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Update on Pest Management  
and Crop Development

F R U I T J O U R N A L

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Geneva, NY

GENERAL INFO

HOT  
OR  
COLD?

A MATTER OF  
DEGREE DAYS  
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apple scab fungus is by using degree days calculated with a low cutoff temperature of 32°F. We also know that codling moth development does not progress below 50°F. This is also the case for most plants, thus DDs calculated with a base temperature (or low cut-off) of 50°F are commonly referred to as growing degree days, or GDDs.

[Editor's note: We are reprinting this article from last season because of its applicability to our insect and disease predictive activities for management purposes.]

❖❖ Several inquiries regarding degree days have surfaced in the past as NEWA (Network for Environment and Weather Applications, [newa.cornell.edu](http://newa.cornell.edu)) use has increased. Degree days (DD) are, essentially, a mathematical way to calculate the accumulation of heating units over time. (Cooling units, i.e., chilling hours, can also be calculated, though this is not currently programmed into NEWA.) A brief description of DDs is available from the University of Illinois at <http://ipm.illinois.edu/degreedays/calculation.html>.

## NEWA serves many agricultural and horticultural commodities

Several crop, pest, and disease phenology models are programmed into NEWA. Some rely solely on DD tables, some display results directly (so the DD accumulations are not apparent to the user), and some provide DD ranges when IPM decisions and interventions are needed (hanging traps, timing sprays, etc.).

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Keep in mind:

- NEWA serves many agricultural and horticultural commodities.
- There are several formulas that can be used to calculate degree days.
- Max and Min temperatures are collected during a "defined" 24-hour period.

Because DDs are a way of expressing heating units, entomologists, plant pathologists, horticulturists, and agronomists have utilized DD calculations to model the development (phenology) of arthropod pests, plant diseases, plants, crops, and weeds. For instance, we know that the best fit for explaining the development of ascospores of the

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Degree Days (DD) calculated in NEWA at <http://newa.cornell.edu/index.php?page=degree-days> and the insect phenology and disease models for which they were developed.

Base Temp	Insect Phenology Model or Disease Development Model
4°C	cabbage maggot
0°C	apple scab
40°F	onion maggot
43°F	obliquebanded leafroller, spotted tentiform leafminer
45°F	oriental fruit moth
47.14°F	grape berry moth
48°F	alfalfa weevil
50°F	growing degree days (GDD), codling moth, plum curculio, apple maggot
55°F	fire blight shoot blight symptom development

Implementation of these models is guided by research and extension faculty at Cornell University, as well as extension educators in Cornell Cooperative Extension. NEWA also provides a platform for stakeholder input to improve model performance and webpage results. For example, if you are looking at the "Results" pages generated by the Apple Insect Models on NEWA, those screens are generated by accumulating temperature data for the location of interest, generating a DD value (using Baskerville-Emin calculations, see below), and then comparing that total against a lookup table of DD ranges and corresponding text messages that are used to populate the Pest Status, Pest Development, and Pest Management boxes on the screen.

There are several formulas that can be used to calculate degree days

In NEWA, historically, the simple Max-Min formula has been used for DD calculations. This formula can readily be calculated by hand and was also included in many of the Cornell Pest Management Guidelines. The Baskerville-Emin (BE) formula uses a sine wave algorithm and results in more precise DD calculations. This formula was implemented in NEWA in ~2006.

We chose to place the simple DD formula choices at the top of the drop-down selection list on the NEWA Degree Day Data webpage <http://newa.cornell.edu/index.php?page=degree-days> to reduce confusion

among our long-time NEWA users. Those choices that use the BE DD formula are noted as "BE" in the name. Currently, in all the NEWA apple disease and apple insect phenology models that utilize DD accumulations, the BE formula is being used. Kerik Cox and Art Agnello have chosen to use BE DDs because of their higher precision. Furthermore, BE DDs have been used in the entomology field observations in Geneva, NY, for the past 25 years or more.

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### scaffolds

is published weekly from March to September by Cornell University—NYS Agricultural Experiment Station (Geneva) and Ithaca—with the assistance of Cornell Cooperative Extension. New York field reports welcomed. Send submissions by 2 pm Monday to:

scaffolds FRUIT JOURNAL  
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This newsletter available online at:  
<http://www.scaffolds.entomology.cornell.edu/index.html>

If you are comparing the Scaffolds "Upcoming Pest Events" tabulated DDs with what is tabulated for Geneva in NEWA, make sure you compare these with the BE DDs to get the best match. "Best match" because, having used two calculators to crunch an involved equation and come up with two answers that don't exactly match, it is true that software programs can differ slightly in the way they handle rounding of decimal places, etc., which can create some differences in the mathematical answer.

#### Max and Min temperatures are collected during a "defined" 24-hour period

Another area that introduces variability in DD accumulations is how the 24-hour period is defined. For some, the 24-hour day begins at midnight, and for some it ends at midnight. That is, in some systems midnight is 0:00, in some it is 24:00. In NEWA, midnight marks the beginning of the day and is tabulated as 0:00 in the Hourly Data pages. NEWA's 24-hour period runs from 12:00 AM (= 0:00) until 11:59 PM. Data is collected for NEWA's database at the top of the hour. Therefore, some NEWA weather stations may miss the true Max and true Min temperature for a given day, because it might have occurred at 2:16 PM. Hence, this adds another source of variability! Consequently, NEWA's new weather stations with the IP100 ethernet interface, described at <http://newa.cornell.edu/index.php?page=get-weather-station>, will be programmed to collect the true daily Max and Min values.

