Final report submitted to the New York State Integrated Pest Management Program, 2006

***Project Type:*** Implementation – continuing

# Using NEWA Internet Resources and Scouting to Improve Pest Management in Onions

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Jim and Mike Johnson, Sodus, NY
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Phil Jr. and Alicca Vigneri, Elba, NY

***Abstract:*** Much information is available through Northeast Weather Association (NEWA), an on-line resource that plugs into local weather stations to model/forecast disease and insect activity/pressure. This information in combination with scouting has great potential to be used in an Integrated Pest Management (IPM) strategy in onions, but both require in-depth training before it may readily be used by onion growers. In this project, we worked with seven onion growers and taught them how to use scouting information and weather and disease model information provided in NEWA to make fine-tuned, effective and economical crop protection decisions. We also trained two grower's teenage children to scout onions and to retrieve the information provided in NEWA. Of the information provided by NEWA, the downy mildew disease model appears to be the most useful, followed by the Michigan Botrytis Leaf Blight model while the Purple Blotch model had the least practical application. Having an unbiased skilled onion scout appears to be critical to an onion IPM program. In this study, weekly monitoring of pest pressure allowed one grower to delay both his first fungicide and insecticide sprays two and three weeks, respectively, a total savings of $125 per acre. The grower's teenage children still require more training, but show great promise in being a relatively inexpensive means for their onion grower parents to obtain scouting information that will save them money in pesticide sprays while maintaining high quality of their crops.

***Background and Justification:***
Onions are one of the most valuable vegetable crops grown in New York State with a reported 13 200 acres valued at $54.3 million in 2004. Onions are also one of the most intensively managed crops with respect to pesticide use. Consequently, onion growers are aggressively marketed to by local sales representatives of several chemical companies. Increasing the adoption of IPM techniques is currently ranked as a high implementation priority by the NY IPM program. In this project, two Extension Educators and their Program Assistant worked closely

with onion growers and in a couple of cases, their teenage children to use NEWA on-line resources along with field scouting information to make effective and efficient crop protection decisions.

Much research and effort has been invested towards the development of onion disease forecasting models and of thresholds that may be implemented into an IPM program for onions. The NEWA website includes the Cornell Blight Alert, Michigan's Botrytis and Alternaria forecasts, the Canadian Downy Mildew forecast, and insect degree days for onion maggot. All of this forecast information is based on weather stations located in the regions where onions are grown (Elba, Potter and Sodus), which records temperature, relative humidity, precipitation and leaf wetness. NEWA disease forecast information is provided to growers by Cornell Cooperative Extension Educators in the Cornell Vegetable Program seasonal weekly newsletter, *PestMinder*. Growers need more in-depth training on what the numbers mean and how to apply them to their pest management decisions.

During 2002-2004 in the OWYS vegetable region, Carol MacNeil and John Gibbons worked closely with some of their onion growers to train them on using NEWA internet resources to increase use of onion IPM. In the first year they reported that the one grower that they had worked with used reduced rates of fungicides based on the forecasts in that dry year, did a better job of choosing materials, and increased his confidence in his crop protection program. However, they also reported that having weekly scouting reports by an experienced scout (i.e. John Gibbons with 17 years experience) to accompany the NEWA forecasts was essential for the grower to see what the disease models could do. After the third season, MacNeil and Gibbons reported that growers still had plenty of questions regarding interpreting information and needed lots of practice studying the disease and weather forecasts available on NEWA and relating them to the field situation. In Elba, Christy Hoepting worked with a single grower (no funding) on a trial basis with similar results. It is clear that in order for onion growers to implement NEWA into their pesticide program, intense one-on-one training and consultation accompanied by experienced field scouting is required. In two cases, grower's children were trained in how to scout onions so that they could provide this valuable information to their grower parents.

***Objectives:***

1. Encourage adoption of using disease/insect pressure information provided by NEWA and spray thresholds into the pest management programs of onion growers.

2. Improve our interpretation of disease pressure values reported by NEWA as they relate to the field situation and grower practices.

3. Program evaluation to measure adoption of technology, knowledge of pest complex and changes in pesticide use.

***Procedures:***

Objective 1: This program had two levels of intensity depending on whether growers were new or returning to the program, and whether an Extension professional provided the scouting or the grower's children were trained in onion scouting. Returning growers with more intermediate skills received less training, scouting and consultation, and were requested to help subsidize the program. We had two returning growers in Sodus (Ken Datthyn and Kevin Datthyn), one in

Potter (Sacheli), and one in Elba (Star) with one new grower in Sodus (Johnson) and two in Elba (LS & Sons and Vigneri).

Prior to the growing season, growers were briefed on the information available on NEWA and on how it was reported in the weekly *PestMinder* and used to make recommendations. Program Assistant, John Gibbons scouted one field each of direct seeded onions for Sacheli, Ken Datthyn, Kevin Datthyn and Johnson weekly from June 5 to August 14. Hoepting scouted one field of direct seeded and transplanted onions for Star growers in Elba weekly or bi-weekly from May 29 to August 14. Counts were specifically made for number of Botrytis Leaf Blight (BLB) lesions and onion thrips per plant for a minimum of 15 plants per field. Other observations of plant development, weed escapes, and other diseases and insects were also made. The growers received a scouting report that included the scouting information (quantification of pest pressure in the field), NEWA info for past week (quantification of how favorable conditions were for disease development), next week's forecast (provided by NEWA – i.e. will the weather continue to be favorable for disease?) and a spray recommendation provided by Hoepting and/or MacNeil based on these three criteria (Appendix i). The intention was to help growers fine-tune their pesticide applications to use only what is needed while not compromising the quality of the crop.

Hoepting trained grower's teenage children, Tim Shuknecht and Alica Vigneri on how to scout onions and retrieve the disease pressure information and weather data available on NEWA. An information packet was prepared, which included scouting and pest information, and notes on how to retrieve and interpret the information available on NEWA. These information packets were given to the beginner scouts. Hoepting spent an afternoon with each of these beginner scouts individually training them using a "hands on" technique right in the onion field.

Information retrieved from NEWA was incorporated into control recommendations made for onions in the weekly *PestMinder*. The project was discussed at the summer Onion Industry Council Meeting held in Sodus.

Objective 2: Spray records from 2006 were collected from the cooperating growers where Extension professionals did the scouting. The final report to the grower consisted of a summary of the seasonal NEWA pest pressure information (color-coded according to favorability of conditions for disease), pest activity in the field, crop information and spray records all on a single spreadsheet (Figure 1, 2 and 3). This way, the NEWA information could be related to the actual pest activity and the spray program used. Individual and regional databases were compared for similarities and trends.

Objective 3.
Personal grower interviews were conducted at the end of the season to measure adoption of technology, knowledge of pest complex and changes in pesticide use. We identified areas where the interpretation of the information provided by NEWA may be refined to improve spray recommendations (in progress).

