck finish bit rough, Small to medium neck size (30/70), Thicker skins, Nice skin quality, Dark exterior colour a little uneven, Odd one with yellowing on skins, Interior colour white or cream (70/30) a little uneven, Great interior blending even, Dead centers white or green (60/40), Green colour in rings (10%), Average to good packer, Uniformity of shape uneven, Nice solid onion, Firmness a little uneven, Run size uneven, Long term storage onion.
- OLYX 13-990:** *Crookham*, Good appearance, Good tight neck finish, Medium neck size, Average skin thickness, Pretty good skin quality, Odd one with skin cracking, Good exterior colour even, Odd one with greening on skins, Interior colour white or cream (80/20), Good interior blending, Dead centers white or green (70/30), Green colour in rings (30%), Good packer, Uniformity of shape uneven, Average firmness, Firmness even, Small run size, Mid-term storage onion.
- OLYX 13-164:** *Crookham*, Good appearance, Average tight neck finish, Medium neck size, Average skin thickness, Pretty good skin quality, Odd one with skin cracking, Good exterior colour even, Interior colour white, Average interior blending, Dead centers white or green (30/70), Average packer, Uniformity of shape uneven, Average firmness, Firmness a little uneven, Run size uneven mixed, Mid-term storage onion.

## LONG TERM AVERAGES OF ONION CULTIVAR TRIALS

Cultivar	Source	# Years Evaluated	Yield bu/A	% Marketable	% Jumbos >3"	Days to Maturity	Firmness In*	Firmness out*	Neck Finish	Score	% Onion Maggot Damage	# of Seeders
HIGHLANDER	Tak	21	997	85.7	12.4	92	8.6	6.0	9.3	6.19	3.0	0.0
ALPINE	Tak	11	1035	89.6	14.4	95	8.5	5.9	9.6	6.24	4.9	0.0
KILLINGTON	Sem	7	1224	91.9	17.0	97	9.1	6.5	7.6	6.10	1.6	0.1
TREKKER	Tak	11	1084	92.9	8.8	100	9.8	8.3	7.5	7.51	3.3	0.0
NORSTAR	Tak	28	1079	91.2	12.5	102	8.2	5.9	8.6	6.34	4.2	0.0
SADDLEBACK	Sem	10	1158	90.4	15.9	102	9.6	7.2	7.3	6.44	2.2	0.1
LA SALLE	Sem	16	1146	92.5	13.2	104	9.5	7.7	7.4	6.79	5.6	0.3
OVERLOOK	Sem	7	1198	91.4	15.4	105	9.6	6.8	7.0	6.20	2.9	0.5
ONEIDA	Bejo	8	957	80.7	5.8	105	9.5	7.9	7.6	7.36	2.5	0.1
RICOCHET	Sem	9	1134	96.8	30.5	105	9.6	8.0	7.5	7.11	7.8	0.5
TRAILBLAZER	Tak	15	1043	91.9	15.0	105	9.8	8.3	8.0	7.45	4.1	0.0
TRAVERSE	Tak	9	1163	94.4	11.0	105	9.6	8.1	7.5	7.49	2.0	0.0
ARSENAL	Sem	13	1232	97.6	15.0	106	9.6	8.1	7.6	7.16	5.2	1.7
FRONTIER	Tak	32	1071	92.2	9.0	106	9.9	8.1	8.0	7.57	4.2	0.0
MOUNTAINEER	Tak	13	1018	94.8	16.6	106	9.6	8.2	7.9	7.58	4.3	0.0

Listed in order of Days to Maturity.

\* 10.0 = Most Desirable, 7.5 = Good, 6.0 = Average

\* Firmness: A = Evaluated at time of Harvest

B = Evaluated in December

... / cont

## LONG TERM AVERAGES OF ONION CULTIVAR TRIALS - continued

Cultivar	Source	# Years Evaluated	Yield bu/A	% Marketable	% Jumbos <3"	Days to Maturity	Firmness In*	Firmness out*	Neck Finish	Score	% Onion Maggot Damage	# of Seeders	Leaf Length (cm)
CATSKILL	Sem	11	1211	93.2	15.5	106	9.7	7.6	7.3	6.80	3.9	0.0	67
RIDGELINE	Tak	10	1193	93.2	22.3	107	9.9	7.7	7.3	6.90	3.5	0.0	63
HAECKERO	Haz	6	902	90.8	10.4	107	10	9.2	6.8	7.07	8.1	0.0	63
CORONA	Bejo	23	1230	86.6	20.0	108	9.5	7.1	7.1	6.26	5.8	0.0	65
PATTERSON	Bejo	15	1181	93.7	13.6	108	9.8	8.7	6.9	7.43	5.7	0.7	67
TAHOE	Bejo	9	1214	95.0	20.0	108	9.6	8.2	7.1	7.32	6.5	1.9	66
BRADDOCK	Bejo	17	1226	90.3	14.8	109	9.6	7.8	6.7	9.94	2.5	0.5	67
MILESTONE	Tak	24	1295	95.8	22.5	111	9.6	7.5	6.7	7.13	3.8	0.0	65
STANLEY	CF	27	1157	91.4	16.5	111	9.9	8.5	6.5	7.08	3.9	0.8	65
FORTRESS	Sem	32	1066	94.5	7.8	111	9.8	8.0	6.8	7.33	3.2	1.1	65
SAFRANE	Bejo	20	1211	93.1	17.4	111	9.9	8.7	6.9	7.27	2.9	2.1	66
LIVINGSTON	Sol	14	1132	95.3	12.1	112	9.7	8.3	6.5	7.07	5.5	0.3	64
HAMLET	Sem	23	1230	94.1	13.3	112	9.8	8.1	7.1	7.19	8.1	0.2	65
PRINCE	Bejo	24	1233	93.6	22.2	115	9.8	8.6	6.2	7.20	5.4	0.4	66
CROCKETT	Bejo	14	1190	90.9	15.4	117	9.9	8.7	5.5	7.16	4.9	1.0	71

Listed in order of Days to Maturity.

\* 10.0 = Most Desirable, 7.5 = Good, 6.0 = Average

\* Firmness: A = Evaluated at time of Harvest

B = Evaluated in December

**MAIN ONION STORAGE TRIAL 2024 - 2025**

Cultivar	Source	% Marketable	% Weight Loss	% Sprouts	% Rot	% Soft	Firmness In *	Firmness Out **	% Sprouting at Base	% Sprouting at Top
TRAIL BLAZER	Sto	94.1 a*	2.00 k	2.79 i	0.57 def	0.00 d	10.0 a	8.8 abc	1.7 h	0.3 ef
LA SALLE	Sto	91.7 ab	2.53 jk	4.88 hi	0.42 ef	0.25 cd	9.5 bc	8.7 a-d	1.7 h	0.0 f
SAFRANE	Bejo	91.4 ab	3.44 ij	2.98 i	0.00 f	0.19 cd	10.0 a	8.5 a-d	1.3 h	0.0 f
SWITCHBACK	Tak	90.7 abc	3.76 fj	3.87 hi	0.08 ef	1.00 b	9.5 bc	7.2 fgh	0.7 h	2.0 def
POWELL	Bejo	90.2 abc	5.31 a-d	3.75 hi	0.46 ef	0.00 d	10.0 a	8.5 a-d	2.2 h	0.3 ef
37 346B	Haz	90.1 abc	3.69 g-j	5.70 hi	0.21 ef	0.00 d	10.0 a	9.0 ab	4.2 h	2.0 def
FRONTIER	Tak	90.0 abc	4.13 c-i	5.18 hi	0.28 ef	0.00 d	10.0 a	8.8 abc	2.8 h	3.0 b-f
GUNNISON	Bejo	89.8 abc	3.83 f-j	5.68 hi	0.55 def	0.00 d	9.8 ab	8.8 abc	3.5 h	0.0 f
HAECKERO	Haz	89.1 abc	4.55 b-i	3.78 hi	2.11 b-f	0.00 d	10.0 a	9.3 a	2.2 h	0.0 f
BRADDOCK	Bejo	89.0 abc	3.83 f-j	6.74 hi	0.12 ef	0.00 d	9.8 ab	8.0 c-f	3.7 h	2.7 c-f
MOUNTAINEER	Tak	87.9 abc	3.69 hij	7.54 hi	0.40 ef	0.00 d	9.8 ab	8.5 a-d	5.0 h	3.7 b-f
CATSKILL	Sto	84.7 abc	3.59 hij	10.67 hi	0.67 def	0.00 d	9.8 ab	7.3 e-h	6.3 h	1.0 ef
FORTRESS	Sto	84.2 abc	4.42 b-i	10.69 hi	0.43 ef	0.00 d	9.8 ab	8.7 a-d	7.3 gh	2.0 def
HAMILTON	Bejo	82.6 abc	4.83 b-i	11.31 hi	0.95 def	0.00 d	10.0 a	8.8 abc	7.7 fgh	0.0 f
STANLEY	CF	82.2 abc	4.10 d-i	12.58 hi	0.97 def	0.00 d	9.8 ab	8.5 a-d	7.7 fgh	0.7 ef
MILESTONE	Sto	78.3 a-d	4.03 d-i	16.31 ghi	1.02 def	0.00 d	10.0 a	7.3 e-h	9.7 fgh	0.7 ef
HIGHLANDER	Tak	77.1 a-d	3.85 e-j	8.06 hi	4.92 a	5.51 a	9.2 c	5.0 i	4.7 h	6.0 a-e

Listed in Order of Percent Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05 Fisher's Protected LSD Test.

\*\* 10.0 = Most Desirable, 7.5 = Good, 6.0 = Average

.../continued

**MAIN ONION STORAGE TRIAL 2024 - 2025 continued**

Cultivar	Source	% Marketable	% Weight Loss	% Sprouts	% Rot	% Soft	Firmness In *	Firmness Out **	% Sprouting at Base	% Sprouting at Top
SUMO	CF	75.9 a-d*	4.33 b-i	17.68 f-i	1.57 c-f	0.00 d	9.7 ab	8.2 b-e	9.0 fgh	2.2 def
CROCKETT	Bejo	75.0 a-e	5.15 a-f	18.96 f-i	0.54 def	0.00 d	10.0 a	8.8 abc	10.7 fgh	0.0 f
LODESTAR	Tak	73.2 b-f	4.64 b-i	21.76 e-h	0.25 ef	0.00 d	9.8 ab	8.3 bcd	16.0 e-h	0.3 ef
OVERLOOK	Sto	72.5 b-f	4.12 c-i	21.09 f-i	1.99 b-f	0.00 d	9.5 bc	7.3 e-h	11.7 e-h	0.7 ef
RIDGE LINE	Tak	71.8 c-f	4.67 b-i	19.01 f-i	3.13 a-d	0.77 bc	9.7 ab	7.0 gh	7.7 fgh	2.3 def
KILLINGTON	Sem	71.5 c-f	3.76 f-j	20.50 f-i	3.69 abc	0.22 cd	9.2 c	6.7 h	12.3 e-h	3.7 b-f
SKYLINE	Tak	61.9 d-g	5.39 a-d	32.56 d-g	0.00 f	0.00 d	10.0 a	8.0 c-f	31.3 d-g	0.0 f
Y 604	SN	60.5 d-g	4.11 d-i	33.06 d-g	1.89 b-f	0.00 d	10.0 a	7.8 d-g	31.7 def	4.0 b-f
THUNDERSTONE	SN	59.8 d-g	5.27 a-e	34.77 c-g	0.00 f	0.00 d	9.8 ab	8.0 c-f	35.0 de	0.0 f
SADDLEBACK	Sto	55.7 e-h	4.47 b-i	36.35 c-f	2.65 a-e	0.46 bcd	9.7 b	7.3 e-h	35.0 de	5.0 a-f
VENECIA	Bejo	53.8 fgh	4.99 a-h	40.45 cde	0.26 ef	0.00 d	9.7 ab	8.2 b-e	41.0 cd	8.3 abc
COPPERSTONE	Haz	47.5 ghi	5.56 abc	42.88 bcd	3.76 abc	0.00 d	9.8 ab	8.2 b-e	45.0 cd	0.3 ef
BRONSTONE	Haz	46.8 g-j	5.12 a-g	46.47 bcd	1.05 def	0.30 cd	9.7 ab	7.3 e-h	50.0 bcd	0.0 f
LODESTAR	SN	44.8 g-j	5.67 ab	49.10 a-d	0.14 ef	0.00 d	9.8 ab	8.3 bcd	55.0 bcd	7.0 a-d
37 293C	Haz	36.9 hij	4.59 b-i	53.40 abc	4.35 ab	0.29 cd	10.0 a	7.3 e-h	61.7 abc	8.7 ab
ONEIDA	Bejo	33.6 ij	4.37 b-i	61.53 ab	0.23 ef	0.00 d	9.8 ab	8.2 b-e	73.3 ab	2.3 def
YAKAMA	Bejo	27.9 j	6.36 a	65.35 a	0.33 ef	0.00 d	9.2 c	6.8 h	80.0 a	10.3 a
<b>TRIAL AVERAGE</b>		<b>72.1</b>	<b>4.36</b>	<b>21.69</b>	<b>1.18</b>	<b>0.26</b>	<b>9.8</b>	<b>8.0</b>	<b>20.0</b>	<b>2.3</b>

Listed in Order of Percent Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05 Fisher's Protected LSD Test.

