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PURDUE EXTENSION

FACTS FOR Fancy Fruit

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Crop conditions

With recent very warm weather, crop development is advancing rapidly. Apples in southern areas are just past full bloom but in the north are around pink to popcorn stage. Peaches are still in the shucks in southern areas and just past full bloom in the north. Grapes, blueberries, and brambles are past bud break.

Spring 2013

While our weather so far this spring has not exactly been "normal", so far it's closer to normal than we have been in a few years. Compared with the last three years, we had a delayed spring this year, almost in line with the long-term average. Recent very warm weather has resulted in rapid accumulation of Growing Degree Days that has accelerated plant development. Note that this also accelerates insect development. Even though we are behind the last few years, we have still accumulated twice as many GDD as the long-term average. I think most growers would agree that it feels pretty good to be somewhere around the average instead of these early springs. There have been a number of light freezes around the state, but because they were pretty light and came before full bloom in most cases, I expect there to be relatively little damage. Any damage that did occur probably just caused a little early thinning!

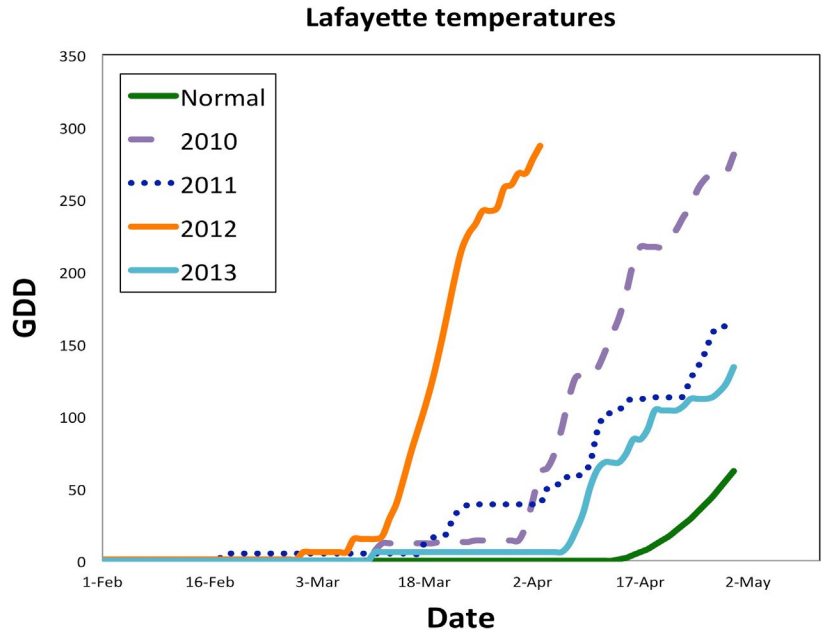

Figure 1. Heat accumulation (measured as Growing Degree Days or GDD) over the last 4 years for Lafayette IN.

Chemical thinning – 2013 edition

We're getting close to the time when growers need to make chemical thinning decisions – for many the most perplexing and risky decision they will make all year. This is usually a tricky call to make, and this year will be even more so. This year many growers will need to factor in last year's light crop and the drought. In most cases I don't expect the drought to have had too much effect on flowering this year. However growers should expect very heavy flowering this year because of last year's freeze and resulting light crops. There are a couple of things to keep in mind when trees flower heavily. The first is that the proportion of fruit drop will be higher. This is because there are more flowers and developing fruitlets competing with each other for limited resources. The second thing to keep in mind is that despite the heavy drop, there will likely be an abundance of fruitlets remaining on the trees that will require an aggressive approach to thinning.

As apple crops approach petal fall, it's time to start chemical thinning. Pollinating weather has generally been favorable. With spring being relatively late this year, I think it's a good year to start chemical thinning at petal fall, since the risk of freeze damage is now pretty low.

The effectiveness of a chemical thinner application depends on many factors, and to hit it just right takes as much art as science. That's a fancy way of saying that we don't really understand why different orchards respond differently to a given thinner application. But we know they do. That's why it's impossible to develop a recipe approach to thinning. So let me explain a little about how thinners work, then discuss some specific strategies.