***Results and Discussion:***

Summary of 2007 growing season weather and disease pressure according to NEWA: According to the weather data provided by NEWA, Elba, Sodus and Potter all had very similar monthly average temperatures during the onion growing season (May through August) in 2007 with Elba

being 1°F cooler during July and August (Table 1). Total rainfall during the same time period varied across the three locations with Sodus receiving 19.8 inches (9.4 inches in July alone) and Potter and Elba receiving 16.9 and 14.4 inches, respectively. Total hours of leaf wetness were highest in Elba (1010 hours) during the season, followed by Potter (817) and Sodus (664). The number of days favorable for BLB were highest in Elba with 70 days or 64% of the time, followed by Potter with 62 days (= 57%) and Sodus with 40 days (= 37%). Overall, there were less days that were favorable for DM compared to BLB with the highest number in Potter with 63 days (= 58%) followed by Elba with 47 days (= 43%) and Sodus with 40 days (= 37%). Generally, number of hours of leaf wetness was more important than total rainfall for producing conditions that were favorable for disease. Although Sodus received 3 inches more rain than Elba and Potter, this location had the lowest number of hours of leaf wetness and number of days favorable for disease.

Table 1. Weather conditions and Disease Pressure Information Retrieved from NEWA (http://newa.nysaes.cornell.edu) for Elba, Sodus and Potter, 2006.

| | **Weather Conditions** | | | | | | | | | **Disease Pressure** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Average Temp (°F)** | | | **Total Rainfall (inches)** | | | **Total No. Hours LW** | | | **No. Days Fav. for BLB** | | | **No. days Fav. for DM** | | |
| **Month** | **E** | **S** | **P** | **E** | **S** | **P** | **E** | **S** | **P** | **E** | **S** | **P** | **E** | **S** | **P** |
| May | 56.4 | 56.6 | 56.7 | **3.4** | 2.8 | 2.6 | **212** | *99* | 186 | 11 | *7* | 11 | 6 | 8 | **11** |
| June | 65.3 | 65.4 | 65.2 | *2.4* | 5.2 | 5.9 | 145 | *103* | **292** | 18 | *12* | 19 | 14 | 12 | **19** |
| July | *71.0* | 72.2 | 71.9 | 6.0 | **9.4** | 6.3 | 232 | **298** | *163* | 17 | *11* | 19 | 9 | 11 | **19** |
| Aug | *66.1* | 67.4 | 67.3 | 2.6 | 2.4 | 2.1 | **421** | 164 | 176 | **24** | 10 | 13 | **18** | 9 | 14 |
| **Total** | | | | **14.4** | **19.8** | **16.9** | **1010** | **664** | **817** | **70** | **40** | **62** | **47** | **40** | **63** |

**E:** Elba; **S:** Sodus; **P:** Potter; **LW:** leaf wetness; **BLB:** Botrytis Leaf Blight (Michigan); **DM:** Downy Mildew.
Numbers in *italics* indicate the lowest value per month per variable. Numbers in **bold** indicate the highest value per month per variable.

Relationship between weather and disease models according to NEWA: Figures 1, 2 and 3 illustrate daily weather conditions as they relate to the favorability of disease and scouting information in Sodus, Potter and Elba, respectively. By comparing disease pressure to weather information, generally, it is obvious why the weather conditions favor disease according to the models. For example, in Sodus during the period of June 26th to 28th, conditions were very favorable for Botrytis Leaf Blight (BLB), Downy mildew (DM) and Purple Blotch (PB) when temperatures were also cooler and there was rainfall and leaf wetness everyday. Alternatively, warmer temperatures and low leaf wetness was not favorable for disease such as during June 17th to 19th and August 1st and 2nd in Sodus. However, there were instances where cooler weather, leaf wetness and rainfall did not result in favorable disease conditions according to the NEWA models. For example, May 21st to 22nd and August 3rd to 4th in Sodus. Alternatively, there were instances where very favorable disease pressure did not relate to cooler wet weather. For example, in Potter on June 6th to 7th and in Elba on July 23rd, disease pressure was very favorable for all diseases in all models while there was no rainfall or leaf wetness, although there was a drop in temperature. The strongest relationship between favorability of disease and weather conditions in 2007 occurred most consistently in Potter.

Relationship between information provided by NEWA and scouting information: *Botrytis Leaf Blight (BLB)* - NY and Michigan BLB models were identical between Elba and Potter during May 15th to 22nd where the MI model showed each of these 8 days to be very favorable for BLB while the NY model indicated that none of these days were favorable for disease. During this time period in Sodus, the NY model was identical to the other locations while the MI model showed 2 days that were very favorable. In all locations, number of days that were very favorable for BLB according to both models was very similar (3 – 5 days) from May 23rd to June 5th. On June 5th, prior to any fungicide applications, scouting data showed that direct seeded onions at the 3 leaf stage had 1.24, 1.2 and 1.3 BLB per leaf in three fields in Sodus, 0.6 BLB per leaf in Elba and 2.0 BLB in Potter. Although, there was similarity among fields within the same location with respect to field level of BLB, there was no relationship between disease model information and level of disease in the field.

In all fields in Sodus, BLB dropped slightly in the second week (June 12th) but remained at or above the threshold to spray fungicide (1 BLB lesion per leaf). It then dropped significantly in the third week, which may be related to conditions not being favorable for BLB (according to NEWA) and/or fungicide sprays (unknown at this time). In the forth week, BLB remained low on two of the farms, but jumped up to threshold on the other (Kevin Datthyn), despite not very favorable disease conditions according to NEWA. Knowing the grower's fungicide spray program could provide information to explain these differences. In the fifth week (July 3rd), in relation to very favorable conditions for disease, BLB doubled at all sites and was above threshold again for Kevin Datthyn. In the sixth week, BLB dropped at all sites with less favorable weather, but remained at threshold for Kevin Datthyn. For the rest of the season with exception of Kevin Datthyn, BLB remained very low, despite instances when conditions were favorable for disease according to NEWA. For Kevin Datthyn, BLB remained above threshold from the eighth week (July 24th) until the end of the season. BLB in the field in Potter followed the same pattern as it did in Sodus (not Kevin). In Elba, BLB remained virtually undetectable despite stretches of very favorable conditions until the eighth week when it jumped to 11.9 BLB per leaf, which cannot be explained by the weather or disease models. BLB remained undetected in transplants in Elba. Although Elba had more days that were favorable for BLB during the growing season according to NEWA than Sodus or Potter, it was these latter locations that experienced more disease pressure in the field. The next step is to compare field information with grower spray records.

*Downy Mildew (DM)* – A hotspot of DM was detected in Elba on July 10th about 2 weeks after NEWA reported a stretch of 5 days that were favorable for disease. Generally, it takes 10 to 14 days after the time of infection for this disease to sporulate on leaf tissue. This implies that the DM model on NEWA may help to predict DM outbreaks. DM did not occur in Potter which had the most number of favorable days during the season. Again, spray records would provide useful information.

