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PURDUE EXTENSION

FACTS FOR Fancy Fruit

July 24, 2013
Volume 13 • Issue 7

In This Issue

Determining apple maturity

Making the decision on when to harvest can be a very tricky and complicated issue. The longer you intend to store the fruit, the more precise your timing needs to be. For summer apples, most growers only intend to store them until their better quality fall apples come on stream, so storage times beyond a week or two are not that common. Even for fall apples, many growers aim to sell the majority of their crop immediately to the consumer, and try to be done by mid November or so. So since storage times are relatively short, harvest maturity is less important. This being the case, harvest apples when fruit are fully ripe. There are various tests for this, but taking a bite out of a few apples is just as good an indicator as any test. This also applies to apples intended for U-pick.

Bear in mind that even in cold storage, fruit continue to ripen, just at a slower rate. Therefore, fruit intended for longer term storage should be harvested when they are less ripe. There is no single test that will give you the answer but factors such as calendar date, heat unit accumulation, fruit firmness, soluble solids concentration, starch content and ethylene evolution all give answers to a piece of the puzzle. As you can see, this gets complicated real fast. Beyond the taste test, if you are going to perform one test I suggest looking at starch index. This gives an estimate of how much of the starch in the apple has been converted to sugar. So in Figure 1 the fruit with a rating of 0 that are completely black, are full of starch and not ready to be harvested. The fruit with a rating of 6 have almost complete conversion of starch to sugar are are ready for immediate consumption. This test is quick, easy, and doesn't require expensive equipment. For more details look in the Tree Fruit Pest Management Handbook, ID-93, available at http://www.hort.purdue.edu/fruitveg under bulletins. (Hirst)

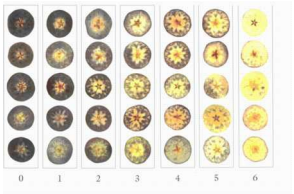

Figure 1.

ReTain on apples

ReTain is a fairly new growth regulator that basically prevents the tree from making ethylene. Smartfresh℠ on the other hand, does not prevent the tree or fruit from making ethylene, but prevents ethylene from acting, so even though ethylene is there, it cannot be sensed and therefore has no effect. As many growers know, ethylene is a hormone that causes abscission and pre-harvest drop and also plays a key role in fruit ripening. ReTain is a harvest management tool that allows growers to spread out their harvest to better fit their labor or marketing schedules. This could be especially useful in U-pick operations. With most varieties, harvest delays of 7-10 days can be obtained using ReTain.

To be effective, ReTain must be applied before the large rise in ethylene production that signals the start of fruit maturation. If applied too early, the effects of the ReTain application may wear off prematurely, but if applied too late, a significant proportion of the fruit may have already started to produce ethylene.

Remember that ReTain shuts down the production of ethylene, but once ethylene has started to be produced by ripening fruit, ReTain will not stop the fruit responding to it. Also bear in mind that ethylene is autocatalytic so that a small amount of ethylene triggers more and more ethylene production (like the snowball effect).

ReTain should be applied as a single application 4 weeks before anticipated harvest. Keep in mind that the season is running 7-10 days early this year. Count back 30 days from this anticipated harvest date and from that point you have about 7 days to apply the ReTain. Remember that the PHI (pre-harvest interval) is 21 days, so you cannot legally harvest fruit for 21 after you apply ReTain – yet another reason not to be late with your application.

ReTain should be applied in enough water to ensure good coverage and an organo-silicone surfactant should be added. Application during slow drying conditions will increase absorption and better results will be obtained. Avoid spraying when temperatures are over 90F. On sensitive varieties such as Gala, Jonagold and Honeycrisp, some growers will use lower rates (as low as half rates) but this may also decrease the response.

One of the benefits of delayed harvest with ReTain is that fruit size and color continue to increase and are improved when fruit are harvested. Typically, lower incidences of superficial scald, watercore and internal breakdown are seen with the use of ReTain. (Hirst)

Control of preharvest drop with NAA

The traditional material used for stop drop control on apples is NAA (Fruitone N), a synthetic auxin. Other synthetic auxins you may have heard of include 2,4-D and 2,4,5-T. Of course you also know Fruitone N as a chemical thinner. Early in the season NAA knocks them off and later towards harvest it sticks them on. This highlights the importance of timing when using plant growth regulators.