From the time of bloom and for the next month or so, there are thousands of flowers and developing fruitlets on the tree, struggling to get enough resources to grow. By resources I mean food in the form of carbohydrates. These carbohydrates come from stored sources in the tree but especially from leaves taking light energy and converting it to carbohydrates through the photosynthetic process. At this time of the year, leaf area for photosynthesis is limited, so there is a shortage in the supply of carbohydrates. Because the demand exceeds the supply, fruitlets compete for carbohydrates and only the strong survive. The weak flowers or fruitlets lose out and drop off, which we call fruit drop or June drop. The thinners we commonly use in Indiana exacerbate this shortage, so that even more fruitlets drop off. Some, like NAA, reduce photosynthesis so there is less carbohydrate supply. Others (such as Sevin) decrease the flow of carbohydrates from leaves to fruitlets, thereby also decreasing the supply. The Maxcell-type thinners increase respiration, burning up more carbohydrates so less is left over for developing fruitlets. So in these 3 different ways, thinners increase the shortfall of carbohydrates resulting in increased fruit drop. Keeping this in mind allows growers to predict the response to thinners from year to year. For example, a lot of cloudy weather soon after bloom means less light for photosynthesis, less carbohydrate and increased fruit drop. In that situation growers may want to back off a little with their thinner rates.

It turns out that some of our most biennial varieties (Fuji, Golden Delicious) are also some of the more difficult to thin. So not only is thinning more difficult, the consequences of inadequate thinning are greater. Keep in mind your own experience on your orchard, but with Fuji you might want to start with a full rate of Maxcell soon after petal fall. Wait a full 2 weeks to see the response to the thinner application before applying more thinners. If another application is needed, I'd suggest ONE of the following, depending on how aggressive you want to be. In order from conservative to most aggressive, I'd suggest:

- Maxcell again
- Sevin
- Maxcell + sevin
- Maxcell + ethrel
- Maxcell + oil

Keep in mind these are general thoughts based on my experience and published research, but as you know things work a little differently on different farms, so mix these thoughts with your own experience to come up with a plan. Most products do not thin Fuji enough. I'd put NAA/NAD, carbaryl and ethephon in this category. I'd stay away from NAA and NAD because of the tendency to form pygmies. Starting at petal fall gives you some time for a follow up application 2 weeks later

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Current bud stages West Lafayette, IN		
Apple	Peach	Grape
		
advanced pink stage, almost popcorn	*petal fall*	*bud break*
Blackberry	Blueberry	Strawberry
		
1 inch shoots	*pink tip*	*early bloom*

if necessary and spreads the risk. The single application approach is putting all your eggs in one basket and too risky for many growers. (Hirst)

Sprayer calibration videos

One of the items on every grower's 'to do' list each spring is to make sure that the sprayer is properly calibrated. If you need a refresher on how to go about doing this, Cornell professor Andrew Landers has posted a couple of videos on YouTube that walk through the process. To find the videos:

1. Go to the YouTube website, www.youtube.com <http://www.youtube.com> .
2. Type 'vineyard sprayer calibration' into the search box at the top. Andrew's videos should appear at or near the top of the list. (Note they are listed "by Bill Larzelere")

The videos are in two parts – "Part 1 Selecting and Changing Nozzles" and "Part 2 Measuring Liquid Flow". Each video is done in a metric version and one with US units of measure. (Bordelon)

More on the effect of water quality on pesticides

I wrote about water quality impacts on pesticide performance in the last issue of Facts for Fancy Fruit Newsletter. Here is some additional information (by Annemiek Schilder from the MSU Fruit Management Guide E-154) to show you just how important water pH can be.

The pH is a measure of the acidity or alkalinity of water, which refers to the number of hydrogen (H+) and hydroxyl (OH–) ions in a solution. The scale for measuring pH runs from 0 to 14. The lower the pH, the more acidic the solution; a higher pH indicates that the solution is more alkaline. Water at pH 7 is neutral — meaning that there are equal numbers of hydrogen and hydroxyl ions in the solution. Many areas in the Midwest have alkaline water (pH 8.0 or above) with high mineral/iron content. In addition, the pH of water from natural sources can vary throughout the season.