\*\* 10.0 = Most Desirable, 7.5 = Good, 6.0 = Average

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## ONION CULTIVAR STORAGE TRIAL EVALUATION NOTES - 2024-2025

- Trail Blazer:** *Stokes sample*, Root sprouts just starting to light 0-1 cm, Majority skin rot, Odd basal plate rot, Basal plates just starting to push out 10-30%, Very firm onion, Firmness a little uneven, Long term storage onion, Stored excellent.
- La Salle:** *Stokes sample*, Root sprouts just starting 0-1 cm, Botrytis rot, Basal plates just starting to push out 30-80%, Firm onion, Firmness slightly uneven, Long term storage onion, Stored nice to excellent.
- Safrane:** *Bejo sample*, Root sprouts just starting 0-1 cm, Basal plates just starting to push out 25-30%, Fairly firm onion, Mid to long term storage onion, Stored nice to excellent.
- Switchback:** *American Takii sample*, Top sprouts just starting to light 0-1 cm, Root sprouts just starting 0-1 cm, Internal rot, Basal plates just starting to push out 40-80%, Firm onion, Firmness slightly uneven, Mid-term storage onion, Stored good to nice.
- Powell:** *Bejo sample*, Root sprouts just starting 0-1 cm, Majority skin rot, A few internal rot, Basal plates just starting to push out 10-50%, Fairly firm onion, Long term storage onion, Stored nice to excellent.
- 37 346 B:** *Hazera sample*, Top & root sprouts just starting 0-1 cm, Internal rot, Basal plates just starting to push out 10-50%, Firm onion, Firmness even, Long term storage onion, Stored excellent.
- Frontier:** *American Takii sample*, Top & root sprouts just starting 0-1 cm, Skin rot, Basal plates just starting to push out 33-70%, Firm onion, Firmness slightly uneven, Long term storage onion, Stored nice to excellent.
- Gunnison:** *Bejo sample*, Root sprouts just starting 0-1 cm, Majority basal plate rot, Some internal rot, Odd skin rot, Basal plates just starting to push out 10-20%, Firm onion, Firmness even, Long term storage onion, Stored nice to excellent.
- Haeckero:** *Hazera sample*, Root sprouts just starting 0-1 cm, Basal plate, skin and internal rot, Basal plates just starting to push out 5-10%, Very firm onion, Firmness even, Long term storage onion, Stored excellent.

.../continued

## ONION CULTIVAR STORAGE TRIAL EVALUATION NOTES - 2024-2025 -- continued

- Braddock:** *Bejo sample*, Top & root sprouts just starting 0-1 cm, Basal plate rot, Basal plates just starting to push out 10-30%, Firm onion, Firmness slightly uneven, Mid to long term storage onion, Stored good to nice.
- Mountaineer:** *American Takii sample*, Top & root sprouts just starting 0-1 cm, Majority internal rot, Some basal plate rot, Basal plates just starting to push out 20-60%, Firm onion, Firmness slightly uneven, Long term storage onion, Stored nice.
- Catskill:** *Stokes Seeds sample*, Top & root sprouts just starting 0-1 cm, Majority basal plate rot, Some skin rot, Basal plates just starting or pushing out 10-50%, Okay firmness, Firmness slightly uneven, Mid-term storage onion, Stored fair to good.
- Fortress:** *Stokes sample*, Top & root sprouts just starting 0-1 cm, Internal & basal plate rot, Basal plates just starting to push out 30-40%, Firm onion, Firmness slightly uneven, Long term storage onion, Stored nice to excellent.
- Hamilton:** *Bejo sample*, Root sprouts just starting 0-1 cm, Majority internal rot, Odd basal plate rot, Basal plates just starting to push out 10-40%, Firm onion, Long term storage onion, Stored good to nice.
- Stanley:** *Clifton sample*, Top & roots sprouts just starting 0-1 cm, Some internal rot, Odd neck rot, Basal plates just starting to push out 15-45%, Firm onion, Long term storage onion, Stored nice.
- Milestone:** *American Takii sample*, Top & root sprouts just starting 0-1 cm, Internal & skin rot, Basal plates just starting or pushing out 80%, Firmness uneven, Early to mid-term storage onion, Stored okay to nice.
- Highlander:** *American Takii sample*, Top sprouts just starting to light 0-2.5 cm, Root sprouts just starting 0-1 cm, Majority skin rot, Odd internal rot, Basal plates pushing out 90%, Soft onion, Firmness uneven, Early storage onion, Stored a little poor.
- Sumo:** *Clifton sample*, Top & roots sprouts just starting 0-1 cm, Majority internal rot, A few skin rot, Basal plates just starting to push out 15-40%, Firmness slightly uneven, Mid to long term storage onion, Stored good to nice.

.../continued

### ONION CULTIVAR STORAGE TRIAL EVALUATION NOTES - 2024-2025 -- continued

- Crockett:** *Bejo sample*, Root sprouts just starting 0-1 cm, All internal rot, Basal plates just starting to push out 50-75%, Firm onion, Firmness even, Long term storage onion, Stored nice to excellent.
- Lodestar:** *American Takii sample*, Root sprouts just starting 0-1 cm, Internal & skin rot, Basal plates just starting to push out 35-65%, Firm onion, Firmness slightly uneven, Mid to long term storage onion, Stored good to excellent.
- Overlook:** *Stokes Seeds sample*, Top & root sprouts just starting 0-1 cm, Majority skin rot, Odd internal & basal plate rot, Basal plates just starting to push out 40-50%, Firmness uneven, Early to mid-term storage onion, Stored okay to good.
- Ridgeline:** *American Takii sample*, Top & root sprouts just starting 0-1 cm, All skin rot, Basal plates just starting to push out 30-80%, Okay firmness, Firmness uneven, Early to mid-term storage onion, Stored a little poor to fair.
- Killington:** *Seminis sample*, Top & root sprouts just starting 0-1 cm, Majority skin rot, A few internal rot, Odd basal plate rot, Basal plates just starting or pushing out 20-75%, Firmness uneven, Early to mid-term storage onion, Stored okay.
- Skyline:** *American Takii sample*, Root sprouts just starting 0-1 cm, No rot, Basal plates just starting to push out 10-25%, Firmness uneven, Mid-term storage onion, Stored fair to good.
- Y 604:** *Seminova sample*, Top & root sprouts just starting 0-1 cm, Majority skin rot, Odd internal rot, Basal plates just starting to push out 20-60%, Firmness uneven, Mid-term storage onion, Stored okay to good.
- Thunderstone:** *Seminova sample*, Root sprouts just starting 0-1 cm, No rot, Basal plates just starting to push out 15-45%, Firmness uneven, Mid to long term storage onion, Stored okay to nice.
- Saddleback:** *Stokes sample*, Top sprouts just starting to light 0-1 cm, Root sprouts just starting 0-1 cm, Internal & skin rot, Basal plates just starting to push out 30-70%, Okay firmness, Firmness slightly uneven, Early to mid-term storage onion, Stored okay to good.
- Venecia:** *Bejo sample*, Top sprouts just starting to light 0-1 cm, Root sprouts just starting 0-1 cm, Majority internal rot, Odd basal plate rot, Basal plates just starting to push out 15-50%, Mid to long term storage onion, Stored a little poor to nice. **.../continued**

**ONION CULTIVAR STORAGE TRIAL EVALUATION NOTES - 2024-2025 -- continued**

- Copperstone:** *Hazera sample*, Root sprouts just starting 0-1 cm, Skin & internal rot, Basal plates just starting to push out 25-65%, Fairly firm onion, Firmness slightly uneven, Mid-term storage onion, Stored a little poor to nice.
- Bronstone:** *Hazera sample*, Root sprouts just starting 0-1 cm, Skin & internal rot, Basal plates just starting to push out 15-25%, Okay firmness, Firmness slightly uneven, Mid-term storage onion, Stored okay to good.
- Lodestar:** *Seminova sample*, Top & root sprouts just starting 0-1 cm, Some basal plate rot, Basal plates just starting or push out 60-65%, Firmness slightly uneven, Mid term storage onion, Stored fair to nice.
- 37 293 C:** *Hazera sample*, Top & roots just starting to light 0-1 cm, Majority skin rot, A few basal plate rot, Basal plates just starting to push out 15-25%, Firmness uneven, Mid-term storage onion, Stored a little poor to good.
- Oneida:** *Bejo sample*, Top & root sprouts just starting 0-1 cm, Sprouting is a concern, Basal plate rot, Basal plates just starting to push out 20-40%, Fairly firm onion, Firmness slightly uneven, Mid-term storage onion, Stored fair to good.
- Yakama:** *Bejo sample*, Top & root sprouts just starting 0-1 cm, Root sprouts are a concern, Skin rot, Basal plates just starting or pushing out 50-90%, Firmness uneven, Early to mid-term storage onion, Stored poor to fair.

## LONG TERM AVERAGES OF ONION STORAGE TRIALS

CULTIVAR	SOURCE	# YEARS TESTED	% MARKETABLE	% WT LOSS		% ROT, SOFT & SPROUT		FIRMNESS *	
				IN STORAGE	STORAGE	SPROUT	IN	OUT	
INFINITY	BCSVS	9	84.6	5.9		8.3	9.68	6.68	
CANADA MAPLE	Sto	9	83.3	8.3		8.3	NA	7.40	
TAURUS	Sem	9	82.9	7.3		9.8	NA	5.85	
MILLENNIUM	BCSVS	8	82.8	6.6		10.5	4.95	6.85	
TAHOE	Bejo	9	82.8	5.0		11.9	9.70	7.68	
TRAILBLAZER	Tak	15	81.9	5.4		11.9	9.78	7.59	
LA SALLE	Sem	15	81.1	5.9		12.6	9.51	6.74	
PATTERSON	Bejo	14	81.0	6.1		12.2	9.85	7.61	
TRAPPS #8	E.J.	9	79.9	8.9		11.3	NA	6.35	
TREKKER	Tak	11	79.1	7.0		13.2	9.88	6.64	
HAMLET	Sem	25	78.1	7.4		15.2	9.60	6.46	
HAECKERO	Haz	6	77.8	6.6		15.0	9.97	7.75	
STANLEY	CF	27	77.4	6.7		15.3	9.86	7.29	
POWELL	Bejo	7	77.3	7.6		14.5	9.93	6.73	
NEBULA	Nun	8	77.2	5.8		16.3	9.60	7.40	
LIVINGSTON	Sol	13	76.1	6.9		13.8	9.70	6.90	
SCORPION	Cro	7	75.9	7.1		17.6	9.76	7.14	
ARSENAL	Sem	13	74.7	7.0		18.7	9.65	6.02	
POCONO	Sem	7	74.7	6.4		18.0	9.66	6.66	
BRADDOCK	Bejo	20	74.6	6.3		18.7	9.59	6.82	

Listed in order of % Marketable.

Storage period approximately 11 months.

\* 10.0 = Most Desirable, 8.0 = Good, 6.0 = Average

## LONG TERM AVERAGES OF ONION STORAGE TRIALS - continued

CULTIVAR	SOURCE	# YEARS TESTED	% MARKETABLE	% WT LOSS		% ROT, SOFT & SPROUT		FIRMNESS *	
				IN STORAGE	STORAGE	SPROUT	IN	OUT	
FORTRESS	Sem	31	74.6	7.9	17.4	9.64	6.94		
SAFRANE	Bejo	18	74.1	6.4	18.6	9.84	7.37		
PRINCE	Bejo	24	73.9	8.9	17.9	9.70	6.92		
PARAGON	BCSVS	10	73.5	11.2	17.1	9.00	6.90		
TAMARA	Bejo	9	71.9	9.9	21.8	9.85	6.75		
TARMAGON	Sto	6	70.5	10.1	19.1	8.25	5.25		
MOUNTAINEER	Tak	13	70.0	5.7	23.8	9.51	6.88		
MILESTONE	Tak	23	69.4	6.4	23.6	9.63	5.93		
CROCKETT	Bejo	13	67.7	7.3	24.2	9.92	7.82		
FRONTIER	Tak	30	67.5	7.5	25.7	9.84	7.14		
CATSKILL	Sem	10	64.8	6.2	28.7	9.71	6.51		
HUSTLER	HM	11	64.1	9.9	27.8	8.00	5.30		
TRAVERSE	Tak	8	60.2	7.1	32.0	9.59	6.45		
RICOCHE	Sem	9	58.0	6.1	33.9	9.60	5.93		
RIDGE LINE	Tak	9	57.8	6.9	34.6	9.84	5.98		
KILLINGTON	Sem	6	56.8	6.0	36.9	9.07	5.93		
SADDLEBACK	Sem	9	56.3	6.3	36.9	9.62	6.18		
CORONA	Bejo	23	55.4	9.6	37.0	9.47	5.56		
NORSTAR	Tak	28	51.7	9.8	40.1	8.26	4.71		
ONEIDA	Bejo	7	48.8	7.0	43.4	9.41	6.70		

Listed in order of % Marketable.

Storage period approximately 11 months.