*Purple Blotch (PB)* – In Sodus, PB first appeared July 24th on two farms and on Ken Datthyn's farm on July 31st when onions had 7 to 8 green leaves. In Elba, PB started on July 10th when the onions had 7 to 8 green leaves, and on transplanted onions on June 26th when the onions had 8 to 9 green leaves. In Potter, PB started on July 17th when onions had 8 green leaves. There does not appear to be a strong relationship between the NEWA PB model and onset of PB in the field as conditions appear favorable throughout the season. It appears to show up at the 7 to 8 green leaf stage anywhere from late June to late July. It can also be quite challenging to control once it gets going. Therefore, adding fungicides that are specific for

control of PB to the tankmix in mid-July or at first sign of disease might be the most effective strategy. A system should be developed to quantify PB pressure in the field in order to monitor disease development and fungicide efficacy.

*Onion thrips (OT)* – In Sodus, no OT were detected until Jun 26th (4th week) at all sites. At two sites, OT hovered around threshold (1 OT per leaf) in the seventh and eighth weeks and then remained low for the rest of the season. In Kevin Datthyn's field, OT remained well below threshold for the duration of the season. In Potter, OT was first detected on June 5th, and was over threshold two weeks later on June 19th. They remained at threshold before plummeting on July 3rd two weeks later. Then, OT crept back up to threshold every other week for the rest of the season. In Elba, OT were first detected on June 5th in transplants and two weeks later in direct seeded onions on June 19th at the time when they were approaching threshold in the transplants. Direct seeded onions reached threshold on July 10th and remained over threshold for the rest of the season. Similarly, once the OT reached threshold in the onion transplants, they also remained over threshold for the rest of the season. First detection of OT varied considerably among regions and pressure varied considerably among fields within regions. Spray records will provide useful information to explain differences in OT pressure among fields despite similar weather conditions.

The relationship between the information provided in NEWA and what occurs in the field with respect to disease pressure in onion fields is not consistent enough for a grower to soley rely on to make pesticide spray decisions. The numbers can be difficult to interpret, but tend to be the most meaningful and accurate when they are high, indicating very favorable conditions for disease. However, when the numbers generated by the disease models are most obvious that conditions are favorable for disease, the weather is also more obviously favorable for disease (i.e. prolonged periods of cool wet weather). Similarly, when it is really hot and dry for prolonged periods, the numbers generated by the disease models in NEWA are more obviously not favorable for disease, which can also be more accurately predicted by the weather conditions.

Since the DM model provided by NEWA does a fairly decent job of accurately describing when conditions are favorable for DM infection and it takes 7 to 10 days for this disease to cycle, the model can be used as an alert to scout for this disease and to apply preventative fungicides after a stretch of 5 to 7 favorable days in a row occurred.

<u>Value of Scouting:</u> The variability in pest pressure among fields within the same region and among regions provides opportunity for growers to fine-tune their pesticide program. This information is provided by scouting. There is opportunity to save money on fungicides and insecticides if a grower waits until he reaches the threshold for BLB and OT, because at low levels both of these pests are not economically damaging. Adequate control of these pests can be achieved if pesticides are controlled once they reach the spray threshold. For example, in Elba, BLB did not reach threshold until sometime in mid-July. Compared to a grower using a calendar fungicide spray program starting during the third week of June, Star growers were able to save 3 weeks worth of fungicide sprays, a value of approximately $45 per acre. Similarly, if they sprayed for OT when they were first detected, instead of waiting until they reached threshold, they would have made two additional insecticide sprays, a value of $50 - $80 per acre. If weather were hot and dry for a period of 7 days or more, a grower could increase his spray interval for fungicide sprays. However, he would probably need to spray for onions thrips during this time. Alternatively, if the weather was cool and wet for 7 days or more, a grower

could increase his spray interval for insecticides, provided scouting indicates that thrips are remaining below threshold.

Clearly, scouting is the most important component of onion IPM and having unbiased qualified scouts in the field is critical. The level of detail in the scouting that we provided to growers for this project would be too time-consuming and expensive for a grower to adopt on his whole farm. Perhaps, detailed scouting including counts of BLB and OT on 15 plants per field, could be conducted in one or two fields, which could be used as a guide for the scout to compare to when he scouts the other fields visually (no counts). Transplants and direct seeded onions, different plantings and varieties should be scouted separately.

The training of grower's teenage children to scout onions and to retrieve information from NEWA was successfully started. Scouting onions are complicated and retrieving and interpreting the information provided in NEWA requires practice. Tim Shuknecht was very interested in learning how to scout onions, had great observational skills, asked very good questions and did some scouting on his own. When the chemical salesman recommended to his father to put on an insecticide spray, he decided not to, because his son had scouted that week and thrips numbers were still very low, a cost savings of $40 per acre. Alica Vigneri was younger and although did a good job, was not as interested as she preferred working with animals. More one-on-one training in the field on a weekly or bi-weekly basis is still required to train the two grower's children. Tim is interested in fine-tuning his skills with Hoepting next summer.

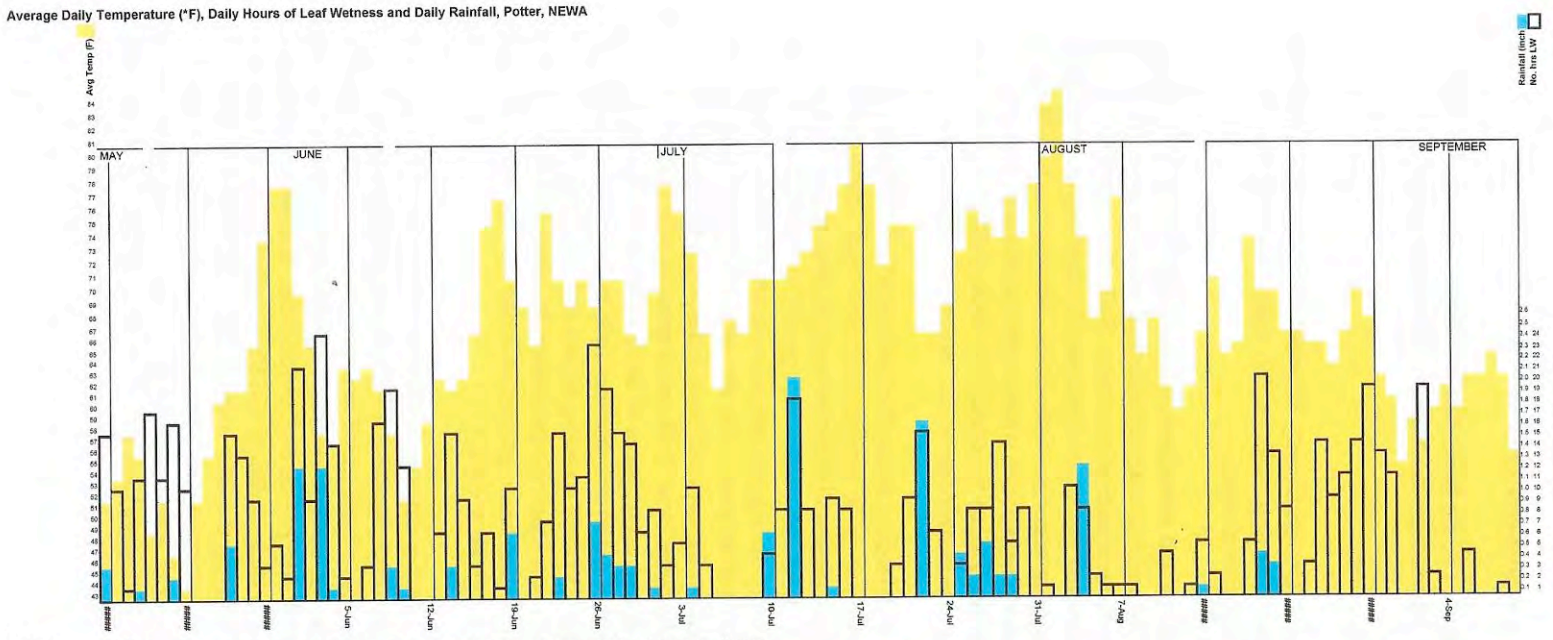
Note: Obtaining grower spray records and project evaluations are still in progress.

