UNIVERSITY of GUELPH

# MUCK CROPS RESEARCH STATION
# IPM PROGRAM REPORT
# 2008

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## The 2008 IPM PROGRAM OF THE MCRS

The 2008 Integrated Pest Management (IPM) program for vegetable crops in the Holland Marsh, Ontario, was successfully provided by the University of Guelph, Muck Crops Research Station (MCRS). The program objectives are to scout growers' fields, provide growers with disease and insect forecasting information and to identify and diagnose diseases, insect pests and weeds.

### 1. FUNDING SOURCES

The Integrated Pest Management (IPM) fees paid by the grower clients covered the cost of the scout and materials. Additional funding for the Muck Crops Research Station IPM program for 2008 was provided by the Bradford Co-op and by the Thedford/Grand Bend Growers Association to cover the costs of maintaining data loggers and disease and insect forecasting in that area.

### 2. SCOUTING

In 2008, 288 acres were scouted between four crops: carrot (106 acres), celery (30 acres), lettuce (20 acres) and onion (132 acres), for 7 growers

One scout was hired for the 2008 season. The scout had completed two years of University education unrelated to agriculture, but had agricultural work or life experience. Scout training began by attending a one day Ontario Ministry of Agriculture Food and Rural Affairs (OMAFRA) vegetable IPM training session at the end of April. Training continued at the MCRS with a two day in-class and in-field training session at the beginning of May. Training, re-training and pest updating continued throughout the growing season through in-class and in-field sessions once a week mostly on Wednesdays.

Scouting schedule consisted of visiting fields either on Mondays and Thursdays or Tuesdays and Fridays. Besides training, Wednesdays were set aside to prepare sticky traps, scout fields that were skipped due to pesticide application re-entry periods or inclement weather. Beginning in September field scouting was continued on a once per week basis by the IPM supervisor. During the first six weeks of the scouting season, the IPM supervisor went out once per week with the scout for training and scouting assessment. During the rest of the growing season, the IPM supervisor went out with the scout once every other week.

### 3. DIAGNOSTICS, EXTENSION & DISSEMINATION OF INFORMATION

Any grower, whether on the IPM program or not, could bring in samples (plant and/or soil) for problem diagnosis. Field visits could also be requested. Three of the MCRS personnel were available for diagnosis and extension including the IPM Coordinator and two full-time post-doctoral fellows. Shawn Janse and Kevin Vander Kooi were also available for consultations and recommendations. On-site tools available for diagnosis were visual inspection, laboratory inspection and culturing, comparison to known problem symptoms and personal experience. Following assessment, the extension advice given was based on OMAFRA guidelines in terms of recommendation of pesticides and other control methods.

Over 150 diagnostic and extension problems have been assessed and addressed between March-December 2008. For most of the assessments records have been filed.

The data collected from the MCRS research plots were compiled twice per week, analyzed and summarized. The results were disseminated through the MCRS Agriphone as a recorded phone message accessible to all growers regardless of participation in the IPM program.

Also, a copy of the Agriphone was sent to the Bradford Co-op. The data collected from the IPM clients were also compiled twice per week, analyzed and summarized. The results were disseminated through the MCRS IPM Agrifax and faxed or emailed to all the IPM clients. The Agriphone and Agrifax also contained any additional important data related to pest monitoring and modeling, forecasting and control, relevant weather data, OMAFRA and government notices, and meetings.

## 4. PEST PREDICTIVE MODELS

A number of predictive models were used to forecast for different insect pest and disease problems and potential issues. Insect pest emergence was predicted with degree day models and confirmed with sticky traps and plant assessments. Disease forecasts were provided based on spore traps and three forecasting models: BREMCAST for downy mildew (*Bremia lactucae*) in lettuce, BOTCAST for botrytis leaf blight (*Botrytis squamosa*) of onion and DOWNCAST for downy mildew (*Peronospora destructor*) of onion. All of the predictive models required environmental data such as air temperature, relative humidity, rainfall and leaf wetness. The environmental data was collected using various sensors attached to a permanent CR10X data logger located at the side of the field at the MCRS. Additional CR21X data logger was placed in a MCRS onion research plot to collect environmental data within the crop canopy.