\* 10.0 = Most Desirable, 8.0 = Good, 6.0 = Average

### RED ONION CULTIVAR TRIAL SEASON SUMMARY – 2025

Compared to the previous 10-year average, air temperatures in 2025 were above average for June (20.0°C) and July (22.6°C), average for September (16.6°C) and below average for May (12.8°C) and August (19.6°C). The 10-year average temperatures were: May 13.6°C, June 18.6°C, July 21.3°C, August 20.5°C and September 17.0°C. Monthly rainfall was below the 10-year average for June (46 mm) and August (54 mm) and above average for May (112 mm) and July (84 mm) and September (82 mm). The 10-year rainfall averages were: May 61 mm, June 94 mm, July 74 mm, August 73 mm and September 48 mm.

Above seasonal temperatures from 17 April on allowed for the ground frost to thaw and by the end of April the soil was satisfactory for seeding. A rainfall on 1 May (16.3 mm) prior to seeding slowed land preparation but created good soil moisture levels. Onion seeding in the Holland Marsh began the last week of April and was pretty much completed by the 9<sup>th</sup> of May. The trial was seeded on 8 May. The daytime air temperatures the first week after seeding were in the low to high twenties, with a mix of sun and cloud, and nighttime air temperatures were in the low single digits. Soil temperatures were in the low teens before seeding and climbed to mid teens after seeding. A soaking rainfall of 39.4 mm occurred on 17 May, 10 days after seeding. A couple more light rain showers on 22 and 23 May created wet soil conditions. A drop in both day and nighttime temperatures occurred ten to eighteen days after seeding. This was just as the onion seedlings were in the loop stage. Plant vigor and stand were affected in a negative way with flag leaf and first true leaf slower than expected. More seasonal air temperatures returned in the final few days of May and the month of June. A few light rain showers provided moisture that encourage onion seedling growth. The first true leaf was fully grown, and the second true leaf was approximately 1 inch in length on 10 June. Two herbicide applications of Prowl H2O were applied at the recommended rate on 26 May and 28 June when there was good soil moisture. Three herbicide applications of Goal and Pardner were applied at the recommended rate on 4, 6 and 12 June to cleaned up broadleaf weeds. Weed pressure decreased as the season progressed, however a couple of hand weeding events were required to keep the trial free from weeds. Even with the below average rainfall amount in June and average rainfall in July, the onions maintained steady growth. One inch of irrigation water was applied twice on 15 July and 6 August to encourage growth. When leaf lengths were recorded in the week of 21 July, the average leaf length was 60.7 cm, a 3 cm increase in length compared to the main yellow trial average heights.

On-station monitoring for onion maggot fly emergence began on 20 May with 0.06 flies/trap/day. There were no distinctive peaks in onion maggot fly numbers during the monitoring period. The highest count was reached on 31 July of 4.25 flies/trap/day. For the entire monitoring period, onion maggot fly numbers continually had small waves of increasing and decreasing populations. Onion maggot populations were extremely low for the entire season. At evaluation there was a trial average of 0.3% onion maggot damage. This was a 0.2% drop from 2024 and a record low for damage in the main onion variety trial. The onions with the Sepresto seed treatment has certainly lowered onion maggot damage.

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## RED ONION CULTIVAR TRIAL SEASON SUMMARY - 2025 – continued

Thrips were first found on 3 July and were present throughout the rest of the growing season. Onion thrips numbers in the variety trial never reached above 0.25 thrips/leaf, well below the spray threshold of 3.0 thrips/leaf. The highest thrips count was 0.17 thrips/leaf on 16 July. Two insecticide applications of Movento on 1 and 12 July kept the thrips numbers low for the following 4 weeks. Additional Delegate and Agri-mek applications kept thrips below 1.0 thrips/leaf for the rest of the season. Rainfall and irrigation water also aided in keeping thrips levels very low for the growing season. Environmental conditions were low to moderate for fungal diseases to develop in June and August with below average, and July average seasonal precipitation. Stemphylium leaf blight was found in the cultivar trial on 16 July and several fungicide applications (see Onion Management Procedures) kept severity low to moderate until late August. When tip burn began in late July the percentage of leaf damage increased each week in August. A rating of tip burn was evaluated and recorded on 1 August. Tip burn was at a lower degree of damage with a trial average of 9.0 compared to the main yellow onion trial which had a trial average of 7.9. Botrytis and Downy mildew were not observed in the trial.

Bulb development started as expected in early August. Most bulb sizing occurred mid August. Cultivars Barolo (4 August) and Red Marley (6 August) were the first to lodge. It took approximately three weeks for 95% of the cultivars to reach 85% lodged. Approximately forty percent of the cultivars reached full maturity by 18 August when at least 85% of the onions had lodged. The average days to harvest (107 days) was an increase of 9 compared to the 2024 season. The onion tops dried down in a satisfactory time frame. No seeders were present in the trial. On 5 September, a sample from each cultivar was pulled for judging and comparison during Grower Field Day. By this time, most cultivars had lodged but leaves were 50-80% desiccated. All cultivars matured naturally resulting in acceptable neck finishes when yield samples were harvested on 10 and 11 September. Harvest samples from each cultivar were placed in storage on 10 October and cured artificially for approximately 48 hours.

At evaluation in early December, quality was good in most of the cultivars and yield potential varied considerably among cultivars. Cultivars Motely Red (1502 bu/A) and Red Marely (1436 bu/A) among the highest yielding entries. The trial had a moderate yield (average of 1145 bu/A) with a 50/50 split on the number of onions in either the 3-2½" medium size range or the 1 3/4 -2 ½" small size range. The first replicate had significantly lower yield compared to the second and third replicates higher yields. The trial average for the percentage of jumbos (>3" diameter) was 14.8%, which is a significant increase from 2024 (0.1%) and 2023 (2.3%). Sixty percent of the cultivars had a percentage of jumbos greater than 10%. The first replicate had significantly lower percentage of Jumbos compared to the third replicate. Uniformity of size varied by cultivar but was generally moderate. Several cultivars produced consistent bulb size, while others showed wider size distribution. Uniformity of size rating was only an average 6.4. The uniformity of shape had a below average rating of 5.7. During evaluation, shapes were highly variable within the individual samples. Only five cultivars had a rating of  
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### RED ONION CULTIVAR TRIAL SEASON SUMMARY - 2025 – continued

6.0 or greater for uniformity of shape. Red Garcia had the highest rating (8.3) for uniformity of shape. The first replicate had significantly lower ratings for uniformity of shape compared to the second and third replicate. The average stand count was 7.6 plants/ft, a decrease from 9.6 plants/ft in 2024. Stand counts were significantly lower in the second replicate (6.7 plants/ft) compared to the first and third replicates (8.3 and 7.7 plants/ft) respectively. The vast majority of unmarketable onions (culls) were undersized onions (peewees). There were very few double onions or rot issues found in the trial. The trial average for marketable onions was 90.9%, which is a 5% increase from the 2024 trial. Four cultivars had a percent marketable below 90%. Percent marketable was significantly lower in the first replicate compared to the second and third replicate. Skin quality was more average with a slight increase in skin cracking than the last couple of years, but still satisfactory. Skin thickness had an average trial rating of 6.3. Skins generally felt thinner to the touch. Skin attachment had a good rating of 7.2 with a slight increase in minor skin cracking on most cultivars. There was no skin rot found in the trial; however, Botrytis was found on a lot of the onion skins. Exterior colour was fair and a bit uneven in most cultivars. There were four cultivars with a below average rating of 6.0 or lower. There were very few onions with mechanical damage. Some browning or white speckling was found on the outer skins but very limited. Interior colour appeared to be lighter in colour; however, most cultivars rated average (6.0) or higher. Cultivars OLS14-1265 and EXP 378 had the highest interior colour ratings of 8.2 and 8.0, respectively. When onions were cut in half for interior colour evaluation, it was noted that 63.6% of the cultivars had a high percentage of double or multiple centers which was an increase of approximately 10% from 2024. Cultivars Red Garcia and OLS14-1265 had the highest percentage of single centers at 73.3 and 66.7%, respectively. Neck finishes were dry and mostly tight with a trial average of 7.2. There were limited rough neck finishes and most were found in the longer to mature cultivars. Cultivar EXR 378 had the best neck finish with a rating of 9. Three other cultivars had a neck finish rating of 8.0 or better. At evaluation all cultivars had maintained fair firmness. Firmness was a little less than what was expected considering how close to harvest the onions were evaluated, but still satisfactory. Cultivars Red Wing, E61L.10886 and Red Carpet had the best firmness with a great rating of 9.0, 8.7 and 8.7, respectively. Maggot damage in the evaluation samples ranged from 0 – 0.8%, with a trial average of 0.3%. This is the lowest average percent onion maggot damage ever. Six cultivars had no onion maggot damage. The seed treatment of Sepresto has significantly increased onion maggot control and decreased damage. When the onions were cut in half horizontally, a very small hole was observed near the heart of the onion. Center hollowness was found in all cultivars, with a trial average of 63.6%. This was a 3.5% decrease compared to the 2024 trial. Overall, Red Mountain and E61L.10886 provided the best balance of yield, stand strength, and internal quality, while Red Garcia stood out for best internal quality. Yield leaders did not always align with internal quality. For overall balance, Red Mountain and Red Garcia performed most consistently.

## RED ONION CULTIVAR TRIAL – 2025

### MANAGEMENT PROCEDURES

#### Fertilizer:

90 kg/ha Nitrogen (Calcium Ammonium Nitrate 27-0-0) + 90 kg/ha Phosphorous (MESZ 10-40-0) + 175 kg/ha Potassium (ASPIRE 0-0-58) + 125 kg/ha K-Mag (0-0-22) + 35 kg/ha Manganese + 5 kg/ha Copper (99% Cu) + 3.5kg/ha Boron and 100 kg/ha Gypsol was worked into the soil on 30 April.

A side dressing blend of 200 kg/ha Potassium was applied on 14 July.

#### Seeded:

All trials were seeded on 8 May. Pelletized onion seed was seeded with a Stanhay Precision Seeder. Raw onion seed was seeded with a V-Belt seeder equipped with a 5 cm wide scatter shoe. Row spacing was 43 cm. The trial was replicated three times and the Adaptation Trial was not replicated.

Pre-emergence: 1 application: **PARDNER** at 350 ml/ha on 15 May.

Post-emergence: 1 application: **PARDNER** at 70 ml/ha and **GOAL** at 70 ml/ha and Manganese at 1.0 kg/ha on 4 June.

2 applications: **PROWL H2O** 6.0 L/ha on 26 May and 28 June.

2 applications: **GOAL** at 140 ml/ha and **PARDNER** at 70 ml/ha and Manganese at 2.0 kg/ha on 6 & 12 June.

#### Minor Elements:

Eight foliar sprays: Calcimax on 10 & 21 June and 1 July (2.0 L/ha) and 12, 18 & 25 July and 1 & 8 August (3.0 L/ha)

Seven foliar sprays: Zinc Max on 10 & 21 June (2.0 L/ha) and 12, 18 & 25 July and 1 & 8 Aug (3.0 L/ha)

Seven foliar sprays: Mag Max on 21 June and 1 July (2.0 L/ha) and 12, 18 & 25 July and 1 & 8 August (3.0 L/ha)

Seven foliar sprays: Manganese Sulfate on 21 June and 1, 12, 18 & 25 July, 1 & 8 August (2.0 kg/ha)

Seven foliar sprays: Alexin on 1 July (2.0 L/ha) and 12, 18 & 25 July and 1, 8, & 15 August (3.0 L/ha)

Five foliar sprays: Suprafeed on 18, & 25 July and 1, 8 & 15 August (3.0 kg/ha)

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## **RED ONION CULTIVAR TRIAL - 2025 - continued**

### **Minor Elements continued:**

Four foliar sprays: 20-20-20 on 10 & 21 June and 1 & 12 July (2.0 kg/ha)

Two foliar sprays: Nutri Bor on 1 & 15 August (1.0 L/ha)

Two foliar sprays: Copper Max 1 & 15 August (1.0 L/ha)

### **Insect and Disease Control:**

According to IPM recommendations.

**MIRAVIS DUO** at 1.0 L/ha + **MOVEUTO** at 365 ml/ha and Minor Elements on 1 July.

**MIRAVIS DUO** at 1.0 L/ha + **MOVEUTO** at 365 ml/ha and Minor Elements on 12 July.

**LUNA TRANQUILITY** at 1.2 L/ha + **DELEGATE** at 336 g/ha and Minor Elements on 18 July.

**QUADRUS TOP** at 1.0 L/ha + **DITHANE DG** 3.0 kg/ha and Minor Elements on 25 July.

**ALLEGRO 500F** at 1.16 L/ha + **DELEGATE** at 336 g/ha and Minor Elements on 1 August.

**MIRAVIS DUO** at 1.0 L/ha + **AGRI-MEK SC** 270 ml/ha and Minor Elements on 8 August.

**DITHANE DG** 3.0 kg/ha and Minor Elements on 15 August.

### **Harvest:**

The trial was pulled and topped on 10 & 11 September. The trial was placed in a forced air and temperature controlled storage 10 October. The trial was cured for 48 hours (25°C, minimum 65% RH). After curing the temperature was lowered 5°C per week until 0°C was attained.

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**RED ONION CULTIVAR TRIAL - 2025 - continued**

**Skin Thickness:**

10.0 = Most Desirable      7.5 = Good      6.0 = Average

**Skin Attachment:**

10.0 = Most Desirable, skins well attached      7.5 = Good, skins have a few small cracks      6.0 = Average, skins have cracks but still attached

**Neck Finish:**

10.0 = Most Desirable, small tight neck      6.0 = Average, neck closed      4.0 = Poor, neck bit rough and open

**Overall Score:**

Based on quality and general appearance.