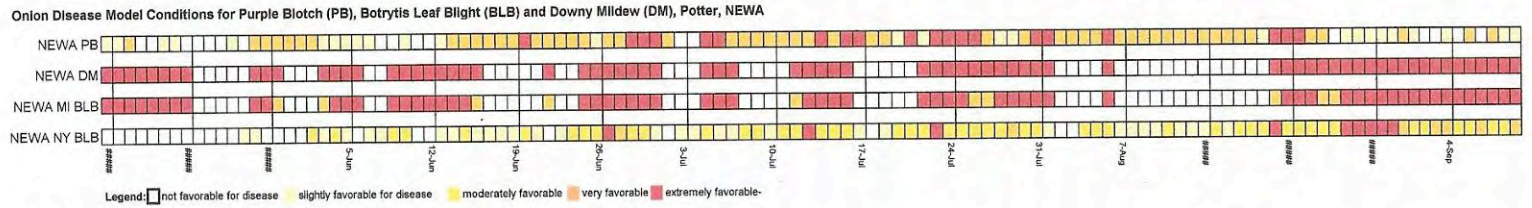
***Project locations:***
Wayne, Yates and Orleans/Genesee

***Samples of resources developed:***
Onion Scouting Report, complete with NEWA past and forecasted weather, and disease model information (Appendix i)

Notes on How to use NEWA for Onion IPM (Appendix ii)

Figure 1. Weather and Disease Pressure Information Provided by NEWA, Scouting Information and Recommendations, Sodus, 2006.




**Weekly Scouting Information: leaf stage, Botrytis Leaf Blight, Onion Thrips, Other Information and Recommendations**

| **Direct seeded** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| leaf stage | 4 L | 4 L | 5 L | 0.2 L | 7 L | 8 L | 8 L | 9 L | 10-20% lodging | 7 L, 40-75% |
| BLB (per leaf) | 2.0 BLB | 2.0 BLB | 1.0 BLB | 0.2 BLB | 0.06 BLB | 0.13 BLB | 0.0 BLB | 0.1 BLB | 0.04 BLB | 0.0 BLB |
| OT (per leaf) | 0.2 OT | 0.43 OT | 1.6 OT | 1.0 OT | 0.2 OT | 0.6 OT | 0.9 OT | 0.6 OT | 1.2 OT | 0.1 OT |
| other | | | | OT count taken in Spintor plot lower in Lannate | OT low in both Spintor and Lannate areas | bacterial dis. | PB started | PB onions look good | PB OT high on edges | PB |
| recommendation | start F | watch OT cont. F | start I cont F | I watch for disease | bacterial dis. | watch OT | I for OT | I for OT | | |

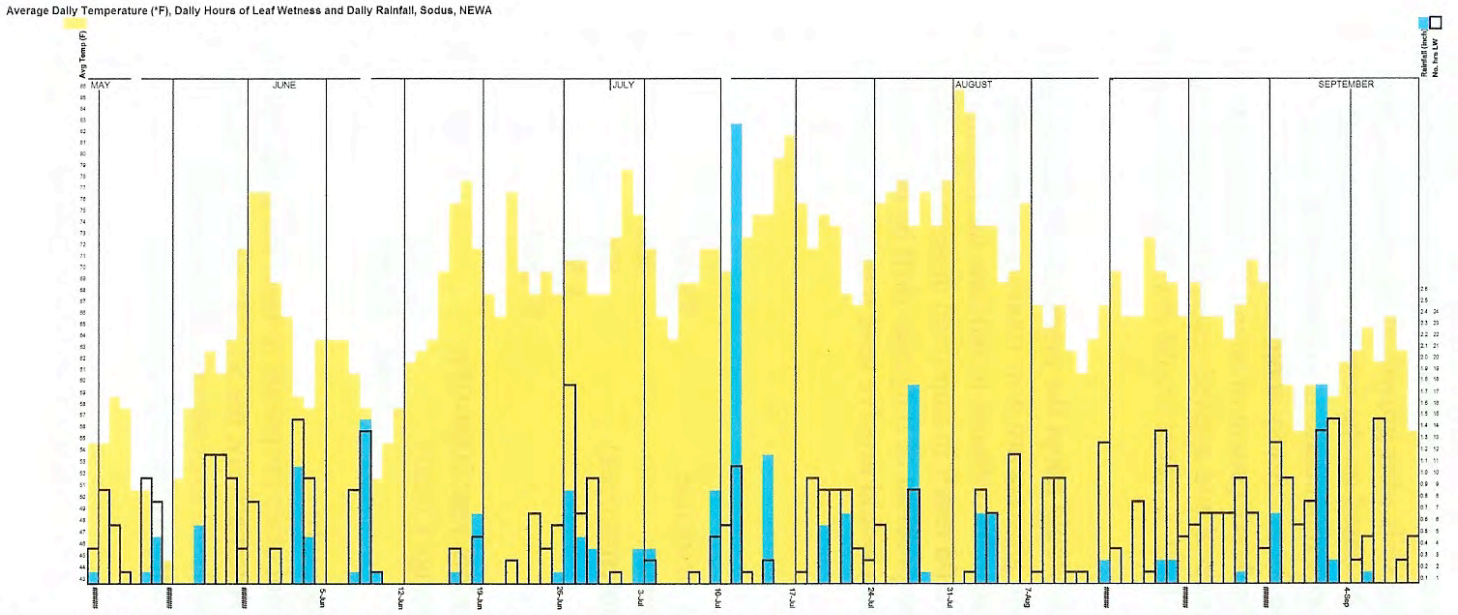
**L:** green leaves, **F:** fungicide, **I:** insecticide, **cot:** cotyledons