Another newer stop drop material is ReTain. Although both NAA and ReTain can reduce preharvest drop, they do this in different ways. ReTain delays apple maturity whereas NAA does not delay maturity (and may even hasten it) but just reduces the fruit dropping. ReTain must be applied well ahead of the anticipated harvest date so a considerable amount of planning is required. NAA on the other hand needs to be applied just before apples start dropping, so in this regard can be viewed as a rescue treatment.

Once NAA is applied it takes about 3 days for the activity to kick in. After that you can expect about 7 days of drop control. Rates of 10-20 ppm are usually effective, but knowing exactly when to apply it can be tricky. If the application is made too soon, the effect may wear off before harvest is complete. If the NAA is applied too late, then too many apples will have dropped on the ground before the NAA starts having an effect. Wait until you start to see a few apples drop, and perhaps assist this by bumping a few branches and seeing if any apples drop.

Then it's time to apply the NAA. Longer stop-drop control can be obtained with a split application, 10 ppm applied 7-14 days apart. NAA works best when the temperature is over 70F. Be aware that high rates of NAA (20 ppm) can advance fruit maturity.

NAA can be tank mixed and is compatible with a wide range of products. Always conduct a small test before mixing NAA with materials you haven't tried previously. Apply in enough water to ensure good coverage. (Hirst)

Apple and peach nutrition

While soil nutrient analysis is very useful prior to planting a new orchard, for an established orchard periodic foliar sampling is recommended. The results of foliar analysis shows what the tree has extracted from the soil rather than just what is in the soil. Sampling problem blocks may help shed light on causes of the problem and on other blocks regular sampling may help reveal trends that can help avoid future problems.

The best time to collect leaves for analysis is typically mid-July through mid-August (NOW). This is typically when extension growth has pretty much stopped and nutrient levels in the leaves has stabilized. As with any kind of nutritional analyses, obtaining meaningful results all hinges on taking a representative sample. Select one variety per sample – mixing leaves from different varieties will not give representative results of any variety. Samples should consist of 50-100 leaves, taken from the midpoint of current extension shoots around the periphery of

Facts for Fancy Fruit is a newsletter for commercial and advanced amateur fruit growers. It provides timely information on pest control, production practices, and other topics likely to be of interest to fruit growers. All growers and interested persons are welcome to subscribe.

Subscriptions are $15 per year. Subscribers will receive 12-15 issues biweekly during the growing season and monthly otherwise.

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trees. Collect 5-10 leaves per tree and take care not to sample spur leaves or those growing in the shade. Leaves should be collected with the petiole (leaf stalk) attached.

Washing leaves to remove dust or spray residue can cause as many problems as it solves, so growers should not wash leaves, but should wait as long as possible after applying pesticides before collecting samples. A list of certified labs that can analyze samples is given at: http://urbanext.illinois.edu/soiltest/ (Hirst)

Grape phylloxera

I have gotten lots of inquiries about the foliar or leaf phase of grape phylloxera this season. In my opinion, leaf phylloxera is probably not an economically important pest. I doubt that even heavy infestations have enough negative impact on vines to warrant insecticide treatment. There are a few varieties that are extremely susceptible to this pest. Frontenac, Frontenac gris, and La Crescent are the most susceptible (or favorable to the pest perhaps). On those varieties we have seen 75% or more of the leaves heavily galled by the end of the season. Still, the vines had no problem ripening the crop and vine size did not seen affected.

However, I understand that growers want to control pests they perceive as damaging and they need recommendations based on research results. Several new insecticides have been labeled for phylloxera in recent years and the recommended timing has been changed in the spray guide. I decided to conduct a research project to look at insecticide efficacy and spray timing to provide growers with answers. We reported our results at the 2012 Indiana Horticultural Congress. Here is a recap. The study was conducted on Frontenac and La Crescent at the Meigs Horticulture Research Farm in 2011. We tested five registered insecticides for efficacy using the label recommendations for rates and timings. We also conducted a study to compare a new method of timing applications based on the insect biology and growing degree day model.

