Northern Michigan FruitNet 2014
Northwest Michigan Horticultural Research Center

Special Update
May 30, 2014

Northwest Regional Update
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MSU Extension Educators

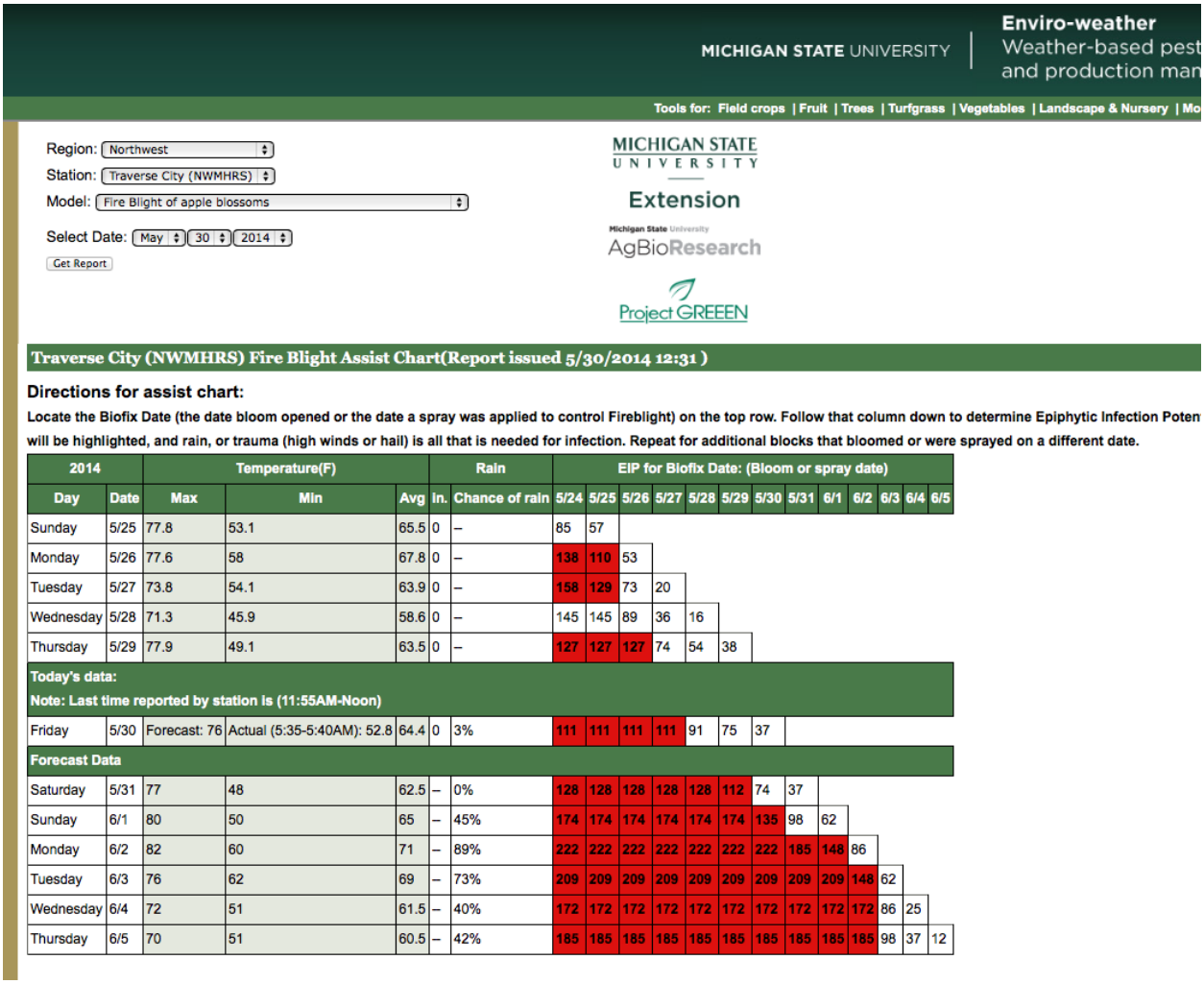
Bloom progressed quickly, and pollinators were very active during this week's beautiful warm and dry weather—we have the potential to set nice crops in all tree fruits. These warm conditions have also been conducive for growth of fire blight bacteria on open apple blossoms. As there is rain in the forecast on Sunday-Tuesday, we need to be protecting against the fire blight pathogen as well as covering our quickly expanding foliage against apple scab and cherry leaf spot infections.