### *4.1. WEATHER/ENVIRONMENTAL DATA*

The air temperatures in 2008 were below the long term (10 year) average for May (10.7°C), August (17.9°C) September (14.7°C), and October (7.4°C), average for July (20.4°C) and above average for June (19.2°C). The long term (10 year) average temperatures were: May 12.6°C, June 18.4°C, July 20.3°C, August 19.2°C, September 15.7°C and October 9.0°C. Monthly rainfall was below the long term (10 year) average for May (48 mm) and June (68 mm), above average for July (137 mm) and August (63 mm), and average for September (82 mm) and October (54 mm). The long term (10 year) rainfall averages were: May 80 mm, June 76 mm, July 69 mm, August 56 mm, September 80 mm and October 59 mm.

### *4.2. DAMAGING WEATHER EVENTS*

Recording damaging weather events are important in IPM programs because these events can have a detrimental effect on normal crop growth and development and increase individual plant susceptibility to certain pests. Often damaging weather events warrant a management response by the grower. Not many damaging weather events were recorded in 2008 growing season. Only a few thunderstorms and storms with heavy rainfall occurred during the first week of August. Excessive damage from heavy rain, hail and wind was not an issue in the 2008 growing season.

## 5. CROP PEST SUMMARIES

For scouting purposes, the Holland Marsh was divided into the following four areas: west – all fields west of highway 400, centre - including fields north of Woodchoppers Lane, south of Strawberry Lane, east of highway 400 and west of Keele Street, north– including all fields on the North Canal Road that were east of highway 400, east – all fields that were not on North Canal Road but were east of Keele Street.

*5.1. CARROT*

5.1.1. Insect

The main insects that carrots were scouted for in 2008 were: Carrot Weevil (*Listronotus oregonensis*), Carrot Rust Fly (*Psila rosae*) and Aster Leafhopper (*Macrosteles quadrilineatus*). Degree day models were used to predict the occurrence of different life stages of all three insects

CARROT WEEVIL

Carrot weevils are pests of carrots and celery. Carrot weevil adults were first found in wooden traps on 16 May in one carrot field and 26 May in celery. The threshold of 1.5 or greater weevils/trap was reached mid-May which coincided with the degree day model for the beginning of laying eggs on 24 May. The highest cumulative number of weevils caught anywhere in the Holland Marsh/trap was 32.5 in a carrot field and 2.8 in a celery field (Fig. 1).

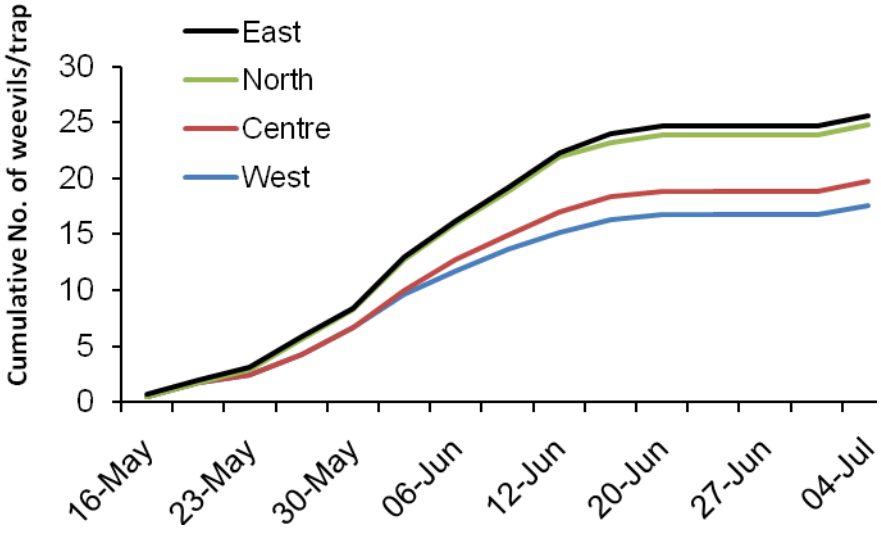


**Fig. 1.** Cumulative number of carrot weevils/wooden trap averaged over different areas of the Holland Marsh; (threshold=1.5-5 weevils/trap, threshold 2 = >5weevils/trap).