In the trial on Frontenac, the untreated vines had and average of 39 galls per leaf on 75% of their leaves by veraison. Insecticide treatments applied at recommended timings resulted in significantly reduced phylloxera infestation. The poorest treatment had an average of 5 galls per leaf on 33% of the leaves. The best treatment resulted in an average of 2.8 galls per leaf on 5% of the leaves. The soil applied Admire Pro was the only insecticide treatment that did not provide significant control throughout the season. Danitol provided excellent control, but it is a restricted use pesticide that requires license and record keeping. Assail, Voliam Flexi, and Movento are all general use products that provided control that was not significantly different from Danitol.

In the second experiment we tested a new method of timing insecticide applications based on scouting for egg hatch from the stem mother galls (galls made by larvae that hatch from overwintering eggs), and using a growing degree day model to help predict egg hatch and crawler emergence. This method has been developed by Donn Johnson at the University of Arkansas and recommends a single application of insecticide compared to the standard method that generally recommends two applications. In this study we used Voliam Flexi and Danitol. The untreated vines of La Crescent had an average of 40 galls per leaf on over 90% of the leaves sampled. Insecticide treatments applied at both the standard phenology based timing and degree day model timing resulted in significantly reduced phylloxera infestation. Treated vines had less than 2 galls per leaf on less than 10% infested leaves.

It is important to note that only one application was made using the degree day model whereas two applications were made with the standard model. Thus, through scouting and careful timing of insecticide applications, a 50% reduction in pesticide use could be achieved while maintaining excellent pest control.

We followed up the study in 2012, but as often occurs with research, unexpected things can happen. Last year the stem mother galls were present when the April freeze hit. All the galls were killed, which basically caused a population crash. We had essentially no leaf phylloxera in our study that year. We are repeating the study again in 2013, but in our plots, leaf phylloxera is spotty. It may take several years to build back up the population for a good study. Nevertheless, I am confident in recommending a single application of Assail, Voliam Flexi, or Danitol timed when the eggs in the stem mother galls hatch and the crawlers emerge. This happened about 4 days before first capfall, the beginning of bloom. Growers need to be scouting next spring before bloom for the stem mother galls and monitoring them for egg hatch and crawler emergence.

So what should growers do about leaf phylloxera now? Nothing. Insecticide applications at this point in the season are ineffective. (Bordelon)

Santa Cruz county grower to pay $15,000 Fine; $200,000 worth of strawberries destroyed

The California Department of Pesticide Regulation (DPR) recently ordered a Santa Cruz County grower to destroy 10 acres of strawberries, estimated to be worth about $200,000, after an illegal pesticide was detected on the crop. In addition, the grower, V.L. Farms of Watsonville, has been ordered to pay a $15,000 penalty.

The enforcement action comes after DPR's Residue Monitoring Program detected the pesticide methomyl on strawberries for sale in Los Angeles County. State and federal law prohibits the use of this pesticide on strawberries. A subsequent investigation by the Santa Cruz County Agricultural Commissioner and DPR also detected the

pesticide on the crop and equipment at VL Farms.

"This is a significant action that should deter anyone who considers breaking our regulations," said DPR Director Brian Leahy. "DPR works closely with local county Agricultural Commissioners to ensure that growers adhere to the state's stringent pesticide rules, which make California's produce the safest in the nation."

The investigation was initiated in May, after DPR's Residue Monitoring Program found illegal residues of methomyl on strawberries in retail outlets. A California Department of Food and Agriculture laboratory, using state-of-the-art testing equipment, detected 1.44 parts per million of methomyl. Methomyl is a restricted material that can only be used on crops listed on the label and with a permit issued by the county Agricultural Commissioner.

As a result, DPR ordered 1,093 cartons of strawberries removed from distributors and retail outlets. In addition V.L. Farms has been ordered to destroy the entire affected strawberry crop in the field.

The DPR investigation found a number of violations including:

- Using a pesticide in a manner that conflicts with the registered label
- Using the restricted pesticide without a written permit from the County Agricultural Commissioner
- Unlawful packing, shipping, or selling of produce that carries pesticide in excess of the permissible level

See settlement agreement.

The DPR Pesticide Reside Monitoring Program is the most extensive program of its kind in the nation. It collects about 3,500 produce samples annually from wholesale and retail stores, farmers markets, and other outlets for testing at California Department of Food and Agriculture's laboratories. The laboratories test for more than 300 pesticides and breakdown products. Lean more about the CA Pesticide Residue Monitoring Program.
Source: DPR

First thornless primocane blackberry on the way

The new variety comes from University of Arkansas plant breeder John Clark.