Fire Blight
Fire blight bacteria, *Erwinia amylovora*, overwinter on and around cankers formed during the previous season, and these bacteria rapidly develop during warm conditions, beginning when temperatures reach 65 degrees F. Rain, hail, dew, heavy wind and pollinators visiting flowers can transfer fire blight bacteria to flower pistils. Once on the pistils, the bacteria multiply rapidly when temperature reach 65 degrees F and higher; water from rain or heavy dew wash the bacteria down into the flower where infection occurs on susceptible apple varieties.

Flowers are open on many apple varieties and will continue to open over the next several days; these flowers are susceptible to fire blight infection and growers need to protect those blossoms before the coming rain. Currently the fire blight model on Enviro-weather is predicting potential fire blight infection periods for Traverse City, Old Mission, Northport, Kewadin, Elk Rapids, Eastport, East Leland, Benzonia, and Bear Lake, where apple blossoms have not yet been protected and for newly open blossoms. In areas with streptomycin resistant *E. amylovora* bacteria, oxytetracycline and Kasumin (in counties where it is permitted by Section 18 exemption: Grand Traverse, Leelanau, and Antrim) is the best option for control. Growers need to be sure that they have used a registered alternative for fireblight control *prior* to the first application of Kasumin. In counties that do not have a Section 18 exemption for Kasumin use, streptomycin and oxytetracycline are the best options for fire blight control.

Minimizing shoot growth on apples reduces susceptibility to fire blight and the spread of fireblight bacteria to healthy tissue. Apogee is a locally systemic gibberellin biosynthesis inhibitor that slows shoot extension and reduces the potential for shoot blight. The optimal timing for application of Apogee is at king bloom petal fall. Many varieties of

apple are at king bloom petal fall or quickly approaching this stage. Please refer to the additional article on Apogee for further recommendations.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Region: Northwest
Station: Traverse City (NWMHRS)
Model: Fire Blight of apple blossoms
Select Date: May 30 2014
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Traverse City (NWMHRS) Fire Blight Assist Chart(Report issued 5/30/2014 12:31)

Directions for assist chart:

Locate the Biofix Date (the date bloom opened or the date a spray was applied to control Fireblight) on the top row. Follow that column down to determine Epiphytic Infection Poten will be highlighted, and rain, or trauma (high winds or hail) is all that is needed for infection. Repeat for additional blocks that bloomed or were sprayed on a different date.

2014		Temperature(F)			Rain		EIP for Biofix Date: (Bloom or spray date)										
Day	Date	Max	Min	Avg	In.	Chance of rain	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5
Sunday	5/25	77.8	53.1	65.5	0	–	85	57											
Monday	5/26	77.6	58	67.8	0	–	138	110	53										
Tuesday	5/27	73.8	54.1	63.9	0	–	158	129	73	20									
Wednesday	5/28	71.3	45.9	58.6	0	–	145	145	89	36	16								
Thursday	5/29	77.9	49.1	63.5	0	–	127	127	127	74	54	38							
Today's data: **Note: Last time reported by station is (11:55AM-Noon)**																			
Friday	5/30	Forecast: 76	Actual (5:35-5:40AM): 52.8	64.4	0	3%	111	111	111	111	91	75	37						
Forecast Data																			
Saturday	5/31	77	48	62.5	–	0%	128	128	128	128	128	112	74	37					
Sunday	6/1	80	50	65	–	45%	174	174	174	174	174	174	135	98	62				
Monday	6/2	82	60	71	–	89%	222	222	222	222	222	222	222	185	148	86			
Tuesday	6/3	76	62	69	–	73%	209	209	209	209	209	209	209	209	209	148	62		
Wednesday	6/4	72	51	61.5	–	40%	172	172	172	172	172	172	172	172	172	172	86	25	
Thursday	6/5	70	51	60.5	–	42%	185	185	185	185	185	185	185	185	185	185	98	37	12