Daylight savings time can be problematic. Essentially, an hour is lost and then gained in the annual time continuum. NEWA will soon begin utilizing the same methodology as the National Weather Service (NWS) for dealing with this 23-hour-long day and 25-hour-long day during the year. The NWS has Weather Observer sites reporting daily Max and Min temperatures. These sites collect data, once per day, at specified times, which can affect DD value calculations. Consider the time when you look at the values from your Max-Min thermometer and then clear them. If you look at these first thing in the morning and invariably at 5:00 AM, then you are collecting a true 24-hour Max and Min temperature for the period 6:00 AM un-

til 5:00 AM the following day. If you collect this data in the afternoon, the 24-hour period range would be different. Over time, climatologists have found that "afternoon" observations typically accumulate more DD's than "morning" ones.

#### The bottom line

When comparing DD data, keep in mind the sources of variability in DD accumulations. And don't sweat the discrepancies you find too much; like they say, "you can measure it with a micrometer, but what's the sense if you have to cut it out with a hatchet?" Nothing is more accurate than looking outside and seeing if you have green tip or counting the insects in your traps. We certainly don't expect an adult codling moth to pop out on the dot at 489 DD (base 43°F) from Jan 1, or plum curculio to stop immigrating into the orchard at 308 DD (base 50°F) from petal fall; there are simply too many sources of variability (e.g., in whose data one is using, how it was collected, at how representative a site, and at what point in time, etc.) to make this level of tracking practical.

NEWA provides theoretical predictions and forecasts. The theoretical models predicting pest development or disease risk use the weather data collected (or forecasted) from the weather station location. These results should not be substituted for actual observations of plant growth stage, pest presence, and disease occurrence determined through scouting or insect pheromone traps.❖❖

### PEST FOCUS

Highland: 1st **Oriental fruit moth** trap capture today, 4/15.

EXTRA,  
EXTRA!

SPECIAL  
REGISTRATIONS  
(Art Agnello,  
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### Thionex (endosulfan)

❖❖ Mike Helms from PMEP has informed us that our application for a NYS 2(ee) registration of Thionex for use against the unlabeled pest, Brown Marmorated Stink Bug, in apple has been approved by the NYS Dept. of Environmental Conservation. This registration pertains to both Thionex 3EC (EPA Reg. No. 66222-63) and Thionex 50W (EPA Reg. No. 66222-62). Users must have a copy of the appropriate 2(ee) recommendation in their possession at the time of use. Copies of the above 2(ee) recommendations are posted to the "NYS

2(ee) Recommendations and Categories" section of the PMEP website: [http://pmep.cce.cornell.edu/regulation/2ee/unlabeled\\_pest/fruits/apples/insecticides/index.html](http://pmep.cce.cornell.edu/regulation/2ee/unlabeled_pest/fruits/apples/insecticides/index.html). The recommendation should also be available on PIMS (<http://pims.psur.cornell.edu>) shortly. When using a 2(ee) recommendation, remember to follow any applicable directions, restrictions, and precautions on the primary product label.

### Guthion (azinphosmethyl)

The supplemental label allowing the use of Guthion 50W Solupak (EPA Reg. No. 66222-162) on apples, crabapples, blueberries, cherries and pears until September 30, 2013 in NYS, has been posted on the PIMS website and is now accessible at: <http://128.253.223.36/ppds/534675.pdf>. For specific crop use directions on application rates, insects controlled, remarks and additional restrictions, refer to the full product label. ❖❖

## PHENOLOGIES

Geneva:	4/22, predicted
Apple (McIntosh, Red Delicious, Empire): silver tip	green tip
Pear (Bartlett): swollen bud	bud burst
Sweet cherry: swollen bud	bud burst
Peach: swollen bud	bud burst
Highland:	
Apple(McIntosh): green tip	
Apple(Red Delicious,Ginger Gold): 20% half-inch green	
Apple (Empire): half-inch green	
Pear (Bartlett): swollen bud	
Pear, Oriental (Hosui): >50% bud burst	
Pear (Bosc): dormant	
Plum (Stanley): swollen bud	
Apricot (early): swollen bud	
Sweet cherry-early (Danube): 10% bud burst	
Sweet cherry-late (Regina): swollen bud	
Peach-early, late: swollen bud	

INSECT TRAP CATCHES (Number/Trap/Day)						
Geneva, NY				Highland, NY		
	<u>4/4</u>	<u>4/8</u>	<u>4/15</u>		<u>4/8</u>	<u>4/15</u>
Green fruitworm	0.2*	0.3	0.4	Green fruitworm	2.1	1.2
Redbanded leafroller	0	0	0	Redbanded leafroller	0.1	2.3
Spotted tentiform leafminer	0	0	0	Spotted tentiform leafminer	0.0	0.0
				Oriental fruit moth	–	0.1*
* first catch						

UPCOMING PEST EVENTS		
	<u>43°F</u>	<u>50°F</u>
Current DD accumulations (Geneva 1/1–4/15/13):	82	28
(Geneva 1/1–4/15/2012):	311	155
(Geneva "Normal"):	137	56
(Geneva 1/1–4/22 predicted):	154	65
(Highland 1/1–4/15/13):	135	48
<u>Coming Events:</u>	<u>Ranges (Normal ±StDev):</u>	
Green fruitworm flight peak	102–216	39–101
Pear psylla adults active	31–99	8–34
Pear psylla 1st oviposition	40–126	11–53
Redbanded leafroller 1st catch	110–178	40–82
Spotted tentiform leafminer 1st catch	113–213	41–101
Green apple aphid present	111–265	38–134
Pear thrips in pear buds	118–214	50–98
McIntosh green tip	95–147	36–62

NOTE: Every effort has been made to provide correct, complete and up-to-date pesticide recommendations. Nevertheless, changes in pesticide regulations occur constantly, and human errors are possible. These recommendations are not a substitute for pesticide labelling. Please read the label before applying any pesticide.

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