CARROT RUST FLY AND ASTER LEAFHOPPER

Orange sticky traps where used to monitor and estimate carrot rust fly and aster leafhopper population numbers. Carrot rust flies were first found on sticky traps on May 29 which coincided with the degree day model prediction of first generation emergence on May 26. The fresh carrot threshold of 0.1 flies/trap/day was reached in the beginning of June. First generation peak reached the beginning of June, 2$^{nd}$ generation emergence began mid-July and peak was the beginning of August (Fig. 2).

Aster leafhoppers are pests of carrots, celery, lettuce and leafy greens. Aster leafhopper adults were first found on orange sticky traps on 9 June in carrots, lettuce and celery. The degree day model predicted local adult emergence on 30 June. The adults caught before 26 June may have been local but could also have been immigrants from the United States. Population peaks occurred between mid-July and early August. Aster Leafhoppers are pests of all the above mentioned crops and the scouted data were used across all crops for best assessment of each area in the Holland Marsh throughout the growing season (Fig. 3).

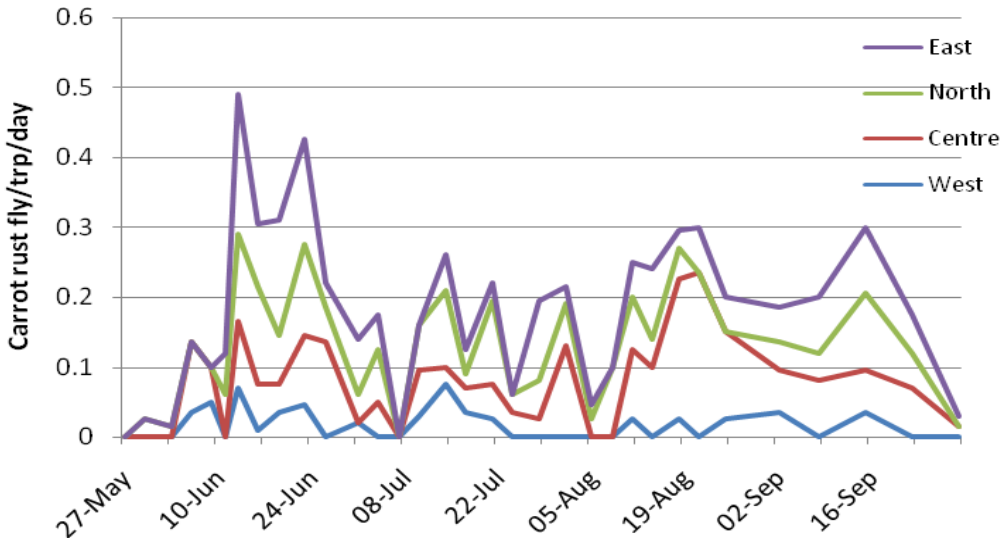


**Fig. 2.** Number of carrot Rust flies caught on orange sticky traps around the Holland Marsh carrot fields, 2008.

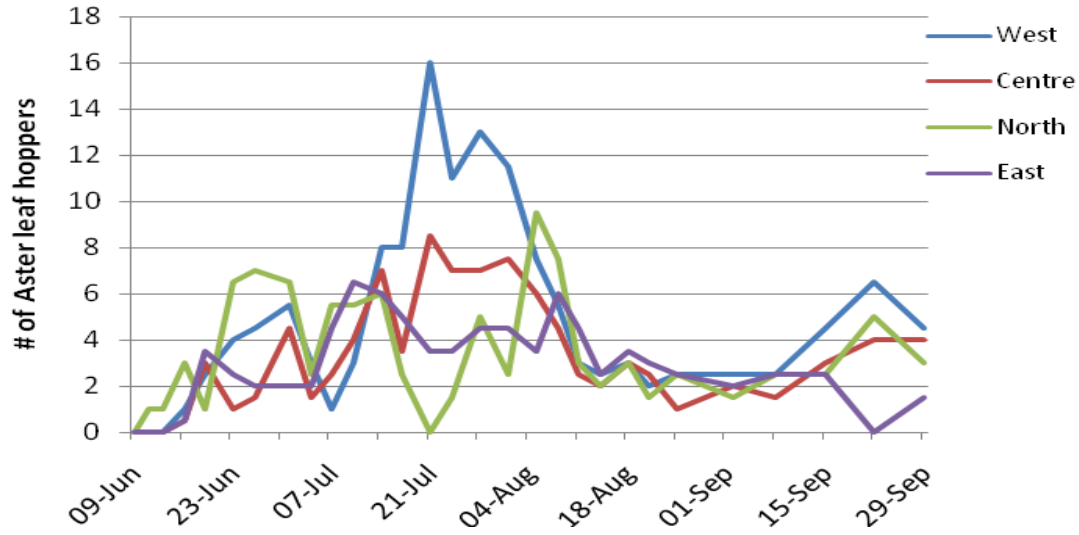


**Fig. 3.** Highest number of aster leaf hoppers caught on any particular day around the Holland Marsh, 2008.

5.1.2. Disease

Carrot fields were scouted for all the important diseases of carrots around the Holland Marsh. Carrot leaf blight caused by the fungi *Alternaria dauci* and *Cercospora carotae* were observed in most carrot fields. Leaf blight symptoms were first seen on July 14 and certain fields reached spray threshold with in a week. The timely announcement of the leaf blight incidence helped to keep the disease pressure below the threshold, which is 25%.