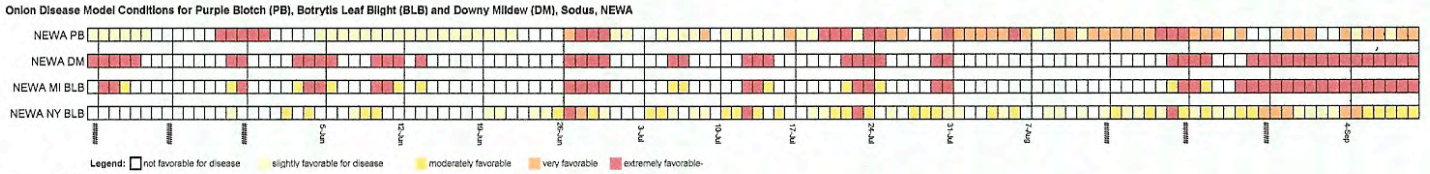
**Grower: Kevin Datthyn (direct seeded)**

| leaf stage | 3 L | 3 L | 4 L | 6 L | 7 L | 7 L | 8 L | 8 L | 7 L | 7 L | 7 L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BLB (per leaf) | 1.3 BLB | 1.5 BLB | 0.4 BLB | 1.0 BLB | 2.0 BLB | 1.0 BLB | 0.6 BLB | 0.7 BLB | 1.4 BLB | 1.4 BLB | 1.6 BLB |
| OT (per leaf) | 0.0 OT | 0.0 OT | 0.0 OT | 0.05 OT | 0.2 OT | 0.0 OT | 0.2 OT | 0.2 OT | 0.4 OT | 0.3 OT | 0.0 OT |
| other | | hail & heavy rain damage | | | | | | PB starting | BLB by woods PB present | PB present bacterial dis. | onions going down PB present |
| recommendation | start F | cont. F | | cont. F | cont. F | cont. F watch for OT | | | cont. F | cont. F | |

**L:** green leaves, **F:** fungicide, **I:** insecticide, **cot:** cotyledons
**spray thresholds for OT and BLB:** 1 BLB lesion or 1 OT per leaf

Figure 2. Weather and Disease Pressure Information Provided by NEWA, Scouting Information and Recommendations, Potter, 2006.



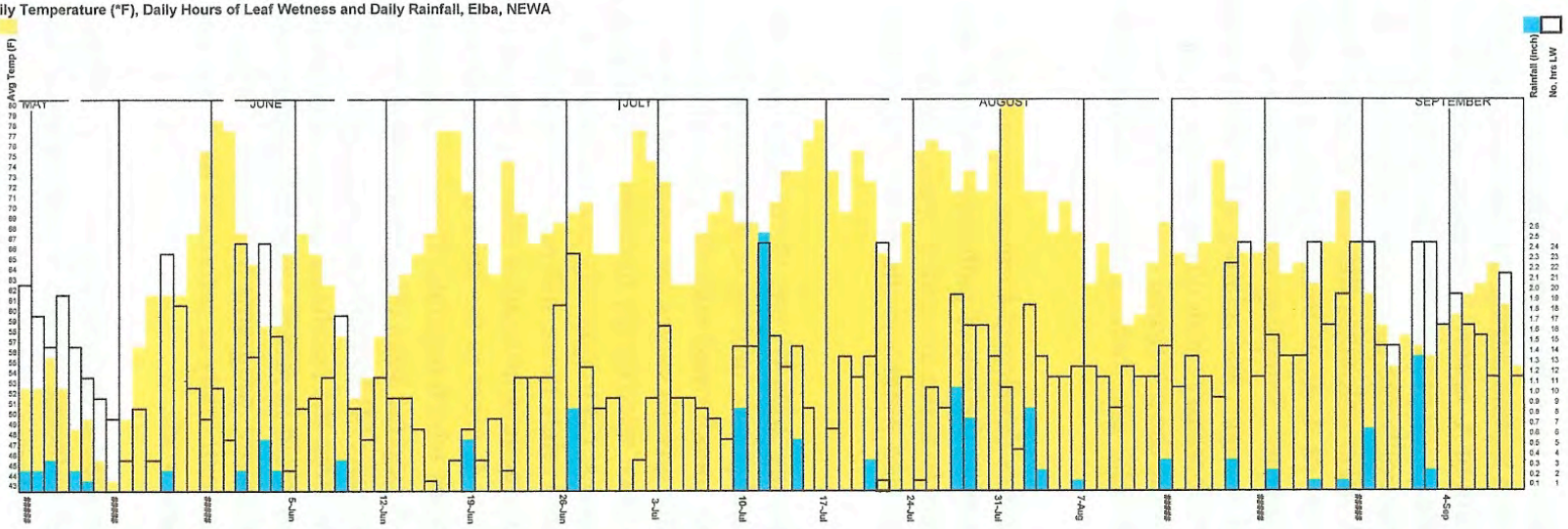

**Weekly Scouting Information: Leaf stage, Botrytis Leaf Blight, Onion Thrips, Other Information and Recommendations**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Grower: Ken Datthyn (direct seeded)** | north | north | north | north | | north | north | north | north | north |
| leaf stage | 3 L | 3 L | 4 L | 6 L | | 7 L | 8 L | 8 L | 7 L | 7 L |
| BLB (per leaf) | 1.24 BLB | 0.93 BLB | 0.5 BLB | 0.3 BLB | | 0.18 BLB | 0.06 BLB | 0.2 BLB | 0.3 BLB | 0.0 BLB |
| OT (per leaf) | 0.0 OT | 0.0 OT | 0.0 OT | 0.2 OT | | 0.4 OT | 1.0 OT | 1.2 OT | 0.6 OT | 0.1 OT |
| other | | hail & heavy rain damage | | | | OT above threshold in hotspots and border areas | | BLB higher where sprays were missed minor LM damage | PB started high OT in border areas | PB present |
| recommendation | | start F | cont. F | cont. F weather will be fav for disease | | start I next week forecast heat will induce OT | I for OT | I for OT F for diseases | I for OT F for diseases | |
| **Grower: Johnson (direct seeded)** | | | | | | | | | | |
| leaf stage | 3 L | 4 L | 4 L | 6 L | 7 L | 7 L | 8 L | 7 L | 7 L | |
| BLB (per leaf) | 1.2 BLB | 1.0 BLB | 0.4 BLB | 0.26 BLB | 0.46 BLB | 0.2 BLB | 0.2 BLB | 0.1 BLB | 0.1 BLB | |
| OT (per leaf) | 0.0 OT | 0.0 OT | 0.0 OT | 0.26 OT | 0.6 OT | 0.9 OT | 0.8 OT | 1.0 OT | 0.2 OT | |
| other | OM damage on north end of field | hail & heavy rain damage | | | OT up in borders | tobum present | OT high in borders | OT high in borders PB starting | onions starting to lodge PB present | |
| recommendation | start F | cont. F | | weather wil be favorable for disease, apply F I for OT | | apply I | apply I | apply I for OT | F for PB | |
| **Grower: Kevin Datthyn (direct seeded)** | | | | | | | | | | |
| leaf stage | 3 L | 3 L | 4 L | 6 L | 7 L | 7 L | 8 L | 8 L | 7 L | 7 L | 7 L |
| BLB (per leaf) | 1.3 BLB | 1.5 BLB | 0.4 BLB | 1.0 BLB | 2.0 BLB | 1.0 BLB | 0.6 BLB | 0.7 BLB | 1.4 BLB | 1.4 BLB | 1.6 BLB |
| OT (per leaf) | 0.0 OT | 0.0 OT | 0.0 OT | 0.05 OT | 0.2 OT | 0.0 OT | 0.2 OT | 0.2 OT | 0.4 OT | 0.3 OT | 0.0 OT |
| other | | hail & heavy rain damage | | | | | | PB starting | BLB by woods PB present | PB present bacterial dis. | onions going down PB present |
| recommendation | start F | cont. F | | cont. F | cont. F | cont. F watch for OT | | | cont. F | cont. F | |