The pH of water can negatively affect the stability of some pesticides. Under alkaline conditions, alkaline hydrolysis occurs, which degrades the pesticide to non-toxic (inactive) forms. In general, insecticides (particularly organophosphates and carbamates) are more susceptible to alkaline hydrolysis than are fungicides, herbicides or growth regulators. The end result is less active ingredient applied and poor pesticide performance. The degradation of a pesticide can be measured in terms of its half-life. For example, if a product has a half-life of 1 hour, its effectiveness is reduced to 50% in 1 hour, to 25% in the next hour, to 12.5% in the next hour, etc. Eventually, the pesticide becomes virtually ineffective.

The effect of pH on pesticides varies from product to product and is also moderated by buffering solutions contained in the pesticide formulation. Tank mixing multiple pesticides can modify the pH of the tank mix. For instance, Captan has a half-life of 32 hours at its optimum pH of 5, but only 10 minutes at pH 8. Rally, on the other hand, is not affected by pH.

The table at the right shows the half-lives of a number of pesticide products as well as the optimum pH (where known). (Note: Only a small part of the table is reproduced.) As you can see from the table, most pesticides are most stable when the spray solution has a pH of about 5. Many water sources are more alkaline than this, so it may be necessary to adjust the pH of the spray solution. There are important exceptions to the rule that spray solutions should be acidified. For instance, in the case of copper-based fungicides, copper becomes more soluble at a lower pH and may become phytotoxic to crops. In addition, phosphorous acid and other acid-based fungicides already have a low pH, and lowering it even more can cause them to injure crops. On the other hand, acidifying carbonate salt fungicides, such as Armicarb, may render them ineffective.
(Bordelon)

Spring is in the air

Spring is in the air, and soon, ascospores, basidiospores, and conidia will be as well--Now is the time for disease management! The importance of timing only increases as we enter tight cluster models, ascospores of the scab fungus are beginning to be released in central Indiana; depending upon which part of the state you live (from central Indiana southwards) infection will be visible in the next two weeks if you haven't stayed on top of your spring sprays. The severity of infection will remain high if the wet weather remains. As this is the Midwest, I wouldn't dare make a prediction (and my Magic Eightball informs me that the "Outlook not so good"). Instead of relying upon a Magic Eightball, consider the Mill's Table that is used to predict apple scab infection periods. This table shows the relationships between temperatures, duration of leaf wetting, and development of apple scab infections.
(Beckerman)

Table 1. Pesticide half-lives and optimum pH.
NOTE: Only a small part of the table is reproduced here.

Product	Active Ingredient	Optimum pH	Half-life (time until 50% hydrolysis)
Insecticids/Miticides			
Admire	Imidacloprid	7.5	Greater than 31 dyas at pH 5-9
Apollo	clofentezine		pH 7 = 34 hrs; pH 9.2 = 4.8 hrs
Assail	acetamiprid	5 - 6	Unstable at pH below 4 and above 7
Dipel/Foray	Bacillus thuringiensis	6	Unstable at pH above 8
Imidan	phosmet	5	pH 5 = 7 days; pH 7 < 12 hrs; pH 8 = 4 hrs
Kelthane	dicofol	5.5	pH 5 = 20 days; pH 7 = 5 days; pH 9 = 1hr
Malathion	dimethyl dithiophosphate	5	pH 6 = 8 days; pH 7 = 3 days; pH 8 = 19 hrs; pH 9 = 5 hrs
Sevin XLR	carbaryl	7	pH 6 = 100 days; pH 7 = 24 days; pH 8 = 2.5 days; pH 9 = 1 day
SpinTor	spinosad	6	Stable at pH 5-7; pH 9 = 200 days
Fungicides			
Aliette	fosetyl-al	6	Stable at pH 4.0 to 8.0
Benlate	benomyl	-	pH 5 = 80 hrs; pH 6 = 7 hrs; pH 7 = 1 hr; pH 9 = 45 min
Bravo	chlorothalonil	7	Stable over a wide range of pH values
Captan	captan	5	pH 5 = 32 hrs; pH 7 = 8 hrs; pH 8 = 10 min
Dithane	mancozeb	6	pH 5 = 20 days; pH 7 = 17 hrs; pH 9 = 34 hrs
Rally	myclobutanil		Not affected by pH
Ridomil	mefenoxam		pH 5-9 = more than 4 weeks

Table 2. The Mill's Table describes the approximate wetting period required for primary apple scab infection at different air temperatures, to estimate the time required for development of conidia. (a)