In 2008, high incidence of crown gall, caused by a bacteria (*Agrobacterium tumefaciens*), was found in several fields. Although it has been known around the Holland Marsh, the disease was severe in 2008 growing season.

The wet weather we had in the 2008 growing season was an ideal condition for the development of cavity spot in several fields. Relatively higher incidences of forked and split carrots were also observed. However, there was no incidence of Sclerotinia despite the wet conditions.

Aster leafhopper counts were low to medium until first week of July. High counts occurred during end of July, which resulted in aster yellows. However, aster yellows incidence remained low.

*5.2. ONION*

5.2.1. Insect

The main insects that onions were scouted for in 2008 were: Onion Maggot (*Delia antiqua*), Onion Thrips (*Thrips tabaci*) and cutworms. A degree day model was used to predict the occurrence of different life stages of the Onion Maggot. The degree day model predicted first adult fly emergence on May 12 which appears to coincide with catching the first adults on May 15 (Fig. 4). It is important to get Onion Maggot Fly sticky traps into fields as soon as they are seeded.

Fifteen days after first generation peak, damage plots were assessed for first generation maggot damage. Damage plots were also assessed at the end of August; the results were the damage from the second generation and most likely some of the third generation of maggots (Fig. 5). The results from the damage assessments were to inform the growers as to the effectiveness of their insecticide at seeding and for the effective use of the action thresholds for insecticide application during the second and third generation.