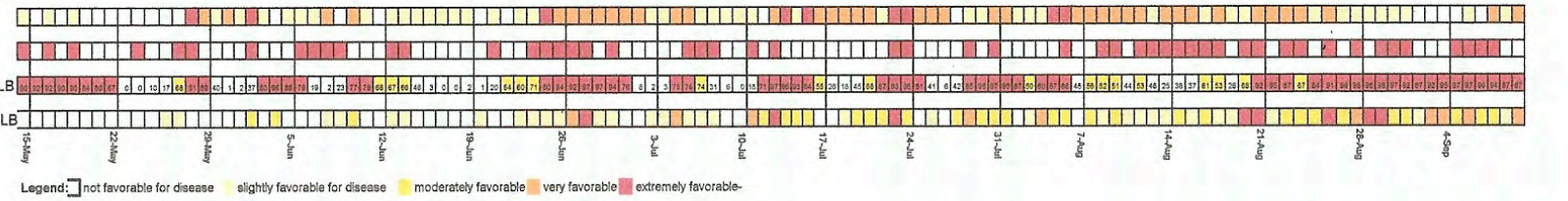
L: green leaves, F: fungicide, I: insecticide, cot: cotyledons
**spray thresholds for OT and BLB:** 1 BLB lesion or 1 OT per leaf

Figure 3. Weather and Disease Pressure Information Provided by NEWA, and Scouting Information and Recommendations, Elba, NY, 2006.

**Average Daily Temperature (°F), Daily Hours of Leaf Wetness and Daily Rainfall, Elba, NEWA**




**Onion Disease Model Conditions for Purple Blotch (PB), Botrytis Leaf Blight (BLB) and Downy Mildew (DM), Elba, NEWA**




Legend: not favorable for disease | slightly favorable for disease | moderately favorable | very favorable | extremely favorable-

**Weekly Scouting Information: leaf stage, Botrytis Leaf Blight, Onion Thrips, Other Information and Recommendations**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Direct seeded** | | | | | | | |
| leaf stage | 1.5 L | 2 L | 3-4 L | 4.85 - 6 L | 6 L | 7-8 L | 7-9 L |
| BLB (per leaf) | 0 | 0.6 BLB | 0.3 BLB | 0.06 BLB | 0.02 BLB | 0.4 BLB | 11.9 BLB |
| OT (per leaf) | 0 | 0.0 OT | 0.0 OT | 0.05 OT | 0.1 OT | 0.9 OT | 1.4 OT |
| other | barley kill again<br>nutsedge 1-3", 3-6L | barley dead,<br>PH, NS (6-7L) | | crop jumped<br>herbicide injury<br>PH active, NS dead | new flush PW<br>PW & NS 6-8"<br>OS | PB starting<br>PH escapes<br>NS hit, DM hotspot | PB<br>leaf dieback in wet spots |
| recommendation | wait until 2L<br>to apply herbicides | weed control<br>nitrogen<br>I next week | Buctril next week<br>no I or F | no I, F<br>spot treat NS | no F, I | start I<br>1.5 pt Bravo<br>+ 3 lbs penncozeb | I for OT<br>1.5 pt Bravo<br>+ 3 lbs mancozeb |
| **Transplants** | | | | | | | 1% lodging |
| leaf stage | 3.5 L | 4.5 - 5 L | 6-7 L | 6-8 L | 8-9 L | 11-12 L, 1-2" bulb | 8 L, 2-3m' bulbs |
| BLB (per leaf) | 0 | 0.6 BLB | 0.4 BLB | 0.11 BLB | 0.2 BLB | 0.0 BLB | 0.1 BLB |
| OT (per leaf) | 0 | 0.3 OT | 0.8 OT | 0.9 OT | 2.5 OT | 2.1 OT | 1.7 OT |
| other | 3 L mustards, 1L PW | 6L mustards<br>below threshold | exellent weed contro<br>herbicide injury | weeds dead<br>herbicide injury | PB starting<br>PW, NS,PSW | looks like OT was<br>higher and was<br>knocked back | big PW<br>CG seeding |
| recommendation | 1-2 oz Goal<br>+ 4-6 oz Buctril | no I or F<br>Buctril + Goal<br>broadcast nitrogen | no F<br>warm weather in forecast<br>may have to put on 1st I<br>before end of week | first I | need to handweed<br>1-2 oz Goal for PW cots<br>I for OT | I again | I for OT<br>3 lbs mancozeb<br>+ Quadris |

**PH:** poison hemlock, **PW:** pigweed, **PSW:** Pennsylvania Smartweed, **NS:** nutsedge
**L:** green leaves, **F:** fungicide, **I:** Insecticide, **cot:** cotyledons

Appendix i. Sample of Onion Scouting Report

# Onion Scouting Report

**Grower:** Star **Location:** Pembroke **Date:** 8/7/2006 **Plant stage:** 9 green leaf

**Botrytis Leaf Blight:** 7.1 **per leaf =** 21.2 **per plant; range:** 0 to 150 **per plant** (new lesions only)
(Threshold for 1st spray = 1 per leaf)
ABOVE THRESHOLD, lots of old lesions.

**Purple Blotch/Stemphylium Leaf Blight:** yes.

**Downy Mildew:** NONE

**Onion Thrips:** 5.1 **per leaf =** 46.2 **per plant; range:** 0 to 291 **per plant**
(Threshold = 1 per leaf)
ABOVE THRESHOLD, starting to see feeding up & down leaves

**Onion Maggot:** **Degree days:** **Next peak degree days:**
(Threshold = Spray during peak if 1st generation damage is 5+%)

**Other notes on crop or pests:**
- BLB higher where grass is thick.

N / W / E


- aphids & outer leaf dieback
- large, thick crabgrass and nutsedge

herbicide burn or BLB??

**Disease Development Forecasts:**
**NY BLB** - NY Botrytis Leaf Blight Inoculum Production Index (IPI) – Spore formation occurs if the IPI is 7+; Infection will occur if there's a **30%** chance of rain the next day and it's been 7 days since the last spray. **Mich BLB** – Mich. Botrytis Leaf Blight Index of **50+ is Significant for disease. PB/SLB** - Purple Blotch/Stemphylium Leaf Blight Index of **5.7+. DM** - (Downy Mildew) – Favorable day for infection.