**Score:**

The average of nine marks at evaluation from Uniformity of Shape to Firmness.

**Firmness:**

10 = Desirable (solid and firm)      6.0 = Average (firm but some elasticity)      1.0 = Poor (spongy)

**Interior & Exterior Colour:**

LR = Light Red      R = Red      DR = Dark Red      DDR = Deep Dark Red

**Days to Harvest:**

Numbers of days from transplant until 85% of the tops were down.

**Percent Onion Maggot Damage:**

Percent of onions damaged by onion maggot ranging from pin hole to completely unmarketable that were found in the 4.66 m harvest sample.

**Average Weight/Bulb (g):**

The total weight in grams of all bulbs divided by the total number of bulbs. A bulb 51 mm (2") in diameter weighs approximately 70 g. A bulb 57 mm (2¼") in diameter weighs approximately 100 g. A bulb 64 mm (2½") in diameter weighs approximately 135 g.

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## RED ONION CULTIVAR TRIAL - 2025 - continued

**Seeders:**

The average number of seeders found in all three replicates of each cultivar.

**% Single Centers:**

Percentage of onions with only one heart.

**% Double Centers:**

Percentage of onions with two hearts.

**% Multiple Centers:**

Percentage of onions with three or more hearts.

**Top Height (cm):**

The average length of 20 randomly chosen onion tops from all three replicates from the ground to the tips as taken on 24 & 22 July. 50 cm is equal to 20 inches.

**Leaf Shape:**

B = Leaves are bent or hanging

U = Up right leaves, straight

**Leaf Colour:**

LG = Light Green, G = Green, BG = Blue Green, DG = Dark Green

**Tip Burn:**

VL = Very light

L = Low

M = Moderate

H = Heavy

S = Severe

**Irrigation:**

Irrigation water was applied twice during the 2025 season.

1 inch on 15 July

1 inch on 6 August

## RED ONION CULTIVAR TRIAL - 2025

Cultivar	Source	# Bulbs Harvested	# Bulbs Jumbos > 100 mm	# Bulbs X-Large 89 - 100 mm	# Bulbs Large 76 - 89 mm	# Bulbs Medium 64 - 76 mm	# Bulbs Small 32 - 64 mm	Stand/Foot	Seed Treatment
RED EAGLE	Bejo	95 a*	0 a	3 a	30 a	35 a	25 a	6.2 a	SE
RUBY RING	Tak	117 a	0 a	0 a	10 def	44 a	58 a	7.7 a	SE
37-140	SN	94 a	0 a	1 a	12 c-f	47 a	30 a	6.1 a	SE
RED WING	Bejo	105 a	0 a	1 a	23 a-d	38 a	38 a	6.8 a	SE
E61L.10886	EZ	116 a	0 a	2 a	16 b-e	48 a	44 a	7.6 a	SE
RED MOUNTAIN	Bejo	135 a	0 a	0 a	7 ef	51 a	69 a	8.9 a	SE
RUBILLION	Tak	113 a	0 a	0 a	11 def	37 a	56 a	7.4 a	SE
MOTELY RED	Sem	120 a	3 a	10 a	26 ab	38 a	33 a	7.9 a	SE
RED MARLEY	Sem	118 a	2 a	10 a	21 a-d	36 a	37 a	7.7 a	SE
RED CARPET	Bejo	109 a	0 a	0 a	16 b-e	46 a	36 a	7.1 a	SE
RED GARCIA	Sem	124 a	0 a	3 a	16 b-e	43 a	48 a	8.1 a	SE
BAROLO	EZ	136 a	0 a	2 a	17 a-e	37 a	64 a	8.9 a	SE
OLRS14-1265	Cro	118 a	0 a	5 a	26 abc	38 a	34 a	7.7 a	SE
EXP 378	Nor	121 a	0 a	0 a	2 f	15 a	69 a	7.9 a	SE
<b>TRIAL AVERAGE</b>		<b>116</b>	<b>0.4</b>	<b>2.6</b>	<b>16.7</b>	<b>39.5</b>	<b>46</b>	<b>7.6</b>	

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## RED ONION CULTIVAR TRIAL - 2025 - continued

Cultivar	Source	Total Harvest Weight (kg)	Wgt. Jumbo > 89 mm (kg)	Wgt. Large 76-89 mm (kg)	Wgt. Medium 76-64 mm (kg)	Wgt. Small 64-32 mm (kg)	Marketable Yield bu/A	% Marketable	Majority of Culls
RED EAGLE	Bejo	17.13 abc*	1.12 a	7.70 a	6.27 a	2.00 a	1289 abc	98.2 a	PW
RUBY RING	Tak	14.95 cd	0.00 a	2.37 def	6.92 a	5.47 a	1113 cd	95.7 ab	PW
37-140	SN	13.64 cd	0.21 a	2.93 b-f	7.48 a	2.73 a	1007 cd	95.4 ab	PW
RED WING	Bejo	15.57 cd	0.21 a	5.54 a-d	6.29 a	3.34 a	1160 bcd	95.2 ab	PW
E61L.10886	EZ	16.90 bc	0.62 a	3.74 b-e	7.89 a	4.22 a	1241 a-d	94.3 ab	PW
RED MOUNTAIN	Bejo	16.47 cd	0.00 a	1.57 ef	8.13 a	6.47 a	1220 a-d	93.6 ab	PW
RUBILLION	Tak	12.83 d	0.00 a	2.45 c-f	5.55 a	4.56 a	946 d	91.7 ab	PW
MOTELY RED	Sem	20.61 ab	4.65 a	6.23 a-d	5.89 a	3.14 a	1502 a	91.4 ab	PW
RED MARLEY	Sem	20.83 a	4.51 a	5.22 a-d	5.91 a	3.40 a	1436 ab	90.7 ab	PW
RED CARPET	Bejo	15.16 cd	0.09 a	3.66 b-e	7.69 a	3.28 a	1110 cd	90.2 ab	PW
RED GARCIA	Sem	15.26 cd	0.94 a	3.66 b-e	6.40 a	3.90 a	1123 bcd	88.7 ab	PW
BAROLO	EZ	15.83 cd	0.50 a	3.90 b-e	5.68 a	5.20 a	1152 bcd	88.5 ab	PW
OLRS14-1265	Cro	16.64 cd	1.85 a	5.70 abc	5.75 a	2.90 a	1222 a-d	88.1 b	PW
EXP 378	Nor	8.13 e	0.00 a	0.34 f	1.75 a	4.64 a	508 e	70.7 c	PW
<b>TRIAL AVERAGE</b>		<b>15.71</b>	<b>1.05</b>	<b>3.93</b>	<b>6.26</b>	<b>3.95</b>	<b>1145</b>	<b>90.9</b>	

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## RED ONION CULTIVAR TRIAL - 2025 - continued

Cultivar	Source	Shape	Uniformity of Shape	Uniformity of Size	Skin Thickness	Skin Attachment	Neck Finish	Overall Score	Score
RED EAGLE	Bejo	G	5.7 b-e*	6.7 a	6.0 c	8.3 ab	6.5 de	7.3 ab	6.98 abc
RUBY RING	Tak	G	5.7 b-e	7.7 a	6.7 bc	7.3 b	7.0 cd	7.0 abc	6.93 abc
37-140	SN	G	6.3 bc	6.0 a	6.2 c	8.0 ab	6.0 e	6.0 de	6.65 c
RED WING	Bejo	Top	5.7 b-e	7.0 a	6.3 c	8.7 a	6.0 e	6.7 bcd	6.89 abc
E61L.10886	EZ	Top	5.0 d-g	6.3 a	8.0 a	7.3 b	7.7 bc	7.3 ab	7.15 a
RED MOUNTAIN	Bejo	SpG	5.7 b-e	6.0 a	6.7 bc	9.0 a	7.0 cd	7.7 a	7.07 ab
RUBILLION	Tak	FG	6.0 bcd	6.7 a	7.3 ab	8.3 ab	7.7 bc	7.0 abc	7.11 a
MOTELY RED	Sem	Top	6.7 b	5.7 a	6.0 c	8.0 ab	6.0 e	6.3 cd	6.30 d
RED MARLEY	Sem	Mix	4.3 fg	5.3 a	6.0 c	5.7 c	8.3 ab	6.3 cd	6.26 d
RED CARPET	Bejo	SpG	5.3 c-f	6.7 a	6.7 bc	9.0 a	7.0 cd	7.3 ab	7.15 a
RED GARCIA	Sem	Top	8.3 a	6.3 a	6.0 c	8.0 ab	6.3 de	7.0 abc	6.81 abc
BAROLO	EZ	G	6.0 bcd	7.0 a	6.0 c	6.0 c	8.3 ab	6.5 cd	6.69 bc
OLRS14-1265	Cro	Mix	4.0 g	6.3 a	6.7 bc	4.0 d	8.0 b	5.3 e	6.09 d
EXP 378	Nor	SpG	4.7 efg	5.7 a	3.7 d	3.0 d	9.0 a	3.7 f	5.15 e
<b>TRIAL AVERAGE</b>			<b>5.7</b>	<b>6.4</b>	<b>6.3</b>	<b>7.2</b>	<b>7.2</b>	<b>6.5</b>	<b>6.66</b>

Listed in order of % Marketable.

10.0 = Most Desirable, 8.0 = Good, 6.0 = Average

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## RED ONION CULTIVAR TRIAL - 2025 - continued

Cultivar	Source	Firmness at Harvest	Firmness at Evaluation	Interior Colour	Interior Colour Rating	Exterior Colour	Exterior Colour Rating	Days to Harvest	% Onion Maggot Damage	Average Weight/Bulb (g)
RED EAGLE	Bejo	9.3 a*	8.3 bc	DR	6.7 cd	DR	7.3 a	110 abc	0.6 a	186.0 ab
RUBY RING	Tak	9.8 a	7.7 bcd	R	6.3 cde	R	7.0 ab	111 ab	0.6 a	131.3 cd
37-140	SN	9.7 a	8.0 bcd	DR	7.7 ab	R	5.7 cde	109 bc	0.4 a	146.6 a-d
RED WING	Bejo	9.8 a	9.0 a	DR	6.0 de	DR	6.7 abc	113 a	0.0 a	151.7 a-d
E61L.10886	EZ	9.8 a	8.7 ab	DR	7.0 bc	DR	7.0 ab	110 ab	0.6 a	149.1 a-d
RED MOUNTAIN	Bejo	9.5 a	8.0 bcd	DR	6.7 cd	DR	7.0 ab	111 ab	0.0 a	122.0 d
RUBILLION	Tak	9.5 a	7.7 cd	DR	6.7 cd	R	6.7 abc	102 e	0.0 a	117.3 de
MOTELY RED	Sem	9.7 a	7.7 cd	R	5.7 e	R	4.7 ef	107 cd	0.7 a	180.1 abc
RED MARLEY	Sem	9.5 a	7.3 d	LR	6.3 cde	LR	6.7 abc	102 e	0.4 a	193.1 a
RED CARPET	Bejo	19.8 a	8.7 ab	R	6.7 cd	DR	7.0 ab	111 ab	0.0 a	141.3 bcd
RED GARCIA	Sem	9.2 a	7.7 cd	R	5.7 e	DR	6.0 bcd	111 ab	0.0 a	126.5 d
BAROLO	EZ	9.3 a	7.7 cd	DR	6.0 de	R	6.7 abc	102 e	0.8 a	120.6 d
OLRS14-1265	Cro	9.3 a	7.3 d	DR	8.2 a	R	5.0 def	104 de	0.3 a	142.6 a-d
EXP 378	Nor	8.0 a	4.3 e	DR	8.0 a	R	4.3 f	92 f	0.0 a	67.9 e
<b>TRIAL AVERAGE</b>		<b>10.2</b>	<b>7.7</b>		<b>6.7</b>		<b>6.3</b>	<b>107</b>	<b>0.3</b>	<b>141.2</b>

Listed in order of % Marketable.