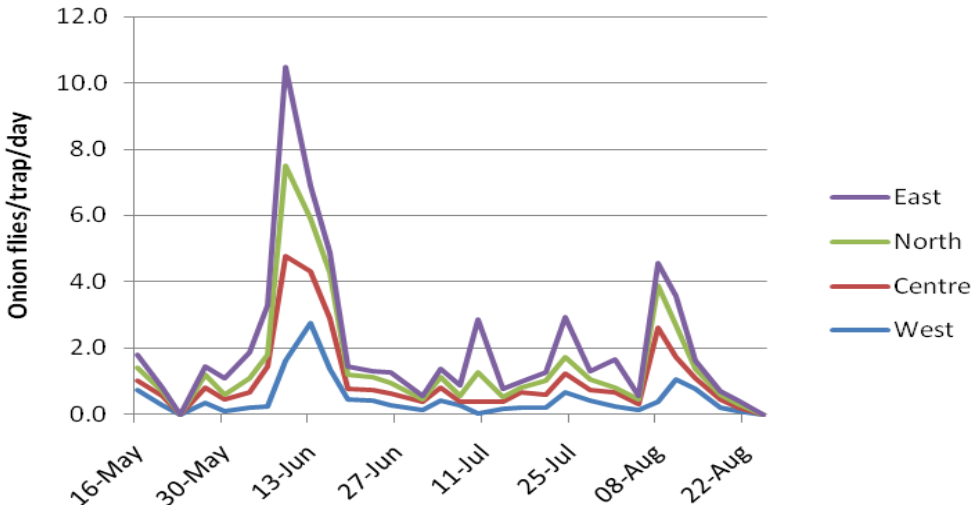


**Fig. 4** Number of onion maggot flies caught on yellow sticky traps around the Holland Marsh onion fields, 2008.

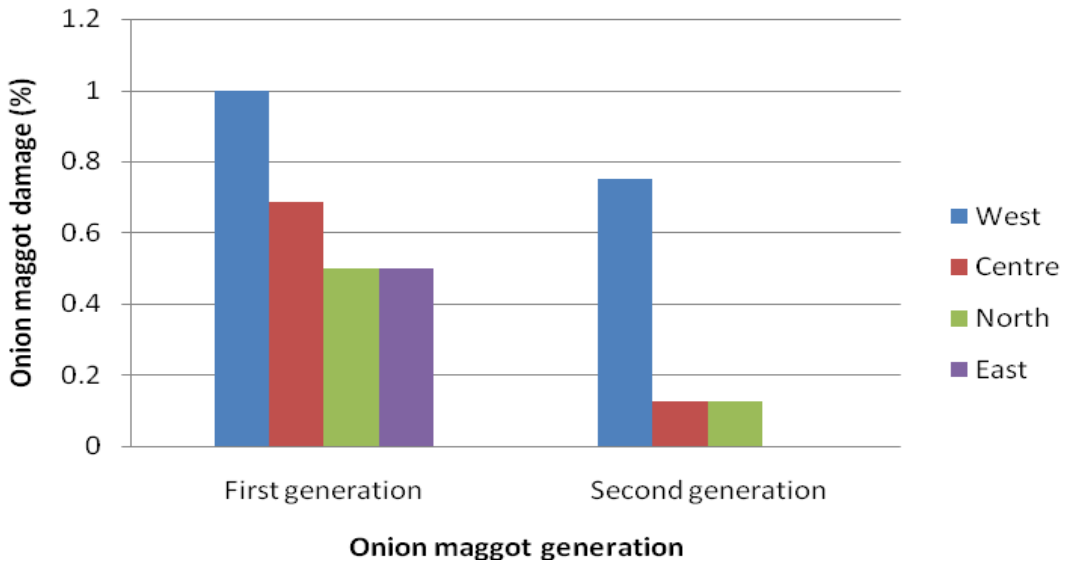


**Fig. 5.** Percent damage caused by the first and second onion maggot generations around the Holland Marsh, 2008.

White sticky traps were used to determine when onion thrips first entered the fields. After thrips were found on the white sticky traps, plant counts were used to determine population numbers. Thrips were first found in onion plants in scouted fields on June 20, although they were found on sprouted culls before this date. Few of the scouted fields reached the threshold of one thrips per leaf by first week of July. Thrips population numbers fluctuated below and above threshold over the whole growing season (Fig. 6).