**Past Week Pest Pressure, Information from NEWA at** http://newa.nysaes.cornell.edu/ Elba

| Date | Mon 7/31 | Tues 8/1 | Wed 8/2 | Thurs 8/3 | Fri 8/4 | Sat 8/5 | Sun 8/6 | # days over threshold |
|---|---|---|---|---|---|---|---|---|
| NY BLB | 15.35 | 12.36 | 4.25 | 8.23 | 17.23 | 11.50 | 11.27 | 6/7 |
| Mich. BLB | 97 | 95 | 87 | 50 | 80 | 87 | 86 | 7/7 |
| PB/SLB | 6.0 | 6.0 | 5.3 | 5.3 | 5.3 | 7.0 | 7.0 | 4/7 |
| DM | FAV | unfav | unfav | unfav | unfav | unfav | FAV | 2/7 |

} very favorable - moderately slightly

**Past Week Weather from NEWA at http://newa.nysaes.cornell.edu/**
**(weather chart here)** Mon Tues Wed Thurs Fri Sat Sun

| Date | 7/31 | 8/1 | 8/2 | 8/3 | 8/4 | 8/5 | 8/6 |
|---|---|---|---|---|---|---|---|
| Temp °F hi | 83.3 | 88.2 | 89.3 | 75.6 | 76.8 | 74.7 | 82 |
| Temp °F lo | 64.3 | 75.4 | 74.7 | 66.3 | 63.3 | 56.9 | 57.3 |
| Rainfall (in.) | 0 | 0 | 0 | 0.78 | 0.21 | 0 | 0 |
| # hrs RH >90 | 13 | 10 | 4 | 18 | 13 | 11 | 10 |

not, humid cooler, rain

I do not know why conditions were favorable for disease Mon–Wed with no rain, leaf wetness and v. hot.

**6-Day Weather Forecast, National Weather Service, from NEWA: http://newa.nysaes.cornell.edu**

| Date | Tues 8/8 | Wed 8/9 | Thurs 8/10 | Fri 8/11 | Sat 8/12 | Sun 8/13 |
|---|---|---|---|---|---|---|
| Daytime hi (°F) | 76 | 79 | 81 | 76 | 76 | 81 |
| Night time lo (°F) | 54 | 60 | 60 | 56 | 57 | 63 |
| %RH (high/low) | | | | | | |
| Rainfall %POP | 0 | 0 | 30/30 | 0 | 0 | 0 |

} cooler weather for DM for downy mildew

**(Weather can change rapidly. Check the forecast at least daily.)**

Recommendation: Big Gun Insecticide + 1 pt Revral (+ 3 lbs Manozeb or 1.5 pt Bravo or 14.5 oz Pristine
i.e. Carzol/Vydate

Appendix ii.

# Notes for Using NEWA for Onion IPM

prepared by Christy Hoepting, 6/23/2006

## Getting Started

NEWA: North East Weather Association
http://newa.nysaes.cornell.edu
- Click on "new users set up an account here"
- Complete account set up

## Onion Disease Models

from homepage, click "onions" on top menu
- Click "onion pest or disease forecasts"

**Botrytis Leaf Blight (BLB):**

Click on "Elba Modified Blight Seasonal Log" (a Cornell model)
See sample data:
Column 1: date (may need to scroll)
Column 2-5: IPI (inoculum production index) by planting date. Earlier planted onions are more susceptible to BLB.

According to the model, the threshold to put on your first fungicide spray for BLB is when the following three criteria apply:

- IPI is 7 or greater
- One or more BLB lesion is found on each leaf
- There is a 30% or greater chance of rain

After the first spray, the criteria to put on another fungicide spray are:

- IPI is 7 or greater
- There is a 30% or greater chance of rain
- It has been greater since 7 days since your last spray

Another way that this model can be used is to describe BLB disease pressure:
- Look at the number of days in the past week (7 days ) that are over the threshold (7 or greater IPI)

Table 1: Using NEWA disease models to describe disease pressure

| # days out of 7 Favorable for disease* | Disease Conditions |
|---|---|
| 5 to 7 | Very favorable |
| 3 to 4 | Moderately favorable |
| 1 to 2 | Slightly favorable |
| 0 | Not favorable |

*i.e. greater than 7 IPI for BLB

- Also, take into consideration the actual numbers - how much over threshold is the IPI each day?

Table 2. NY BLB Conditions

| IPI per day | Conditions for BLB |
|---|---|
| >20 | Extremely favorable |
| 16 to 20 | Very favorable |
| 11 to 15 | Moderately favorable |
| 7 to 10 | Slightly favorable |
| < 7 | Not favorable |

- see color-coded disease pressure chart

**Alternaria Purple Blotch, Botrytis (Michigan Model) and Downy Mildew**

From onion disease page, click "Alternaria, Botrytis, Downy Mildew"
See sample data
Column 1: date
Column 2 & 3: Alternaria Purple Blotch
Column 4 & 5: Botrytis Leaf Blight (Michigan Model)
Column 6: Downy Mildew

Alternaria Purple Blotch (PB):

- According to model, greater than 5 is high risk, but this is too low
    - Use 5.7 and greater as high risk
- Count number of days out of past week that are high risk (5.8 and greater)
-

Table 3: PB/SLB Conditions

| PB/SLB value | PB pressure |
|---|---|
| > 6.7 | Extremely favorable |
| 5.7 to 6.5 | Very favorable |
| 4.7 to 5.5 | Slightly favorable |
| < 4.5 | Not favorable |

Botrytis Leaf Blight (Michigan Model):

- This model only takes into consideration weather conditions, not plant stage (i.e. susceptibility of host)
- SIP: significant inoculation potential
- Greater than 50 = SIP
- Count number of days out of 7 that are above threshold (i.e. greater than 50) – same as Table 1 above.
- Also, look at how high pressure is per day

Table 4. Michigan BLB conditions

| BLB Value | Conditions for BLB |
|---|---|
| 75 to100 | Extremely favorable |
| 50-74 | Moderately favorable |
| 0-49 | Not favorable |

Downy Mildew:
- Each day is either "favorable" or "unfavorable" for Downy Mildew
- Count number of days in past 7 days that are favorable and use Table 2.