10.0 = Most Desirable, 8.0 = Good, 6.0 = Average

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

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## RED ONION CULTIVAR TRIAL - 2025 - continued

Cultivar	Source	Percent Single Centers	Percent Double Centers	Percent Multiple Centers	% Jumbo < 90 mm	% Jumbo > 76 - 90 mm	% Hollowness Centers	Top Heights (cm)	Leaf Shape	Leaf Colour	Tip Burn Avg 1
RED EAGLE	Bejo	10.0 fg*	56.7 bc	33.3 a	3.5 a	31.9 a	56.7 cd	62.5 ab	B	BG	8.3 de
RUBY RING	Tak	43.3 b-e	53.3 bc	3.3 c	0.0 a	8.8 bc	86.7 a	61.7 ab	U	BG	9.0 bcd
37-140	SN	33.3 c-f	53.3 bc	13.3 abc	0.7 a	13.1 bc	40.0 de	66.5 ab	B	BG	9.3 abc
RED WING	Bejo	30.0 c-g	66.7 ab	3.3 c	0.6 a	22.3 ab	60.0 bc	60.2 b	U	BG	8.7 cde
E61L.10886	EZ	50.0 a-d	33.3 cd	16.7 abc	1.7 a	13.5 bc	76.7 ab	63.1 ab	U	G	8.3 de
RED MOUNTAIN	Bejo	43.3 b-e	56.7 bc	0.0 c	0.0 a	4.9 c	60.0 bc	61.7 ab	U	BG	8.3 de
RUBILLION	Tak	53.3 abc	46.7 bcd	0.0 c	0.0 a	9.4 bc	90.0 a	60.2 b	U	BG	8.7 cde
MOTELY RED	Sem	23.3 d-g	56.7 bc	20.0 abc	10.5 a	21.9 ab	53.3 cd	66.8 a	B	BG	9.7 ab
RED MARLEY	Sem	16.7 efg	56.7 bc	26.7 ab	10.8 a	17.8 b	93.3 a	65.1 ab	B	BG	10.0 a
RED CARPET	Bejo	33.3 c-f	50.0 bcd	16.7 abc	0.3 a	14.7 bc	56.7 cd	60.1 b	U	G	9.0 bcd
RED GARCIA	Sem	73.3 a	23.3 d	3.3 c	2.4 a	12.9 bc	26.7 e	60.4 b	B	BG	9.7 ab
BAROLO	EZ	30.0 c-g	60.0 abc	10.0 bc	1.2 a	12.5 bc	53.3 cd	52.4 c	U	BG	9.7 ab
OLRS14-1265	Cro	66.7 ab	33.3 cd	0.0 c	4.8 a	21.8 ab	56.7 cd	60.0 b	U	G	9.3 abc
EXP 378	Nor	3.3 g	86.7 a	10.0 abc	0.0 a	1.7 c	80.0 a	49.0 a	B	G	8.0 e
<b>TRIAL AVERAGE</b>		<b>36.4</b>	<b>52.4</b>	<b>11.2</b>	<b>2.6</b>	<b>14.8</b>	<b>63.6</b>	<b>60.7</b>			<b>9.0</b>

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD Test.

## RED ONION CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025

- Red Eagle:** *Bejo sample*, Average to nice appearance, Average to good tight neck finish, Medium sized necks, Average skin thickness, Pretty good to nice skin quality, Fairly dark exterior colour a little uneven, , Odd one with brown spots on skins, Fairly dark interior colour a little uneven, Dead centers white (70%), Average to good interior blending a little uneven, Average to nice packer, Uniformity of shape uneven, Good firm onion, Firmness even, Medium to large run size, Run size a little even, Mid to long term storage onion.
- Ruby Ring:** *American Takii sample*, Good appearance, Good tight neck finish, Small to medium sized necks, Average skin thickness, Pretty good skin quality, Odd one with skin cracking, Exterior colour a little uneven, Some with brown spots on skins, Odd one with white spots on skins, Interior colour a little even, Dead centers white (85%), Average to good interior blending even, Good packer, Uniformity of shape a little uneven, Good firm onion, Firmness even, Small to large run size, Run size even, Mid to long term storage onion.
- 37 140:** *Semi Nova sample*, Average to good appearance, Average tight neck finish, Odd neck finish a bit rough, Neck finish uneven, Medium sized necks, Average to thicker skin thickness, Average to pretty good skin quality, Odd one with skin cracking, Basal plate rot, Exterior colour slightly uneven, Odd one with white spots on skins, Dark interior colour fairly even, Dead centers white (50%), Good interior blending even, Average to good packer, Uniformity of shape uneven, Solid firm onion, Average to good firmness, Firmness even, Small to large run size, Run size a little uneven, Mid to long term storage onion, Some Botrytis on out wrapper leaves.
- Red Wing:** *Bejo sample*, Average to good appearance, Average neck finish, Neck finish a bit rough, Medium to large sized necks, Thicker skins, Pretty good skin quality, Fairly dark exterior colour a little uneven, Odd one with white spots on skins, Slightly dark interior colour a little uneven, Dead centers white (70%), Average to good interior blending a little uneven, Average to good packer, Uniformity of shape uneven, Good solid onion, Firmness even, Small to large run size, Run size uneven, Long term storage onion.

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## RED ONION CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025 continued

**E61L 10886:** *Enza Zaden sample*, Good to nice appearance, Good to great tight neck finish, Small to medium sized necks, Average skin thickness, Pretty good to nice skin quality, Odd one with skin cracking, Dark exterior colour a little uneven, Odd one with white or brown spots on skins, Fairly dark interior colour a little even, Dead centers white (30%), Average to good interior blending a little uneven, Good to nice packer, Uniformity of shape even, Nice solid onion, Firmness even, Medium to large run size, Run size a little uneven, Long term storage onion.

**Red Mountain:** *Bejo sample*, Good to nice appearance, Good tight neck finish, Small to medium sized necks, Thicker skins, Pretty good to nice skin quality, Dark exterior colour even, Odd one with white or brown spots on skins, Fairly dark interior colour even, Dead centers white (60%), Good interior blending a little even, Average to nice packer, Uniformity of shape a little uneven, Good solid onion, Firmness a little even, Medium run size, Run size even, Long term storage onion.

**Rubillion:** *American Takii sample*, Average to good appearance, Good tight neck finish, Small sized necks, Average skin thickness uneven, Average to nice skin quality, Fairly dark exterior colour a little uneven, Odd one with white or brown spots on skins, Fairly dark interior colour a little even, Dead centers white (70%), Average to good interior blending, Average to good packer, Uniformity of shape uneven, Average to good firm onion, Firmness even, Small to medium run size, Run size even, Mid to long term storage onion.

**Motely Red:** *Seminis sample*, Good appearance, Average tight neck finish, Neck finish a little uneven, Medium sized necks, Average skin thickness, Pretty good skin quality, Exterior colour uneven, Odd one with brown spots on skins, Interior colour uneven, Dead centers white (50%), Average interior blending a little uneven, Average to good packer, Uniformity of shape a little uneven, Good firm onion, Firmness even, Medium to large run size, Run size even, Mid to long term storage onion.

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## RED ONION CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025 continued

- Red Marley:** *Seminis sample*, Average appearance, Good to great tight neck finish, Small sized necks, Thin to average skin thickness, Fair to average skin quality, A few with skin cracking, Slightly light exterior colour even, Odd one with white spots on skins, Some with brown spots on skins, Interior colour a little uneven, Dead centers white (65%), Average to good interior blending a little uneven, Average packer, Uniformity of shape uneven, Average firmness, Firmness a little uneven, Medium to large run size, Run size a little uneven, Suspicion of doubles, Early to mid-term storage onion.
- Red Carpet:** *Bejo sample*, Average to good appearance, Average to great tight neck finish, Medium sized necks, Thicker skins, Pretty good to nice skin quality, Dark exterior colour even, Slightly dark interior colour a little even, Dead centers white (60%), Average interior blending a little uneven, Good to nice packer, Uniformity of shape uneven, Nice solid onion, Firmness even, Medium run size, Run size a little uneven, Long term storage onion.
- Red Garcia:** *Seminis sample*, Average to good appearance, Average tight neck finish, Odd neck a bit rough, Mixed sized necks, Average to thicker skin thickness, Pretty good skin quality, Odd one with skin cracking, Fairly dark exterior colour uneven, Odd one with white spots on skins, Interior colour uneven, Dead centers white (80%), Average interior blending uneven, Good packer, Uniformity of shape even, Firm onion, Firmness a little uneven, Small to medium run size, Run size a little uneven, Mid to long term storage onion.
- Barolo:** *Enza Zaden sample*, Average to good appearance, Good to great tight neck finish, Small to medium sized necks, Thin to average skin thickness, Fair skin quality, Some with skin cracking a concern, Fairly dark exterior colour a little even, Odd one with white spots on skins, Fairly dark interior colour a little uneven, Dead centers white (30%), Average to good interior blending a little uneven, Okay to average packer, Uniformity of shape a little even, Good firm onion, Firmness even, Small to medium run size, Run size a little even, Mid to long term storage onion.

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**RED ONION CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025 continued**

**OLRS14-1265:** *Crookham sample*, Fair appearance, Odd one a bit rough in appearance, Great tight neck finish, Small sized necks, Thin skins, Poor to fair skin quality, A lot with skin cracking a concern, Exterior colour uneven, Odd one with brown or white spots on skins, Fairly dark interior colour even, Dead centers white (40%), Good to great interior blending a little even, Okay packer, Uniformity of shape very uneven, Average firm onion, Firmness a little uneven, Medium to large run size, Run size a little uneven, Early to mid-term storage onion.

**EXP 378:** *Norseco sample*, Poor appearance, Perfect tight neck finish, Small sized necks, Thin skins, Poor skin quality, All with skin cracking big concern, Exterior colour uneven, Odd one with brown spots on skins, Fairly dark interior colour a little even, Dead centers white (30%), Great interior blending even, Poor packer, Uniformity of shape uneven, Soft onion, Firmness a little uneven, Small run size, Run size uneven, Odd one with mechanical damage, Early term storage onion.

**LONG TERM AVERAGES OF RED ONION CULTIVAR TRIALS**

Cultivar	Source	# Years Evaluated	Yield bu/A	% Marketable	% Jumbos <sup>3</sup>	Days to Maturity	Firmness In*	Firmness out*	Neck Finish	Score	% Onion Maggot Damage	# of Seeders
RED SKY	Bejo	6	994	90.0	34.2	81	8.6	6.7	7.8	6.53	0.9	0.0
RED SPRING	Bejo	5	704	63.7	29.4	82	8.2	6.3	7.7	5.89	1.5	0.0
RED STONE	Haz	3	786	95.6	2.9	83	9.9	8.5	8.0	7.47	1.3	0.0
SV 4643	Sem	7	1273	89.7	57.0	89	9.5	7.0	6.9	6.32	1.2	1.1
RUBILLION	Tak	9	880	92.4	16.7	91	9.2	7.1	7.9	7.08	1.8	0.0
MERCURY	Sto	3	1173	86.1	47.5	91	8.8	6.8	6.7	6.07	0.0	0.2
RED HAWK	Bejo	7	1043	83.0	49.6	92	8.7	6.6	6.3	6.77	1.4	0.8
RED NUGENT	Sto	5	1344	89.4	56.5	94	9.4	6.8	6.9	6.07	2.1	0.1
BAROLO	EZ	5	987	85.3	13.8	96	9.5	7.7	7.2	6.79	2.7	0.0
RED BULL	Bejo	8	1128	93.2	42.4	97	9.6	8.0	6.6	6.90	1.1	0.2
RUBY RING	Tak	12	950	93.3	18.5	101	9.7	7.6	6.9	6.78	1.2	0.0
RED MOUNTIAN	Bejo	7	1124	91.9	16.0	102	9.6	7.7	7.3	7.13	1.6	0.0
RED CARPET	Bejo	9	1103	92.7	30.2	106	9.8	8.5	6.3	6.98	3.1	0.0
RED WING	Bejo	11	1236	95.4	41.4	110	9.7	8.3	6.5	7.12	0.7	0.0

All data based from 2011 season forward

Listed in order of Days to Maturity.

\* Firmness: In = Evaluated at time of Harvest

\* 10.0 = Most Desirable, 7.5 = Good, 6.0 = Average

Out = Evaluated in December

## RED ONION STORAGE TRIAL 2024-2025

Cultivar	Source	% Marketable	% Weight Loss	% Sprouts	% Rot	% Soft	Firmness In **	Firmness Out **	% Sprouting at Base	% Sprouting at Top
RUBILLION	Tak	86.1 a*	3.9 a	9.0 f	0.5 cd	0.0 a	9.2 c	8.5 ab	6.0 f	5.0 cd
RED MARLEY	Sto	66.4 ab	5.2 a	25.8 ef	2.5 a	0.0 a	9.3 bc	7.0 de	22.7 ef	12.7 a-d
RED GARCIA	Sem	59.6 b	5.3 a	32.8 ef	1.5 abc	0.4 a	9.5 abc	6.7 e	30.0 ef	5.3 cd
SV NT 4677	Sem	59.4 b	8.8 a	29.6 ef	1.7 a	0.2 a	9.3 bc	6.7 e	23.3 ef	26.7 a
RED MOUNTAIN	Bejo	59.3 b	6.2 a	33.4 e	0.4 d	0.2 a	9.2 c	7.8 bc	29.0 ef	5.3 cd
E6IL 10886	EZ	56.7 bc	5.7 a	36.9 de	0.4 d	0.0 a	9.7 ab	8.7 a	38.3 c-f	2.3 d
COMRAD	CF	53.7 bcd	4.7 a	40.9 cde	0.3 d	0.0 a	9.7 ab	8.0 abc	35.0 def	3.0 d
37-140	Haz	50.3 bcd	5.7 a	43.3 b-e	0.1 d	0.0 a	9.8 a	7.0 de	48.3 b-e	23.7 ab
RED WING	Bejo	33.7 cde	6.6 a	59.0 a-d	0.1 d	0.0 a	9.5 abc	8.3 abc	71.7 abc	7.3 bcd
RUBY RING	Tak	32.2 cde	8.3 a	58.6 a-d	0.6 bcd	0.0 a	9.7 ab	6.7 e	73.3 abc	15.0 a-d
RED CARPET	Bejo	30.8 de	6.9 a	61.5 abc	0.3 d	0.0 a	9.8 a	8.0 abc	68.3 a-d	6.7 cd
BAROLO	EZ	24.8 e	7.3 a	66.1 ab	1.6 ab	0.0 a	9.3 bc	7.8 bc	78.3 ab	20.0 abc
RED EAGLE	Bejo	22.2 e	6.6 a	70.5 a	0.3 d	0.0 a	9.7 ab	7.7 cd	85.0 a	8.3 bcd
<b>TRIAL AVERAGE</b>		<b>48.9</b>	<b>6.3</b>	<b>43.6</b>	<b>0.8</b>	<b>0.1</b>	<b>9.5</b>	<b>7.6</b>	<b>46.9</b>	<b>10.9</b>

Listed in Order of Percent Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05 Fisher's Protected LSD Test.