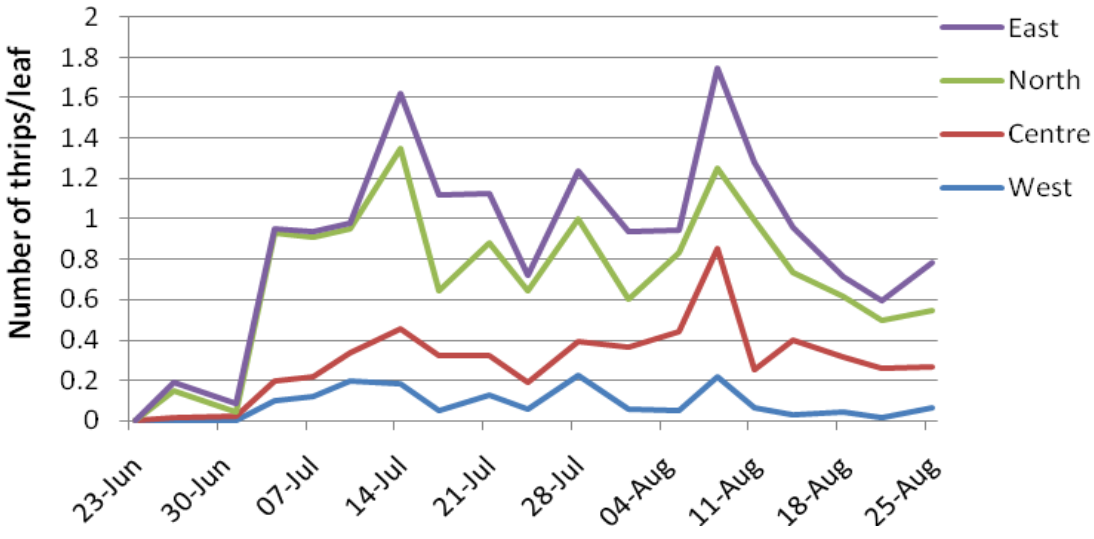


**Fig. 6.** Number of onion thrips in onion fields around the Holland Marsh, 2008

5.2.2. Disease

The main diseases that onions were scouted for were Botrytis Leaf Blight (*B. squamosa*), Downy Mildew (*P. destructor*), Purple Blotch (*Alternaria porri*), White Rot (*Sclerotium cepivorum*) and Pink Root (*Phoma terrestris*).

A predictive model, DOWNCAST, was used to forecast downy mildew of onions. Conditions were optimum for downy mildew sporulation infection period (SIP) on 46 of the 100 days that the DOWNCAST model operated. The first downy mildew SIP occurred on June 26. Symptoms of onion downy mildew were first seen in MCRS research plots on August 1 and August 11 symptoms were seen in a scouted onion field. All scouted onion fields in the Holland Marsh had visible symptoms of downy mildew during the growing season. Risk of disease development was low to moderate until mid July. Disease development and risk of downy mildew was high until the end of the growing season. Most of the 2008 growing season was optimum for *P. destructor* epidemics.

BOTCAST, a disease forecasting program for botrytis leaf blight, was used to predict the severity of *Botrytis squamosa* on onions. The cumulative disease severity index (CDSI) was calculated daily and summed over the season. The CDSI reached 21 (first spray threshold) on 4 and 8 July for the Holland Marsh and Grand Bend Marsh respectively. The CDSI reached 31 (second spray threshold) the first week of August at both locations.

*Botrytis squamosa* spore traps were tested in scouted onion fields for integration into the MCRS IPM program . The spore counts were used with BOTCAST, lesion counts and weather forecasts to recommend fungicide applications.

In the 2008 growing season higher incidence of Stemphylium leaf blight which is caused by *Stemphylium vesicarium* was observed in onion fields around the Holland Marsh. Stemphylium leaf blight symptoms are similar purple blotch and both diseases are managed in the same manner. Although not high, white rot occurred in certain onion fields around the Holland Marsh.