Average temperature	Average temperature	Wetting period (hr)(b)	Wetting period (hr) (b)	Wetting period (hr)(b)	
Farenheit	Celsius	Light Infection	Moderate Infection	Heavy Infection	Incubation period (days)(c)
78	25.6	13.0	17	26	-
77	25.0	11.0	14	21	-
76	24.4	9.5	12	19	-
63 - 75	172. - 23.9	9.0	12	18	9
62	16.7	9.0	12	19	10
61	16.1	9.0	13	20	10
60	15.6	9.5	13	20	10
59	15.0	10.0	13	21	12
58	14.4	10.0	14	21	12
57	13.9	10.0	14	22	13
56	13.3	11.0	15	22	13
55	12.8	11.0	16	24	14
54	12.2	11.5	16	24	14
53	11.7	12.0	17	25	15
52	11.1	12.0	18	26	15
51	10.6	13.0	18	27	16
50	10.0	14.0	19	29	16
49	9.4	14.5	20	30	17
48	8.9	15.0	20	30	17
46	8.3	15.0	23	35	-
45	7.8	16.0	24	37	-
44	7.2	17.0	26	40	-
43	6.7	19.0	28	43	-
42	6.1	21.0	30	47	-
41	5.6	23.0	33	50	-
40	5.0	26.0	37	53	-
39	4.4	29.0	41	56	-
38	3.9	33.0	45	60	-
37	3.3	37.0	50	64	-
36	2.8	41.0	55	68	-
33 - 36	0.6 - 2.2	48.0	72	96	-

a Adapted from Mills, 1944, as modified by A. L. Jones. From: http://www.caf.wvu.edu/Kearneysville/disease_descriptions/millstable.html

b The infection period is considered to start at the beginning of the rain.

c Approximate number of days required for conidial development after the start of the infection period.

Late planting season can lead to increased herbicide drift problems

This year is shaping up to be a late planting year for row crops (corn and soybeans). April was the second wettest month on record with a statewide rainfall average of over 6 inches. That means farmers have not been able to get into the fields to till or apply burn-down herbicides in no-till. It has also been a late year for fruit crops so development has been delayed, but with the recent spell of warm weather, crops are growing quickly. Apples are in bloom and grapes, brambles, and blueberries are past bud break across the state. This is setting up a scenario where much of the herbicide applied to no-till crops will go on when sensitive crops such as grapes have started growing and are more prone to damage. In a "normal" year, much of the burn-down herbicide, which often contains glyphosate and the volatile herbicides 2,4-D or dicamba, is applied before grapes bud out, so they are not sensitive. But this year will be one of those where there is significant potential for off-target damage. If your vineyard is close

to row crops, especially no-till, you might want to talk to the farmers around you to make them aware of the situation. Direct them to the Driftwatch website (www.driftwatech.org). Hopefully your vineyard is registered. If not, register it now. Also direct them to the publication "Watch Out for Grapes" (DW-10) (http://www.extension.purdue.edu/extmedia/HO/DW-10-W.pdf), or print off a copy to give them. This is definitely a case where "an ounce of prevention is worth a pound of cure".
(Bordelon)

The juniper rusts

We are still currently too cool for telial spore horn development to begin on the junipers, at least in central Indiana, but the development should begin in the next significant rain event (or two). Telial spore horns are produced for several weeks. Usually, rust spore release from these gelatinous spore horns coincides with the pink stage of apple development. The DMI fungicides used to control scab have excellent control of the rust pathogens, as well as powdery mildew. If you want to see a video on how the gall produces spore horns and releases spores, check out:

http://www.youtube.com/watch?v=pfDp9cpA5jw

Speaking of **powdery mildew**…Last year was pretty bad, and it didn't get cold enough to kill any mildew overwintering in buds. If growing mildew susceptible varieties like Ginger Gold, Ida Red, Jonathan, Paula Red, and Rome, be sure to include a DMI like Rally or Procur to effectively control this disease. Captan and Mancozeb do not control powdery mildew! You can use a DMI for powdery mildew (and rust) control, or use a strobilurin. Sulfur is also an effective (low-cost) option.