\*\* 10.0 = Most Desirable, 7.5 = Good, 6.0 = Average

## RED ONION CULTIVAR STORAGE TRIAL EVALUATION NOTES - 2024-2025

- Rubillion:** *American Takii sample*, Top & root sprouts just starting 0-1 cm, Majority skin rot, Odd internal rot, Basal plates just starting to push out 5%, Firm onion, Firmness even, Long term storage onion, Stored nice to excellent.
- Red Marley:** *Seminis sample*, Top sprouts just starting to light 0-2.5 cm, Root sprouts just starting 0-1 cm, Majority skin rot, Odd internal rot, Basal plates just starting to push out 10-45%, Firmness uneven, Early to mid-term storage onion, Stored fair.
- Red Garcia:** *Seminis sample*, Top sprouts just starting to light 0-2.5 cm, Root sprouts just starting 0-1 cm, Majority skin rot, Odd basal plate or neck rot, Basal plates just starting or push out 10-30%, Firmness uneven, Early to mid-term storage onion, Stored fair to good.
- SVNT 4677:** *Seminis sample*, Top sprouts just starting to moderate 0-2.5 cm, Top sprouts are a concern, Root sprouts just starting 0-1 cm, Basal plate or skin rot, Odd internal rot, Basal plates just starting to push out 10-20%, Firmness uneven, Early to mid-term storage onion, Stored a little poor to good.
- Red Mountain:** *Bejo sample*, Top & root sprouts just starting 0-1 cm, Majority basal plate rot, Odd skin rot, Basal plates just starting to push out 10-30%, Firmness slightly uneven, Mid to long term storage onion, Stored good to nice.
- E61L 10886:** *Enza Zaden sample*, Top & root sprouts just starting 0-1 cm, All basal plate rot, Basal plates just starting or push out 10-60%, Firm onion, Firmness even, Long term storage onion, Stored good to nice.
- Comrad:** *Clifton sample*, Top & root sprouts just starting 0-1 cm, Skin rot, Basal plates just starting to push out 15-40%, Fairly firm, Firmness slightly uneven, Mid to long term storage onion, Stored fair to nice.

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**RED ONION CULTIVAR STORAGE TRIAL EVALUATION NOTES - 2024-2025 - continued**

- 37 140:** *Hazera sample*, Top sprouts just starting to light 0-2.5 cm, Root sprouts just starting 0-1 cm, Skin and basal plate rot, Basal plates just starting to push out 15-30%, Firmness slightly uneven, Mid-term storage onion, Stored a little poor to nice.
- Red Wing:** *Bejo sample*, Top & root sprouts just starting 0-1 cm, Root sprouts are a concern, Internal and skin rot, Basal plates just starting or pushing out 40-60%, Firm onion, Firmness slightly uneven, Mid to long term storage onion, Stored okay to good.
- Ruby Ring:** *American Takii sample*, Top sprouts just starting to light 0-2.5 cm, Root sprouts light to moderate 0-1 cm, Root sprouting a concern, Neck, internal and basal plate rot, Basal plates just starting or pushing out 10-65%, Firmness uneven, Early to mid-term storage onion, Stored poor to fair.
- Red Carpet:** *Bejo sample*, Top & root sprouts just starting 0-1 cm, Basal plate or skin rot, Basal plates just starting or pushing out 10-80%, Firmness slightly uneven, Mid to long term storage onion, Stored poor to fair.
- Barlo:** *Enza Zaden sample*, Top sprouts just starting to light 0-2.5 cm, Root sprouts just starting 0-1 cm, Skin, basal plate or internal rot, Basal plates just starting to push out 15-25%, Firmness slightly uneven, Mid-term storage onion, Stored poor to fair.
- Red Eagle:** *Bejo sample*, Top & root sprouts just starting 0-1 cm, Internal and basal plate rot, Basal plates just starting to push out 50-60%, Firmness slightly uneven, Early to mid-term storage onion, Stored poor to fair.

**LONG TERM AVERAGES OF RED ONION STORAGE TRIALS**

CULTIVAR	SOURCE	# YEARS TESTED	% MARKETABLE	% WT LOSS IN STORAGE	% ROT, SOFT & SPROUT	FIRMNESS *	
						IN	OUT
RED MOUNTAIN	Bejo	8	58.4	5.7	35.2	9.60	7.15
RED BULL	Bejo	6	56.4	6.3	37.7	9.63	7.20
RED MARLEY	Sto	7	52.2	6.1	40.6	9.59	6.00
RUBY RING	Tak	10	51.7	6.8	39.0	9.57	6.51
RED WING	Bejo	8	51.4	5.9	42.8	9.65	7.20
RED HAWK	Bejo	5	49.7	6.5	45.0	8.58	6.10
RED NUGENT	Sto	5	48.4	7.0	43.3	9.35	5.44
RED CARPET	Bejo	8	45.7	6.4	48.0	9.70	7.30
RUBILLION	Tak	8	44.5	5.6	49.4	8.99	6.61
RED SKY	Bejo	4	30.7	5.4	64.1	8.58	6.28
RED SPRING	Bejo	5	2.5	12.1	85.1	8.00	3.72

Listed in order of % Marketable.

Storage period approximately 11 months.

\* 10.0 = Most Desirable, 8.0 = Good, 6.0 = Average

### BEEF CULTIVAR TRIAL SEASON SUMMARY – 2025

Compared to the previous 10-year average, air temperatures in 2025 were above average for July (22.6°C), average for September (16.6°C) and October (9.9°C) and below average for August (19.6°C). The 10-year average temperatures were: July 21.3°C, August 20.5°C, September 17.0°C and October 9.9°C. Monthly rainfall was below the 10-year average for August (54 mm) and October (45 mm) and above average for July (84 mm) and September (82 mm). The 10-year rainfall averages were: July 74 mm, August 73 mm, September 48 mm and October 58 mm.

Several light rainfalls prior to seeding provided good soil moisture levels and allowed for good bed formation. The trial was seeded on 3 July. Day time air temperatures were in the high twenties to low thirties, with a mix of sun and cloud and nighttime air temperatures were in the mid teens. Soil temperatures were in the mid twenties at seeding. A pre-emergence herbicide of Dual was applied on 8 July. A few light rainfalls (1/4") occurred 6 and 10 days after seeding. Irrigation water (3/4") was also applied 10 days after seeding. The combination of the two moisture sources encouraged good plant emergence and vigor. Additional rainfalls on 20 (5/8") and 26 July (1") provide good establishment of the beet varieties. Throughout the month of August the beets had steady good growth. Two applications of herbicide Upbeet only provided moderate weed control. Therefore hand weeding was required several times to keep the trial free from weeds. When leaf lengths were recorded on the 21 August, the average leaf length was 51.1 cm. There were significant differences for crop height between the first replicate (tallest) and third replicate (shortest). Beet development started in mid August. On 5 September a sample from each cultivar was pulled for judging and comparison during Grower Field Day. By this time, most cultivars were near maturity with good root sizing. Harvest occurred on 15 and 16 September and samples from each cultivar were placed in storage.

At evaluation in mid November, quality was good in most of the cultivars and yields varied between a high of 737 to a low of 456 bushels per acre. The trial yield average was 642 bu/A, a significant increase compared to the average yield of 304 bu/A in 2024. The majority of the cultivars had the highest number of beets in the 2-3" size range. The trial average for the percentage of jumbos (>3" diameter) was 15.4%, but no significant difference was found. Uniformity of size rating was average (6.1). Cultivar PV 954 received the best uniformity of size rating of 8.3 while 37% of the cultivars had a below average rating. The uniformity of shape had an average rating of 6.0. Three cultivars had a poor rating 4.7 or lower for uniformity of shape. During evaluation, shapes were close within the individual samples. Cultivar Red Cloud had the best rating of 8.7 for uniformity of shape and 42% of the cultivars had a rating below average for uniformity of shape. The average stand count was 11.1 plants/ft, slightly below the desired seeding rate of 14 plants/ft. The vast majority of unmarketable beets (culls) were undersized beets (pee-wees). No rot was found within the trial samples. The trial average for marketable beets was a very respective 91.1%. Cultivar Zeppo had the highest percent marketable (95.3%). Most beets had a fairly smooth skin

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### **BEET CULTIVAR TRIAL SEASON SUMMARY - 2025 – continued**

quality: however 6 cultivars were below average. Exterior colour had a trial average rating of 6.4 with Bazzu having the best rating of 9.0. Interior colour was good with a trial average of 7.4 with Scarlett having the best rating of 9.0. The trial average for zoning was only good 6.9 with significant difference between the cultivars. Very few cultivars had any discolour (white) or noticeable rings found in the interiors. Exterior, interior and zoning had a significantly different (higher) rating average in the second replicate compared to the third replicate. Very low presence of browning on scales was found on the outer skins. Cultivar Roditi had the best neck finish rating of 8.0. The majority of the beet cultivars had average neck finishes. Necks were mostly clean and tidy. The tap roots were long and fairly smooth with very little lateral side roots. Within each sample from each cultivar there were a few beets that had mouse damage. Most cultivars maintained good firmness from harvest to the evaluation. This second season of the beet cultivar trial was much more successful than the 2024 trial.

## BEET CULTIVAR TRIALS - 2025

### MANAGEMENT PROCEDURES

#### **Fertilizer:**

40 kg/ha Nitrogen (Calcium Ammonium Nitrate 27-0-0) + 75 kg/ha Phosphorous (MESZ 10-40-0) + 100 kg/ha Potassium (ASPIRE 0-0-58) + 100 kg/ha of K-Mag (0-0-22) + 35 kg/ha of Manganese Sulfate + 3.5 kg/ha Boron (10%) + 100 kg/ha of Gypsol and 30kg/ha of sulfur chips was worked into the soil.

#### **Seeded:**

The trial was seeded on 3 July using a push cone seeder. Seeding rate per foot was as instructed by the supplier. All trials were seeded on beds 86 cm apart. The seeding rate was done according to percent germination. The trial was replicated three times.

#### **Weed Control:**

Pre-emergence: 1 application: **DUAL** at 1.25 L/ha on 8 July.  
 Post-emergence: 1 application: **UPBEET** at 28 g/ha + **AGRAL 90** 2.5 ml/L on 18 July.  
 1 application: **UPBEET** at 70 g/ha + **AGRAL 90** 2.5 ml/L on 24 July.

#### **Minor Elements:**

No minor elements were applied.

#### **Insect and Disease Control:**

According to IPM recommendations.

No insecticides or Fungicides were applied.

#### **Harvest:**

The trial was harvested on 15 & 16 September. All trials were immediately placed in a temperature and humidity controlled storage (1°C, 95 % RH) respectively.

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## BEET CULTIVAR TRIALS - 2025 - continued

### EVALUATION PROCEDURES

The cultivars were evaluated on 17 – 21 November after 8 weeks in storage.

#### **# Carrots Harvested:**

Total number of beets harvested from 2.32 m of row.

#### **Harvest Weight:**

Weights from the harvested 2.32 m of row.

#### **Seeding Rate:**

Number of seeds per foot as specified by seed company.

#### **Stand per Foot:**

Stand per Foot times 3.28 equals Stand per Metre.

#### **Marketable Yield bu/A:**

Number of beets > 100 mm (> 4"), 100 mm to 75 mm (4" to 3"), 75 mm to 50 mm (3" to 2") and 50 mm to 25 mm (2" to 1").

#### **Average Weight/Beet (g):**

The total weight in grams of all beets divided by the total number of beets.

#### **% Oversize:**

The percentage of carrots > 75 cm (> 3") and greater.

#### **Majority of Culls:**

Sp = Splits      PW = Peewee (< 2.5 cm)      R = Rot

#### **External Colour:**

DR = Dark Red      R = Red      PR = Purple Red      LR = Light Red      LY = Light Yellow

#### **Internal Colour:**

DR = Dark Red      R = Red      PR = Purple Red      LR = Light Red      LY = Light Yellow

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## BEET CULTIVAR TRIALS - 2025 - continued

### Zoning:

10 = No rings noticeable even colour throughout      7.0 = Rings slightly noticeable      5.0 = Distinct noticeable rings

### Top Length (cm):

Small = 20-30 centimetres      Medium = 30-45 centimetres      Large = 45 centimetres and greater

### Leaf Colour:

LG = Light Green      G = Green      DG = Dark Green      PG = Pale Green

### Alternaria Leaf Infection:

Evaluation took place on 15 September. 10.0 = Most Desirable, no lesions; 8.0 = Good, mild lesions on leaves, no lesions on petioles; 6.0 = Moderate, lesions on leaves, some lesions on petioles; 3.0 = Poor, numerous lesions on leaves, numerous lesions on petioles; 1.0 = Severe, tops completely rotted, crop cannot be harvested.