Apple Scab

Although there have not been any potential infection periods in the last week, the primary apple scab infection period is ongoing. There has been substantial growth in apples, and growers need to continue to protect new leaves from apple scab infection. These warm conditions coupled with the potential coming rain will necessitate covering tissue for apple scab and powdery mildew.

Cherry Leaf Spot

The cherry leaf spot fungus, *Blumeriella jaapii*, overwinters on leaves that were infected in the previous season. As temperatures rise in the spring, the fungi grow and form ascospores that are discharged during wetting events. Ascospores are carried upward

by wind and rain and infect leaves through stomata. Bract leaves are susceptible to infection and this season, in isolated incidences, we have already observed cherry leaf spot lesions on bract leaves collected from orchards in the region. Cherry leaf spot lesions may appear within as little as five days after infection. The fungus produces conidia on the undersides of infected leaves that are spread to nearby leaves during wet periods.

We had substantial growth during the past week's warm weather, and newly expanded leaves have open stomata that are susceptible to potential cherry leaf spot infection. Like apple scab and other fungi that infect leaf tissue, new leaves that have not been protected with fungicides can become infected if conditions are favorable. Many orchards are at petal fall, therefore, there is less risk for pollinator exposure to a post-bloom fungicide application. Several growers have sprayed or are planning to spray chlorothalonil in anticipation of the coming rain to protect leaves from potential cherry leaf spot infection. Chlorothalonil has excellent efficacy for cherry leaf spot and provides fair to good control of brown rot. Chlorothalonil will not provide protection against powdery mildew, and we often target controlling this disease at first cover.

Announcement regarding special guest at next week's IPM Update

Tree fruit horticulturalist and apple guru, Phil Schwallier of MSU Extension will be joining us at next week's IPM Update in Leelanau County from 12 PM – 2 PM and on Old Mission from 3 PM – 5 PM. The Leelanau update is held at Bardenhagen Farms, 7785 E. Pertner Road, Suttons Bay, MI 49682. The meeting on Old Mission will be held in the Wunsch Farms' packing shed on Phelps Road, Old Mission Peninsula, Traverse City, MI 49686.

Phil will provide his expertise on precision orchard management, specifically regarding approaches to blossom thinning using plant growth regulators on apples for optimizing fruit quantity and quality. At a precision management meeting hosted by the NWMHRC earlier this year, Phil presented this information and how it is related to the apple carbohydrate model generated by a collaboration of fruit researchers in the nation. Please join us for this opportunity to strategize about thinning recommendations for 2014.

Unfortunately, Phil is unable to join us on Wednesday for the Antrim and Benzie county meetings, but we encourage all growers to join us at either of the meetings in Leelanau or Old Mission. Please stay tuned for more details if other opportunities arise between now and early next week.

HOW TO USE THE ENVIROWEATHER FIRE BLIGHT MODEL

Nikki Rothwell, NWMHRC
George Sundin, Plant Pathology, MSU

Growth of the fire blight pathogen is favored at temperatures over 65 F. Degree hours using a base of 65 F (DH65) is used to estimate fire blight bacterial population growth. To reach a level where fire blight can cause problems in the orchard, 198 degree hours (base 65 F) from first bloom are needed to increase the population to a potentially dangerous level. These fire blight bacteria grow on the tip of the flower pistil (the stigma, which receives pollen grains), and once the population has built up on the stigma, a rain or heavy dew can wash the bacteria deep inside the flower where infection can take place.