**Things to Consider:**
- Use the Michigan BLB model as an indicator as to when to start scouting for BLB. Use the modified Blight Alert after BLB has been detected and fungicide program has begun. Compare Michigan and Cornell BLB programs.
- Look at the forecast- is more of the same weather in the forecast? Will it be drier? Is there a good chance of rain? This will help you to predict whether disease pressure will be similar or higher or lower than it was during the previous week.
- Assume that protectant fungicides remain effective unless more than 1 inch of rain fell
- Generally, it is better to spray before a rain than after.
- Adjust spray tank mixes and timing according to disease pressure.
- **NEWA is not a substitute for field scouting.**

## Onion Maggot Peak Flights
- From home page, click on your weather station from drop menu (i.e. Elba)
- Click on "Degree Day (Base 40°F) – side menu
- Click on current month
- See sample data

Column 1: date
Column 2: maximum temperature
Column 3: minimum temperature
Column 4: DD base 40 per day
Column 5: DD base 40 accumulated since January 1
Column 6: DD base 40 accumulated since March 1
Column 7: DD base 40 accumulated since May 1
- Use Column 6 (DD accumulated since March 1)

Table 4. DD base 40 accumulated per onion maggot (OM) event

| Accumulated Degree Days (Base 40°F) | OM event |
|---|---|
| 400 | First emergence of overwintering flies |
| **700** | **Peak flight of 1st generation** |
| 1500 | Emergence of 2nd generation |
| **1960** | **Peak flight of 2nd generation** |
| 2700 | Emergence of 3rd generation |
| **3240** | **Peak flight of 3rd generation** |

- When approaching peak flight of over-wintering generation, click "degree day forecasts" from NEWA homepage (side menu)
- Scroll down to your weather station (i.e. Elba) and look up Base 40°F
- These values are based on the weather forecast. Add them to current DD to predict when 1st peak flight will occur.
- You can use this method for predicting peak flight of 2nd and 3rd OM generations as well.
- Spray for onion maggot flies during peak flight.
- Note: Cornell does not recommend spraying for onion flies

## Potato Late Blight

- Click on "potatoes" from homepage (top menu)
- Click on current year "potato late blight forecasts"
- Scroll down to your weather station
- Click on current month
- See sample data

Column 1 & 2: date
Column 3: hours of RH
Column 4: average temperature
Column 5: total precipitation
Column 6: late blight severity value per day
Column 7: accumulated severity values

- Look at severity values (SV) per day (column 5)
- Once your potatoes are 4 inches tall, start adding up SV values
- Once 18 SV values have been reached, it is time to spray
- After the first fungicide spray has been made, use the following:

Table 5. Recommended fungicide spray intervals for Late Blight according to Disease Pressure

| Accumulated LB SV per week | Disease pressure | Recommended Spray interval |
|---|---|---|
| > 6 | Very favorable | 5 day |
| 3-5 | Moderately favorable | 7 day |
| <2 | unfavorable | 10 day |

In 2004, LB SV values were as high as 22 per day!

- Certainly, when SV values are in the double digits per day for 2-3 days or more at a time, you would want to make sure that your potatoes are covered, especially if LB has been reported in the area.

## General Weather Data

- From homepage, click on your weather station (drop menu)
- Select whichever options you are interested in from the side menu
- See sample data of "monthly summary"
- For archived weather data, click on "weather data" from homepage top menu
- You may choose from monthly, hourly and degree information from previous years by weather station

## Weather Forecast

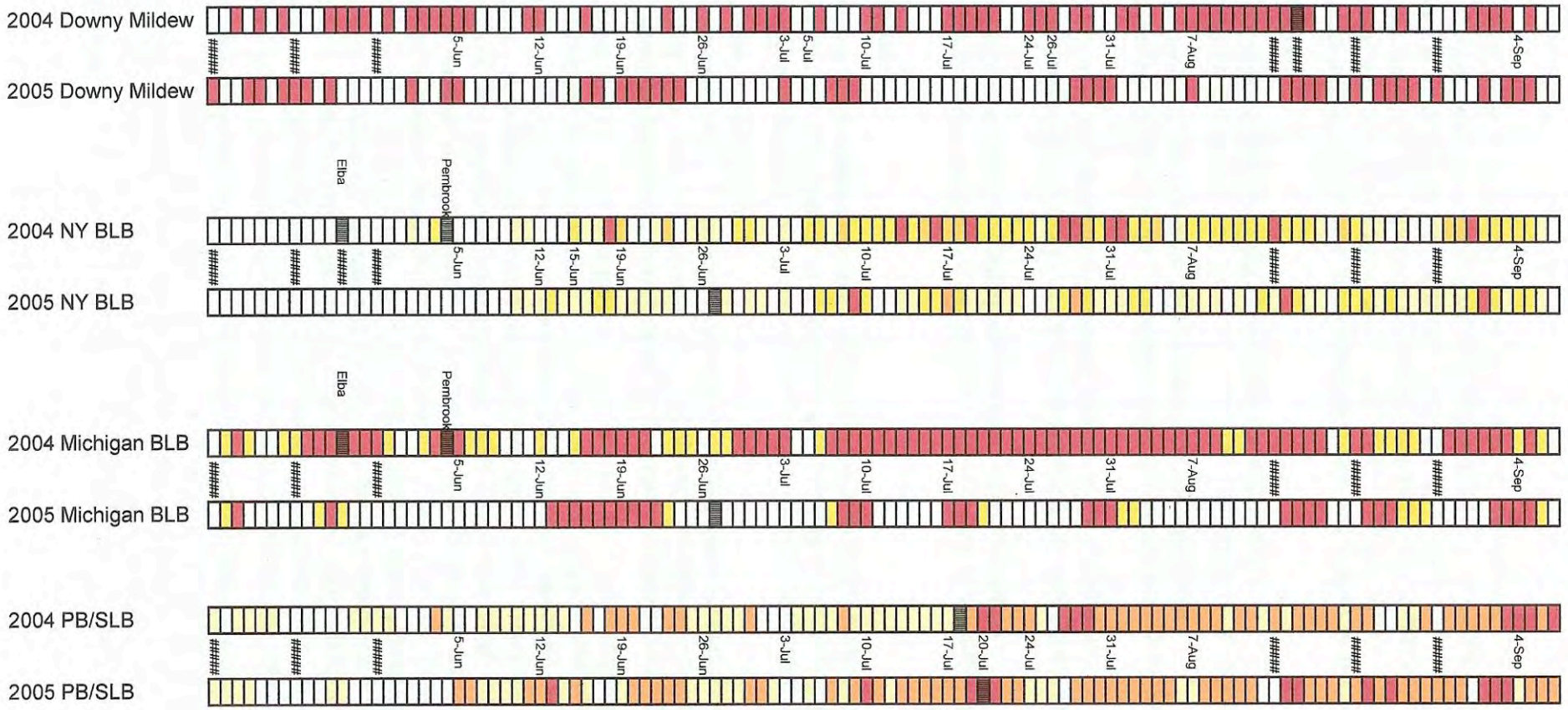
- from homepage, under "Local NWS forecast by "City"…", enter "Elba, NY"
- click "go"

# Onion Disease Pressure Models, NEWA weather station, Elba 2004 vs. 2005

http://newa.nysaes.cornell.edu

Prepared by Christy Hoepting, Carrie Meyers, and Katie Panek

Cornell Cooperative Extension Vegetable Program




**Legends:**

| |
|---|
| **DM:** Downy Mildew |
| **NY BLB:** NY Botrytis Leaf Blight |
| **Michigan BLB:** Michigan Botrytis Leaf Blight |
| **PB/SLB:** Purple Blotch/Stemphylium Leaf Blight |

| Disease Conditions |
|---|
| Not Favorable |
| Slightly Favorable |
| Moderatly Favorable |
| Very Favorable |
| Extremely Favorable |
| Disease First Observed |

see tables on back for details on individual diseases