*5.3. CELERY*

5.3.1. Insect

The main insects that celery was scouted for in 2008 were: Carrot Weevil (*L. oregonensis*), Aster Leafhopper (*M. quadrilineatus*), Tarnished Plant Bug (*Lygus lineolaris*), and the Pea Leafminer (*Liriomyza huidobrensis)*. The degree day models used to predict the occurrence of different life stages of the Carrot Weevil and Aster Leafhopper. The scouting results of these two pests were discussed in the carrot crop section. Tarnished Plant Bugs are pests of celery and lettuce and leafy greens. Using plant inspections, orange sticky traps and sweep nets, Tarnished Plant Bug populations were assessed. Using plant inspections, Tarnished Plant Bug damage was first found on celery on July 17. Threshold for insect counts, 0.1 Tarnished Plant Bugs per plant, and damage threshold of six percent, was not reached in any of the scouted fields.

Aphids are pests of celery and lettuce and leafy greens and the scouted data were used across both crops, especially if fields were next to each other, for best assessment of each area in the Holland Marsh throughout the growing season, for extension purposes. Aphid counts remained low throughout the growing season.

Yellow sticky traps were used in celery to scout for Pea Leafminer adults. No adults were caught in any of the scouted celery fields or in the MCRS celery plots in 2008. Although the

incidence was low, some stippling was seen on celery plots of the MCRS at the beginning of September and another celery field by the end of September.

5.3.2. Disease

Celery leaf blights in Ontario are caused by the fungi *Cercospora apii* (Early Blight) and *Septoria apiicola* (Late Blight) and the bacteria, *Pseudomanas syringae* pv. *apii* (Bacterial Blight). The threshold for pesticide application is disease presence. In older celery plantings, early blight symptoms were first seen end of June. Late Blight symptoms were not seen in any of the scouted celery fields.

Pink Rot (*Sclerotinia sclerotiorum*) was found in scouted celery field by mid-July. Pink Rot disease incidence remained low throughout the season. Symptoms related to nitrogen deficiency were seen at certain celery fields.

*5.4. LETTUCE*

5.4.1. Insect

The main insects that lettuce was scouted for in 2008 were: Aster Leafhopper (*M. quadrilineatus*), Tarnished Plant Bug (*L. lineolaris*) and various aphid species including the Green Peach Aphid (*M. persicae*) and Sunflower Aphid (*A. helianthi*). The degree day model used to predict the occurrence of different life stages of the Aster Leafhopper and the scouting results were discussed in the carrot crop section.

5.4.2. Disease

The main diseases that lettuce and leafy greens were scouted for were Downy Mildew (*Bremia lactucae*), Drop or White Mold (*Sclerotinia sclerotiorum* and *S. minor*) and Gray Mold (*Botrytis cinerea*). BREMCAST was used to predict occurrence of downy mildew on lettuce. The first sporulation infection period (SIP) of the 2008 growing season was June 7. The SIP that occurred on July 4 resulted in the first visible infection symptoms seen on July 7. The information from the BREMCAST played role in maintaining the Downy mildew disease incidence in lettuce fields to remain low.

Sclerotinia drop, botrytis grey mould and Pythium stunt were all first noted early to mid-June, although the plant disease incidence of all the above mentioned diseases remained below three percent for the entire 2008 growing season. Anthracnose (*Microdochium panattonianum*) and aster yellows were found in a lettuce field in early and late-July, respectively.

6. WEEDS

Broad leaf, grass and sedge weed issues differed among growers mainly depending on the importance each grower placed on weed control versus yield. In most fields, weeds were controlled during the critical weed free period for each crop. The critical weed free period for carrots was the first three to six weeks after seeding. The critical weed free period for celery was the first four to eight weeks after transplanting. The critical weed free period for lettuce and leafy greens was the first three weeks after transplanting and for onion the critical weed free period was the entire growing season.

The late rainfall we had in May followed by high temperatures in early June contributed to a high weed pressure. Yellow Nutsedge (*Cyperus esculentus*) was a problem for a number of growers in all of the crops around the Holland Marsh.