On the plus side, this cooler spring is slowing down fire blight development. This could change should the temperatures become suddenly warmer and wetter. See ID-168, "2013 Indiana Commercial Tree Fruit Spray Guide" available at: http://www.extension.iastate.edu/Publications/PM1282.pdf for a complete listing of suggested fungicides for tree fruit disease management.
(Beckerman)

Apple proliferation phytoplasma

The U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) has been notified by the Canadian Food Inspection Agency (CFIA) that they have detected apple proliferation phytoplasma (APP) in an apple orchard near Kentville, Nova Scotia. The affected orchard has been placed under quarantine. This is the first APP detection in North America.

The affected trees are 'Pacific Gala' and were imported into Canada from the U.S. in 2008. It is important to note that no symptoms of APP have been observed in the source nurseries or reported in the U.S. at large, and the source of infestation is unknown at this time. APHIS has provided trace forward information to CFIA, and is currently conducting testing at the source nurseries. At this time, CFIA has not imposed new restrictions on importation of apple trees from the U.S.

APP, or '*Ca.* P. mali', is considered to be a quarantine pest in both Canada and the U.S. It is present throughout Europe, where it is considered to be one of the most critical diseases of apple trees. APP is spread through propagation practices with infected material including budding and grafting. Long-distance dispersal of APP occurs through the trade of infected rootstock, scionwood, or budwood. Specific insects, including certain psyllids, froghoppers and leafhoppers also spread APP, however it is not transmitted through seed or fruit or pruning.

Symptoms of APP include:

- shoots around axillary buds, which create a broom-like appearance at the end of affected branches
- leaf rosetting
- enlarged leaf stipules
- reduced growth and smaller, less sweet fruit

For more information on APP, please contact Craig Southwick at Craig.Southwick@aphis.usda.gov or (970) 494-7578.

Upcoming events

May & June, 2013.
Eastern Indiana Fruit Growers Meetings.
Eastern Indiana Fruit Growers have two upcoming meetings.

May 7, 2013.
The first of these meetings will take place at:
Don Stohlers Nut Farm
4376 W 850 N
Frankfort, IN 46041

June 4, 2013.
The second meeting will take place at:
Stuart Ford residence
10521 W 600 S
Red Key, IN 47373

Aug. 19 - 24, 2013.
1st International Symposium on Horticulture Economics, Marketing and Consumer Research. Please join us as we bring together researchers and industry from the international community for a two-day symposium to promote the investigation of horticultural marketing and economics, as well as industry profitability and competitiveness. For more info, see our website at http://hort.purdue.edu/ismcrh or contact Tammy Goodale, tgoodale@purdue.edu 765-494-1296.

Facts for Fancy Fruit

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Approximately 12-15 issues will be published during 2013, bi-weekly during the growing season and monthly otherwise. The subscription price of $15.00 includes only the basic costs of printing and mailing at first class rates. The newsletter is also available free of charge electronically through the World Wide Web at http://www.hort.purdue.edu/fff/ or by e-mail. If you have e-mail and would like a copy sent electronically, send your name and e-mail address to hirst@purdue.edu and we will include you on the list, or subscribe yourself through the web at http://www.hort.purdue.edu/fff/fff.html.

If your mailing label on the reverse side of this page has a 12/$15 in the upper right hand corner, we haven't received your renewal subscription for 2013. If you wish to receive the printed version of the newsletter in 2013, please fill out the form below and send it to the Department of Horticulture, along with a check for $15.00 (tax included).

We hope that you will benefit from the information contained in the newsletter. We welcome your comments and suggestions.

Peter M. Hirst

Please send me "Facts for Fancy Fruit" for the 2013 season. Enclosed is my check for $15.00 (tax included). Make checks payable to Purdue University.

Name _____ Please Check:

Address_____ _____Grower

City _____ _____Sales

State_____ Phone#_____ _____Other

Zip_____ County_____

I would like to see information on the following fruit crops:

_____Apple	_____Blueberries	_____Grapes
_____Peaches	_____Strawberries	_____Cider
_____Pears	_____Raspberries	_____Other

Please Return to: Facts for Fancy Fruit

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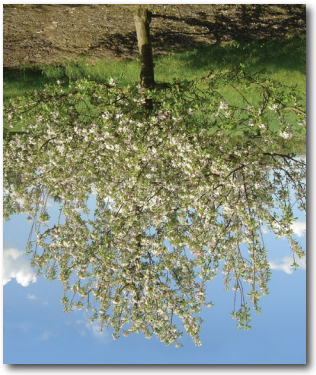

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