The fire blight blossom model is based on the EIP value (Epiphytic Infection Potential), which is a way to express this heat unit accumulation on a 0 to 100 scale. ("Epiphytic" = plant surface). The EIP is calculated by dividing the current DH65 accumulation by 195 and then multiplying this by 100. If the DH65 reaches 195 (which also means that the EIP is 100), the bacteria have built up to a dangerous level, and a rain or heavy dew at this time will wash the bacterial down into the infection site and cause infection.

The current blossom blight model on Enviroweather also has the capacity to reduce the EIP value under cooler weather conditions by figuring in blossom life. In addition, the model reduces the EIP if the maximum temperature for a day is below 64 F, because the fire blight bacteria require warm temperatures to grow. The EIP value is reduced by 1/3 by one "cool" day, another third by a second consecutive cool day, and to zero with a third. A day with freezing temperatures reduces the EIP to zero. However, once the EIP reaches 200, cool weather no longer reduces the accumulation.

The fire blight model is very different from other pest models in that it is based on degree ‘hours’ rather than degree ‘days’. Since the threshold temperature for fire blight is 65 F, we often go above that temperature for many hours in one day, so it takes a lot less time to collect degree hours above the threshold compared to collecting ‘daily’ temperatures that average above 65 F. Growers must be particularly diligent about checking the model because when temperatures change drastically during the day, the EIP can rise quickly and warrant a fire flight spray.

Therefore, at this time of the year, we need to be on the look out for weather conditions that favor fire blight, especially in susceptible varieties (See list of susceptible varieties below). Infection can occur with a small amount of rain (or dew) following a warm period that allows bacterial populations to reach critical levels. The Enviroweather website has a reliable chart growers can use to determine if a fire blight control spray is needed (www.enviroweather.msu.edu). Locate the biofix date (the date bloom first opened **OR** the date a spray was applied to control fire blight) on the top row. Follow that column down to determine Epiphytic Infection Potential (EIP) for that block on each date in the left column. If this number is greater than 100, and the average temperature is greater than or equal to 60 F, this area will be shaded and rain or trauma (high winds or hail) is all that is needed for infection.

At this time of year, it is particularly difficult to gauge fire blight infection potential as we often have warm and rainy weather, but we don’t want to ‘waste’ an antibiotic spray if it is not truly necessary. If the fire blight model’s EIP is close to but not at 100, there are a few rules of thumb to determine if an antibiotic application is warranted: 1) a block with a history of fire blight, 2) susceptible varieties, and/or 3) visible cankers are all good reasons to go into a rainy period with

an antibiotic spray.

Susceptible Varieties
Gala, Fuji, Jonathan, Rome, Idared, Ginger Gold, Mutsu (Crispin), Rhode Island Greening, Paulared, Jonagold, Northern Spy

EXAMPLE:

Interpreting the Enviroweather Chart

First pick the column that best corresponds to the first day blossoms opened in your orchard (see figure). The numbers in the squares gives the EIP (Epiphytic Infection Potential) for these blossoms. Bacterial populations (larger EIP) build on days with temperatures over 65 F. When the EIP reaches 100, a rain or trauma event (strong wind or hail) will initiate a blossom infection. The higher the EIP, the greater is the risk of infection with rain or trauma.