### Shape:

G = Globe      HG = High Globe      Top = Top      Cyl = Cylindrical      FG = Flaten Globe      OB = Oblong

### Score:

The average of the 9 marks from Uniformity of Shape to Blight Rating. 10.0 = Most Desirable, 7.5 = Good, 6.0 = Average.

### Irrigation:

Irrigation water was applied three for the 2025 season:

13 July in the amount of  $\frac{3}{4}$  inch  
 23 July in the amount of  $\frac{3}{4}$  inch  
 8 August in the amount of  $\frac{3}{4}$  inch



## **Check out the Muck Crops Research Station's IPM X / Twitter Account**

The Muck Crops Research Station launched a X / Twitter account in 2014. The account communicates brief updates of the Station's IPM program along with other information to our growers, industry reps and academic personnel. The tweets consist of important pest alerts, reminders of up and coming events and other information that we hope will be helpful to our followers. So take some time, follow us and stay informed.



@MuckIPM



**BEET CULTIVAR MAIN TRIAL - 2025**

Cultivar	Source	# Beets Harvested	# Beets Jumbos > 100 mm	# Beets Lrg 100 - 75 mm	# Beets Med 75 - 50 mm	# Beets Small 50 - 25 mm	Seeds / Foot	Stand / Foot
SCARLETT	Nor	80 ab*	1 ns**	13 ab	38 ab	23 ab	14	5.3 ab
RED TITAN	ILL	63 b	2	12 ab	28 ab	15 b	14	4.1 b
BULLOCK	SN	105 a	1	9 ab	41 ab	42 ab	14	6.8 a
PV 9524	Nor	100 ab	0	6 b	46 a	40 ab	14	6.5 ab
BOREALIS	SN	69 ab	0	15 ab	30 ab	19 ab	14	4.5 ab
BAZZU	Bejo	63 b	0	7 ab	34 ab	18 ab	14	4.1 b
BULLOCK	Nor	109 a	0	10 ab	41 ab	40 ab	14	7.2 a
MANOLO	Bejo	74 ab	0	18 ab	34 ab	18 ab	14	4.8 ab
RED ATLAS	ILL	76 ab	1	15 ab	37 ab	19 ab	14	5.0 ab
ZEPO	RZ	82 ab	1	19 a	42 ab	15 b	14	5.3 ab

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Tukey's HSD Test.

\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

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**BEET CULTIVAR MAIN TRIAL - 2025 - continued**

Cultivar	Source	# Beets Harvested	# Beets Jumbos > 100 mm	# Beets Lrg 100 - 75 mm	# Beets Med 75 - 50 mm	# Beets Small 50 - 25 mm	Seeds / Foot	Stand / Foot
RED ACE	Sto	89 ab*	0 ns**	12 ab	40 ab	30 ab	14	5.8 ab
RODITI	RZ	76 ab	0	14 ab	38 ab	20 ab	14	5.0 ab
JOLIE	SN	82 ab	1	14 ab	34 ab	26 ab	14	5.4 ab
RED CLOUD	Bejo	79 ab	0	18 a	26 b	25 ab	14	5.1 ab
MONTY	RZ	83 ab	0	8 ab	40 ab	28 ab	14	5.4 ab
SCARLETT	SN	98 ab	0	9 ab	45 ab	30 ab	14	6.4 ab
BOHAN	Bejo	74 ab	1	17 ab	27 b	23 ab	14	4.8 ab
SCHRUTE	ILL	96 ab	0	10 ab	38 ab	34 ab	14	6.3 ab
BRANDY	ILL	108 a	0	10 ab	37 ab	44 a	14	7.1 a
<b>TRIAL AVERAGE</b>		<b>85</b>	<b>1</b>	<b>13</b>	<b>37</b>	<b>27</b>	<b>14</b>	<b>5.5</b>

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Tukey's HSD Test.

\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

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**BEET CULTIVAR MAIN TRIAL - 2025 - continued**

Cultivar	Source	Total Harvest Weight (kg)	Wgt. Jumbo > 100 mm (kg)	Wgt. Large 100-75 mm (kg)	Wgt. Medium 75-50 mm (kg)	Wgt. Small 50-25 mm (kg)	Marketable Yield bu/A	Weight / Root	% > 75 mm
SCARLETT	Nor	9.41 ab*	0.54 ns**	3.34 ab	4.69 ns	0.81 abc	707 ab	118.8 ab	17.1 ns
RED TITAN	ILL	8.79 ab	1.04	3.55 ab	3.66	0.52 c	662 ab	140.9 a	19.7
BULLOCK	SN	8.49 ab	0.29	2.14 ab	4.48	1.51 ab	635 ab	81.3 b	8.9
PV 9524	Nor	8.03 ab	0.00	1.51 b	4.90	1.59 a	603 ab	82.3 b	7.2
BOREALIS	SN	8.84 ab	0.14	3.55 ab	4.53	0.60 bc	665 ab	128.7 ab	21.8
BAZZU	Bejo	6.16 b	0.00	1.65 ab	3.69	0.72 abc	456 b	98.8 ab	12.0
BULLOCK	Nor	8.59 ab	0.13	2.68 ab	4.44	1.23 abc	639 ab	79.1 b	9.6
MANOLO	Bejo	9.18 ab	0.00	4.46 ab	4.08	0.61 bc	690 ab	124.8 ab	24.1
RED ATLAS	ILL	9.80 a	0.62	3.88 ab	4.61	0.67 abc	737 a	129.5 ab	19.3
ZEPO	RZ	9.95 a	0.58	4.32 ab	4.49	0.54 c	749 a	126.2 ab	25.0

Listed in order of % Marketable.

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\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

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**BEET CULTIVAR MAIN TRIAL - 2025 - continued**

Cultivar	Source	Total Harvest Weight (kg)	Wgt. Jumbo > 100 mm (kg)	Wgt. Large 100-75 mm (kg)	Wgt. Medium 75-50 mm (kg)	Wgt. Small 50-25 mm (kg)	Marketable Yield bu/A	Weight / Root	% > 75 mm
RED ACE	Sto	8.73 ab*	0.15 ns**	3.10 ab	4.35 ns	1.09 abc	656 ab	99.5 ab	14.3 ns
RODITI	RZ	8.70 ab	0.12	3.61 ab	4.32	0.62 abc	654 ab	115.1 ab	18.5
JOLIE	SN	8.85 ab	0.67	3.55 ab	3.85	0.74 abc	665 ab	108.0 ab	17.1
RED CLOUD	Bejo	9.40 ab	0.17	4.83 a	3.40	0.91 abc	702 ab	123.5 ab	24.3
MONTY	RZ	7.91 ab	0.12	2.06 ab	4.79	0.90 abc	594 ab	97.2 ab	10.4
SCARLETT	SN	8.11 ab	0.00	2.06 ab	4.90	1.02 abc	602 ab	83.0 b	9.4
BOHAN	Bejo	8.80 ab	0.29	4.21 ab	3.34	0.86 abc	656 ab	119.4 ab	22.6
SCHRUTE	ILL	8.44 ab	0.20	2.55 ab	4.39	1.22 abc	630 ab	90.0 ab	11.3
BRANDY	ILL	8.12 ab	0.22	2.47 ab	3.76	1.48 abc	598 ab	75.8 b	9.8
<b>TRIAL AVERAGE</b>		<b>8.61</b>	<b>0.26</b>	<b>3.12</b>	<b>4.22</b>	<b>0.94</b>	<b>644</b>	<b>105.7</b>	<b>15.9</b>

Listed in order of % Marketable.

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Tukey's HSD Test.

\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

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**BEET CULTIVAR MAIN TRIAL - 2025 - continued**

Cultivar	Source	% Marketable	Majority of Culls	Exterior Colour	Exterior Colour Rating	Interior Colour	Interior Colour Rating	Zoning	Leaf Lengths cm	Leaf Structure	Leaf Colour	Cercospora Infection Sept 15
SCARLETT	Nor	93.3 abc*	PW	R	6.0 b	R	9.0 a	8.3 a	55.5 ab	U	G	8.3 ns**
RED TITAN	ILL	92.9 abc	PW	R	5.3 b	R	6.3 def	6.0 b-e	49.8 abc	U	G	8.3
BULLOCK	SN	88.6 abc	PW	R	6.0 b	R	6.7 c-f	5.3 de	51.7 abc	B	G	7.7
PV 9524	Nor	93.6 abc	PW	R	5.7 b	DR	8.7 ab	8.3 a	49.0 bc	U	DG	8.3
BOREALIS	SN	93.7 ab	PW	LR	5.3 b	R	6.7 c-f	7.0 a-d	51.3 abc	U	G	8.7
BAZZU	Bejo	94.7 ab	PW	DR	9.0 a	DR	8.3 abc	8.0 ab	49.5 abc	U	G	9.0
BULLOCK	Nor	83.2 c	PW	R	6.3 b	R	6.7 c-f	6.0 b-e	51.3 abc	B	G	8.0
MANOLO	Bejo	94.7 ab	PW	DR	7.0 ab	R	8.0 a-d	7.8 abc	49.3 abc	U	G	9.0
RED ATLAS	ILL	94.2 ab	PW	R	5.3 b	R	6.7 c-f	6.0 b-e	51.3 abc	U	G	8.7
ZEPPU	RZ	95.3 a	PW	R	6.3 b	R	6.0 ef	6.3 a-e	48.4 bc	B	G	8.7

Listed in order of % Marketable.

10.0 = Most Desirable, 8.0 = Good, 6.0 = Average

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Tukey's HSD Test.

\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

**BEEET CULTIVAR MAIN TRIAL - 2025 - continued**

Cultivar	Source	% Marketable	Majority of Culls	Exterior Colour	Exterior Colour Rating	Interior Colour	Interior Colour Rating	Zoning	Leaf Lengths cm	Leaf Structure	Leaf Colour	Altemria Leaf Infection Oct 8
RED ACE	Sto	93.3 abc*	PW	R	5.7 b	R	7.0 b-f	6.7 a-d	52.2 abc	U	LG	9.0 ns**
RODITI	RZ	94.7 ab	PW	R	6.3 b	R	6.3 def	7.3 a-d	47.2 c	B	G	9.0
JOLIE	SN	91.2 abc	PW	R	6.3 b	R	5.7 f	4.3 e	51.7 abc	U	G	8.7
RED CLOUD	Bejo	89.8 abc	PW	R	6.3 b	R	7.7 a-e	7.0 a-d	51.9 abc	B	G	8.7
MONTY	RZ	92.6 abc	PW	R	7.0 ab	DR	8.3 abc	7.3 a-d	46.8 c	U	RG	8.0
SCARLETT	SN	85.6 abc	PW	R	6.3 b	DR	7.3 a-f	8.3 a	52.5 abc	U	G	8.3
BOHAN	Bejo	90.8 abc	PW	DR	7.3 ab	DR	8.3 abc	7.7 abc	57.2 a	U	G	9.0
SCHRUTE	ILL	86.2 abc	PW	DR	6.7 ab	DR	8.3 abc	7.7 abc	50.2 abc	B	RG	8.7
BRANDY	ILL	84.5 bc	PW	DR	7.0 ab	R	6.3 def	5.7 cde	51.2 abc	U	G	8.7
<b>TRIAL AVERAGE</b>		<b>91.1</b>			<b>6.4</b>		<b>7.2</b>	<b>6.8</b>	<b>50.7</b>			<b>8.6</b>

Listed in order of % Marketable.

10.0 = Most Desirable, 8.0 = Good, 6.0 = Average

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Tukey's HSD Test.

\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

**BEET CULTIVAR MAIN TRIAL - 2025 - continued**

Cultivar	Source	Shape	Uniformity of Shape	Uniformity of Size	Smoothness	Neck Finish	Root Attachment	Overall Rating	Score
SCARLETT	Nor	MIX	5.7 bc*	7.3 ab	5.7 cde	5.3 cd	6.3 ns**	5.7 bc	6.59 bcd
RED TITAN	ILL	R	3.3 c	4.3 c	5.7 cde	6.0 a-d	5.0	5.7 bc	5.30 f
BULLOCK	SN	R	7.3 ab	6.0 abc	6.3 a-e	5.3 cd	6.7	6.0 abc	6.19 c-f
PV 9524	Nor	R	6.7 ab	8.3 a	5.7 cde	5.0 d	5.7	5.3 bc	6.59 bcd
BOREALIS	SN	R	5.3 bc	5.3 bc	5.3 de	6.0 a-d	5.0	5.0 c	5.67 ef
BAZZU	Bejo	TOP	7.3 ab	7.3 ab	7.7 ab	7.3 abc	6.0	7.3 a	7.59 a
BULLOCK	Nor	R	7.0 ab	5.7 abc	6.0 b-e	6.3 a-d	7.0	6.0 abc	6.33 b-e
MANOLO	Bejo	FG	6.3 ab	6.7 abc	7.0 a-d	7.7 ab	6.7	6.8 ab	7.11 ab
RED ATLAS	ILL	R	4.7 bc	4.7 bc	7.3 abc	7.0 a-d	6.0	6.0 abc	5.96 c-f
ZEPO	RZ	FG	7.3 ab	6.0 abc	7.0 a-d	7.0 a-d	6.7	6.7 ab	6.59 bcd

Listed in order of % Marketable.