2013		Temperature(F)			Rain		EIP for Biofix Date: (Bloom or spray date)													
Day	Date	Max	Min	Avg	in.	Chance of rain	5/14	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	5/25	5/26	5/27
Wednesday	5/15	71.3	46.8	59.1	0	--	17	14												
Thursday	5/16	70.2	44.8	57.5	0	--	34	32	17											
Friday	5/17	58.2	42.8	50.5	0.03	--	23	21	12	0										
Saturday	5/18	75.5	51.7	63.6	0	--	48	46	36	25	25									
Sunday	5/19	85	58.9	72	0	--	100	100	100	88	88	63								
Today's data: **Note: Last time reported by station is (8:55-9:00AM)**																				
Monday	5/20	Forecast: 78	Actual (2:45-2:50AM): 63.6	70.8	0	72%	**162**	**162**	**162**	**162**	**162**	**137**	74							
Forecast Data																				
Tuesday	5/21	75	58	66.5	--	83%	**174**	**174**	**174**	**174**	**174**	**174**	**111**	37						
Wednesday	5/22	69	54	61.5	--	79%	**186**	**186**	**186**	**186**	**186**	**186**	**123**	49	12					
Thursday	5/23	62	48	55	--	57%	82	82	82	82	82	82	82	33	8	0				
Friday	5/24	63	36	49.5	--	2%	41	41	41	41	41	41	41	16	4	0	0			
Saturday	5/25	66	36	51	--	10%	16	16	16	16	16	16	16	16	4	0	0	0		
Sunday	5/26	67	44	55.5	--	33%	16	16	16	16	16	16	16	16	4	0	0	0	0	
Monday	5/27	68	48	58	--	32%	16	16	16	16	16	16	16	16	16	12	12	12	12	12

Excerpt from 2013 article: *Fire blight risk increasing: treatment options in counties affected by Section 18 for Kasumin*

Posted on **May 14, 2013** by **George Sundin**, Michigan State University Extension, Department of Plant, Soil, and Microbial Sciences

Temperatures in the high 70s to low 80s are optimal for growth of the fire blight pathogen on apple flower stigmas. At these temperatures, populations of the pathogen can double in size every 30 to 45 minutes on stigmas. Pollinators are also quite active as well, and will also increase the movement of the pathogen around in orchards and facilitate colonization of new flowers.

After a freeze, the MaryBlyt fire blight model resets the EIP value to zero because cold temperatures are inhibitory to growth of the pathogen. Also, since this possible infection was relatively early in the bloom period for most, there was likely not a strong buildup of pathogen cells in most orchards.

What typically happens when temperatures get cold is that the pathogen cells remain on flowers, but do not grow. As the open flower ages to five to six days after opening, the flower reaches a state where the pathogen cannot infect it. Thus, we can escape infection of that flower. However, those pathogen cells do not disappear; they remain on the flower and can serve as inoculum for subsequent infection if they are disseminated to newer recently-opened flowers.

Be sure to use the fire blight model on the MSU Enviro-weather website to see what the EIP values are as predicted from the weather station closest to your orchard. These EIP numbers change every day as predicted high temperatures change.

The higher the EIP value gets, the higher the risk of infection. When the number reaches 100, this indicates the potential for significant infection. At an EIP of 200, the risk is extreme. For historical reference, during the last significant fire blight year we had in 2005, EIP values peaked at 255 for Bainbridge, Mich., and 182 in Sparta, Mich. Of course, weather will play an important role in the potential for fire blight epidemics and subsequent shoot blight infection, but we do know that the occurrence of blossom blight puts trees at significant risk for further infection events of shoots during the summer.

What is the relationship between EIP values and choices for blossom blight control? The main choices we have are streptomycin (Agri-Mycin, FireWall), oxytetracycline (Mycoshield, FireLine), Kasumin and the biological control Serenade MAX. Remember, streptomycin resistance is widespread in southwest Michigan, the Fruit Ridge, and Oceana County. Streptomycin-resistant strains of the fire blight pathogen are beginning to be spread more widely in northwest Michigan. Thus, streptomycin should not be used in these areas, leaving our choices as oxytetracycline, Kasumin, and Serenade MAX.

In general, if EIP values are less than 50, any of the three would be effective as we would be under low fire blight pressure. For EIP values ranging from 50 to 90, oxytetraycline would be a good choice because the disease pressure is moderate and due to the high costs of Kasumin. Remember that this material inhibits growth of the pathogen and must be applied in advance of rains. For EIP values greater than 90, Kasumin is the best choice as our field data indicates

Kasumin has better efficacy than oxytetracycline under high disease pressure. Applications should be made prior to rain to protect blossoms from infection.

Apogee Application Time
Nikki Rothwell, NWMHRC
Phil Schwallier, MSUE

Apogee® is a plant growth regulator composed of prohexadione-calcium that can be used in apples with significant advantages to the grower. Prohexidione-calcium reduces terminal growth by inhibiting important enzymes that help form growth-specific gibberellins. This group of plant hormones is primarily responsible for regulating shoot elongation in apple trees. In laymen's terms, Apogee helps control tree vigor. Controlling vigor can reduce the amount/intensity of pruning, decrease internal shading--a major proponent to properly color apples, and reduce canopy density for thorough pesticide coverage. This product has also been a reliable tool for minimizing impacts of shoot blight caused by the fireblight pathogen, *Erwinia amylovora*. Shoots that have less growth are not as susceptible to fire blight, and Dr. George Sundin's work has shown that Apogee greatly reduces the potential for shoot blight. When applying Apogee to apples, growers should consider the following: timing, rate per acre, thinning relationships, and compatibility with other chemistries in the tank.

Timing
Apogee should be applied when vegetative shoot growth is less than three inches. To best time the application, there is a 7 to 10-day window beginning at king bloom petal fall. This timing applies to most varieties in most years. Two more applications should be made at two-week intervals following the bloom application. Sometimes a fourth application is needed when excessive rainfall or light crops increase vegetative growth.

Rate
The rate per acre is usually calculated on a tree row volume basis and can be adjusted to two-thirds of the full-rate. The two-thirds rate is the starting rate growers should consider if they have not had experience with using Apogee. Growers with past experience will know if this 2/3 rate is too high or too low for a particular block. This suggested two-thirds rate per acre is a season-long rate. For example, if trees are at 75% tree row volume, then 24 ounces per acre is the seasonal rate (48 * 0.75 * 2/3).

Best results are achieved when the seasonal rate is split into three or four sprays. For example, Apogee applications at 8 + 8 + 8oz per acre for a total of 24oz per acre per season. When the fireblight risk is high, the first application of Apogee at king bloom petal fall timing should be increased to as much as 150 percent of the split rate. For example, the rate should be increased from 8oz per acre to 12oz per acre. If the first spray rate is increased, subsequent sprays (second and third sprays) should be reduced. The seasonal application would be 12 + 6 + 6 = 24 ounces per season instead of 8+8+8=24oz. If temperatures continue to remain high with the potential for rainfall on Sunday and into the beginning of the week, a higher rate of Apogee is recommended.

Thinning
Apogee tends to increase fruit set, hence more aggressive thinning is often needed. If using Apogee, growers should increase thinning by 10 or 15%. For example, if the rate to thin was 1 pt Sevin + 8 ppm NAA, the thinning rate in blocks where Apogee has been used should increase to 1 pt Sevin + 10 ppm NAA.

Compatibility
Apogee is not compatible with calcium or boron in the tank. We also recommend that Apogee be applied after thinner application. If the two-week timing interval is also the ideal time to thin, make the thinning application first and follow with Apogee a few days later. Growers should read the Apogee label carefully. Apogee must be used with an organosilicone surfactant, and an equal weight of spray grade ammonium sulfate should be applied. Do not use Apogee on 'Empire,' 'Stayman,' or 'Winesap' because of the potential for fruit cracking.

To conclude, Apogee is an excellent tool to help control vegetative growth, which decreases the need for summer pruning and can suppress the spread of fireblight among shoots and within shoots. The above recommendations are the best way to maximize the use of Apogee.