10.0 = Most Desirable, 8.0 = Good, 6.0 = Average

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Tukey's HSD Test.

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**ONION CULTIVAR MAIN TRIAL - 2025 - continued**

Cultivar	Source	Shape	Uniformity of Shape	Uniformity of Size	Smoothness	Neck Finish	Root Attachment	Overall Rating	Score
RED ACE	Sto	R	4.7 bc*	5.7 abc	5.7 cde	6.0 a-d	6.7 ns**	6.0 abc	6.00 c-f
RODITI	RZ	FG	6.7 ab	6.0 abc	7.7 ab	8.0 a	6.7	6.7 ab	6.85 abc
JOLIE	SN	B	5.0 bc	5.3 bc	6.7 a-e	6.7 a-d	6.3	6.0 abc	5.81 def
RED CLOUD	Bejo	R	8.7 a	6.7 abc	5.7 cde	6.0 a-d	6.7	6.3 abc	6.78 abc
MONTY	RZ	R	6.0 abc	7.0 abc	6.3 a-e	6.3 a-d	7.0	6.5 abc	6.87 abc
SCARLETT	SN	FG	6.7 ab	7.0 abc	6.3 a-e	5.7 bcd	5.3	6.0 abc	6.56 b-e
BOHAN	Bejo	B	5.7 bc	5.3 bc	8.0 a	5.3 cd	5.7	6.0 abc	6.59 bcd
SCHRUTE	ILL	B	5.3 bc	5.7 abc	5.0 e	6.0 a-d	5.7	5.7 bc	6.22 b-e
BRANDY	ILL	FG	6.3 ab	6.3 abc	6.7 a-e	7.3 abc	6.7	6.3 abc	6.52 b-e
<b>TRIAL AVERAGE</b>			<b>6.1</b>	<b>6.1</b>	<b>6.4</b>	<b>6.4</b>	<b>6.2</b>	<b>6.1</b>	<b>6.42</b>

Listed in order of % Marketable.

10.0 = Most Desirable, 8.0 = Good, 6.0 = Average

\* Numbers in a column followed by the same letter are not significantly different at P = 0.05, Tukey's HSD Test.

\*\* ns indicates that no significant differences were found among the cultivars at P = 0.05.

## RED BEET CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025

### **Zeppo:**

*Rijk Zwaan sample*, Average to nice appearance, Uniformity of shape a little even, Average to good neck finish, Medium sized necks even, Skins smooth even, Fair to pretty good skin quality, Medium tap root width, Long tap root, Tap root smooth, Exterior colour a little uneven, Some with brown scales on top 1/4 to 1/3 of beet, Red interior colour a little uneven, Average internal zoning uneven, Rings a little noticeable (40-70%), White in centers (20%), Average to nice packer, Run size uneven, Firm beet, Average firmness a little uneven, Odd one with mouse damage, Mid-term storage.

### **Roditi:**

*Rijk Zwaan sample*, Average to good appearance, Uniformity of shape a little uneven, Good to great neck finish, Small to medium sized necks even, Skins smooth even, Pretty good skin quality, Medium tap root width, Long tap root, Tap root smooth, Exterior colour a little uneven, Some brown scales on top 1/4 of beet, Red interior colour a little uneven, Average to good internal zoning even, Most rings unnoticeable (70%), Average to nice packer, Run size uneven, Firm beet, Average firmness even, Mid-term storage.

### **Manolo:**

*Bejo Seeds sample*, Average to good appearance bit rough, Uniformity of shape a little uneven, Good to great neck finish, Small to medium sized necks even, Skins smooth, Pretty good skin quality, Medium tap root width, Long tap root, Tap root smooth, Dark exterior colour a little even, Odd one with brown scales on top 1/4 of beet, Red interior colour even, Good to great internal zoning even, Rings unnoticeable, Good packer, Medium run size a little uneven, Firm & solid beet, Average to good firmness a little uneven, Odd one with mouse damage, Mid-term storage.

### **Bazzu:**

*Bejo Seeds sample*, Average to nice appearance, Uniformity of shape even, Average to great neck finish, Small to medium sized necks even, Skins smooth even, Nice skin quality, Tap root width & length uneven, Tap root fairly hairy, Dark exterior colour even, Some brown scales on top 1/4 of beet, Dark red interior colour even, Good internal zoning even, Rings unnoticeable (80%), Average to nice packer, Small to medium run size a little uneven, Firm beet, Good firmness a little uneven, Mid to long term storage.

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## RED BEET CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025 continued

### Red Atlas:

*Illinois Seeds sample*, Fair to average appearance, Uniformity of shape uneven, Average to good neck finish, Medium sized necks even, Skins smooth odd on a little rough scaly, Average to nice skin quality, Medium tap root width, Tap root thicker at top, Tap root smooth odd one hairy, Exterior colour a little uneven, Odd one with brown scales on top 1/8 of beet, Slightly dark red interior colour even, Average internal zoning a little uneven, Rings noticeable (60%), Average packer, Medium to large run size a little uneven, Firm beet, Average to good firmness uneven, Odd one with mouse damage, Mid to long term storage.

### Borealis:

*Seminova sample*, Okay appearance, Uniformity of shape uneven, Average neck finish odd one bit rough, Medium to large sized necks even, Skins rough & scaly a little uneven, Fair skin quality, Medium to large tap root width, Long tap root, Tap root somewhat hairy, Lighter exterior colour uneven, Some with brown scales on top 1/3 of beet, Red interior colour a little even, Average to good internal zoning even, Rings somewhat unnoticeable (60-90%), Okay packer, Medium run size uneven, Solid beet, Good firmness a little uneven, Odd one with mouse damage, Mid to long term storage.

### PV 9524:

*Norseco sample*, Poor to average appearance, Uniformity of shape a little even, Poor to average neck finish bit rough, Medium to large sized necks uneven, Skins rough & scaly a little uneven, Poor to fair skin quality, Medium tap root width even, Long tap root, Tap root fairly hairy, Exterior colour a little uneven, Some with brown scales on top 1/4 of beet, Dark red interior colour even, Good to great internal zoning even, Rings unnoticeable (90%), Poor to good packer, Small to medium run size even, Solid firm beet, Average firmness a little even, Odd one with mouse damage, Mid to long term storage beet.

### Scarlett:

*Seminova sample*, Fair to average appearance, Uniformity of shape a little uneven, Average neck finish, Medium to large sized necks a little uneven, Skins a little rough scaly even, Fair skin quality, Medium tap root width, Long tap root even, Tap root thicker at top, Tap root odd one hairy, Exterior colour a little uneven, Odd one with brown scales on top 1/4 of beet, Dark red interior colour even, Good to great internal zoning even, Rings unnoticeable (90%), Okay to average packer, Medium run size a little even, Solid firm beet, Average firmness a little uneven, Odd one with mouse damage, Mid to long term storage.

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### RED BEET CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025 continued

- Red Ace:** *Stokes Seeds sample*, Fair to average appearance, Uniformity of shape uneven, Average to good neck finish odd one a bit rough, Medium sized necks even, Skins a little rough scaly uneven, Fair skin quality, Medium tap root width, Long tap root, Smooth tap root, Exterior colour a little uneven, Some with brown scales on top 1/3 of beet, Red interior colour even, Average to good internal zoning, Rings a little noticeable (40-60%), Okay packer, Small to medium run size a little uneven, Solid firm beet, Average to good firmness uneven, Odd one with mouse damage, Mid to long term storage.
- Red Titan:** *Illinois Seeds sample*, Poor to good appearance uneven, Uniformity of shape very uneven, Average neck finish odd one a bit rough, Medium to large sized necks uneven, Skins a little rough and scaly uneven, Fair skin quality, Medium to large tap root width thick near top, Long tap root a little uneven, Tap root somewhat hairy and smooth, Exterior colour fairly dark a little uneven, A few with brown scales on top 1/3 of beet, Interior colour red a little uneven, Average internal zoning a little uneven, Rings a little noticeable (~50%), Poor to average packer, Medium to large run size uneven, Average to good firmness a little uneven, Firm to solid beets, Odd one with mouse damage, Mid to long storage beet.
- Monty:** *Rijk Zwaan sample*, Average to good appearance, Uniformity of shape a little even, Average to good neck finish, Medium sized necks even, Skins smooth even, Fair to pretty good skin quality, Small to medium tap root width, Short tap root, Tap root smooth, Fairly dark exterior colour even, Odd one with brown scales on top 1/4 of beet, Dark red interior colour even, Average to good internal zoning even, Rings noticeable (30-80%), Average to good packer, Medium run size even, Firm beet, Average firmness a little uneven, Odd one with mouse damage, Early to mid-term storage.

.../continued

## RED BEET CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025 continued

- Jolie:** *Seminova sample*, Average appearance, Uniformity of shape uneven, Average to good neck finish rough, Small to large sized necks uneven, Skins smooth a little uneven, Average to pretty good skin quality, Medium tap root width, Long tap root, Tap root fairly smooth, Exterior colour a little uneven, Odd one with brown scales on top 1/4 of beet, Red interior colour a little uneven, Poor internal zoning uneven, Rings noticeable (60-90%), White in rings, Average to good packer, Medium to large run size uneven, Average firmness, Odd one with mouse damage, Mid-term storage.
- Bohan:** *Bejo Seeds sample*, Fair to average appearance, Uniformity of shape a little uneven, Poor to average neck finish, Odd neck finish a bit rough, Large sized necks a little uneven, Skins smooth even, Pretty good skin quality, Medium to large tap root width, Long tap root, Tap root a little hairy, Dark exterior colour a little even, Odd one with brown scales on top 1/4 of beet, Dark red interior colour even, Good internal zoning even, Most rings unnoticeable (70%), Average packer, Medium to large run size a little uneven, Solid firm beet, Good firmness even, Mid to long-term storage.
- Red Cloud:** *Bejo Seeds sample*, Fair to average appearance, Uniformity of shape very even, Poor to good neck finish, Medium sized necks even, Skins a little rough scaly, Fair to average skin quality, Small to medium tap root width, Uneven tap root length, Tap root smooth, Exterior colour even, Some with brown scales on top 1/3 of beet, Red interior colour a little uneven, Average to good internal zoning a little uneven, Rings unnoticeable (70%), Average packer, Medium to large run size a little uneven, Firm beet, Average to good firmness even, Mid to long term storage.
- Bullock:** *Seminova sample*, Fair to good appearance, Uniformity of shape even, Average neck finish odd one a bit rough, Small to large sized necks a little uneven, Skins a little rough scaly, Fair to pretty good skin quality, Small to medium tap root width a little even, Long tap root, Tap root mainly smooth, Exterior colour a little uneven, Odd one with brown scales on top 1/4 of beet, Fairly dark red interior colour a little uneven, Average internal zoning a little uneven, Odd one with noticeable rings (40-60%), Okay to good packer, Small to medium run size uneven, Firm and solid beets, Average and good firmness a little uneven, Mouse damage common, Mid to long term storage.

## RED BEET CULTIVAR MAIN TRIAL EVALUATION NOTES – 2025 continued

### Schrute:

*Illinois Seeds sample*, Fair average appearance, Uniformity of shape uneven, Average neck finish odd one bit rough, Medium sized necks a little uneven, Skins rough scaly even, Fair skin quality, Medium tap root width, Long tap root, Tap root somewhat hairy, Fairly dark exterior colour uneven, Some with brown scales on top 1/3 of beet, Dark red interior colour even, Good internal zoning even, Rings unnoticeable (80%), Okay packer, Medium run size a little uneven, Solid firm beet, Average to good firmness even, Odd one with mouse damage, Mid to long term storage.

### Scarlett:

*Norseco sample*, Fair to average appearance, Uniformity of shape uneven, Average neck finish a little bit rough, Medium to large sized necks a little even, Skins rough scaly uneven, Fair skin quality, Medium to large tap root width even, Long tap root, Smooth tap root, Exterior colour a little uneven, Some with brown scales on top 1/3 of beet, Slightly dark red interior colour even, Great internal zoning even, Rings a little bit noticeable (10%), Okay to average packer, Medium run size a little even, Average firmness even, Good firm to solid firmness a little uneven, Odd one with mouse damage, Mid to long storage beet.

### Brandy:

*Illinois Seeds sample*, Fair to good appearance, Uniformity of shape uneven, Good neck finish, Small to medium sized necks even, Skins a little smooth uneven, Fair to pretty good skin quality, Medium tap root width, Long tap root, Tap root a little hairy, Exterior colour a little uneven, Odd one with brown scales on top 1/4 of beet, Red interior colour uneven, Poor to average internal zoning uneven, Rings somewhat noticeable (70%), Okay to good packer, Small to medium run size uneven, Solid firm beet, Average to good firmness even, Odd one with mouse damage, Mid to long term storage.

### Bullock:

*Norseco sample*, Average appearance, Uniformity of shape a little uneven, Average neck finish odd one a bit rough, Medium to large sized necks even, Skins a little rough scaly, Fair to average skin quality, Medium tap root width, Long tap root, Tap root smooth, Exterior colour a little uneven, Odd one with brown scales on top 1/4 of beet, Red interior colour a little uneven, Average internal zoning a little uneven, Rings noticeable (70%), Average packer, Small to medium run size a little uneven, Solid firm beet, Average to good firmness uneven, Odd one with mouse damage, Mid to long term storage.