Prime-Ark Freedom, a new variety developed by the University of Arkansas System Division of Agriculture, is the world's first thornless primocane-fruiting blackberry.

Freedom is the fourth in the division's Prime-Ark line of primocane-fruiting blackberries, which flower and fruit on each season's new branches, called primocanes, said John R. Clark, Division of Agriculture fruit breeder. Most blackberries only bear fruit on second-season canes, known as floricanes.

"This unique type of blackberry fruits on current-season canes and second-season canes, potentially providing for two cropping seasons," Clark says.

"Prime-Ark Freedom is an exciting development as it is the first thornless plant of this blackberry type released for commercial introduction in the world," Clark says. "Its potential to produce two crops each year, both being early to very early in ripening, is another unique attribute of this cultivar. Its exceptional fruit size should make it a very noteworthy blackberry for home gardeners or local-market growers."

"It has very large berries with good flavor," Clark says.

Freedom follows the release of Prime-Jan and Prime-Jim in 2004 and Prime-Ark 45 in 2009. All of the prior-released cultivars are thorny.

Although initial evaluations for postharvest storage potential indicate that Prime-Ark Freedom is not well-suited for storage and shipping, it should be very desirable for use in home gardens and local commercial markets, Clark said.
Freedom will be available from nurseries licensed in the U.S. and other countries for propagation. A list of these can be attained from Clark via email at jrclark@uark.edu.

Information about all fruit varieties and sources of plants is available from the University of Arkansas System Division of Agriculture and can be found online at http://www.aragriculture.org/horticulture/fruits_nuts/default.htm.
Source: University of Arkansas

Retention and redistribution properties of fungicides

I write this during a heavy downfall, in a season of constant rain that followed a drought. Indiana is a study in extremes! However, this year's extreme issue is how to get the sprays on (repeatedly), and how to make sure they persist.

Fungicide retention is the ability of the applied fungicide to persist on plant surfaces despite the weathering action of moisture and sunlight that work to break fungicides down. Most packaged fungicides possess good retention (or adjuvants that provide good retention) for sustained protection over one or more infection periods. A few fungicides, like dodine or mancozeb, possess an inherent rainfastness that allows them to persist and adhere to plant surfaces due to the nature of their chemical properties. Most fungicides that possess a good ability to persist (retention) are not able to redistribute after minor rainfall (less than 1" of rainfall).

The ability of a fungicide to persist is due in part to its chemical structure, but also particle size. Particles that are more finely ground stick to plant surfaces better than do coarse ones (e.g., powders and dusts adhere better to plants than granules). This has been shown with copper, mancozeb, and chlorothalonil. However, because they are more adherent, and also often more soluble. So, these finer

Current bud stages West Lafayette, IN		
Apple	Blackberry	Grape
		
early apples ripening	*harvest*	*pre-veraison*

particles can cause increased phytotoxicity, although this can also be due to a greater surface exposure per unit weight of the chemical. As a particle gets smaller and smaller, its surface to volume ratio increases. Fungicide retention can be modified by formulation, and addition of inert filler (referred to as 'other ingredients' on fungicide labels, and often consisting of talc, clays, etc) used.

Fungicides can also be impacted by the adjuvants, surfactants and antiflocculants used to coat both the fungicides and the inert filler so that they can be suitably suspended in water for spraying. Adjuvants are a diverse group of chemicals that are used in pesticide formulations to modify how a pesticide performs, and have been promoted as increasing pesticide activity/efficacy, improving pesticide absorption, and reducing weathering and photodegradation (the process whereby sunlight breaks down a pesticide). Adjuvants include crop oils, fertilizers, buffers, defoamers, anti-flocculants, pentrants, and surfactants, to name but a few. Antiflocculants prevent particles from "sticking together" (aggregating), thereby increasing the stability of the suspension, minimizing the need to agitate prior to spraying. Penetrants are chemical products that increase the ability of a pesticide to permeate or pass into a living organism, and are most commonly used with herbicides. 'Surface-active agents', more commonly referred to as surfactants, are wetting agents that reduce surface tension, thereby improving spreadability of a fungicide. Surfactants and antiflocculants can impact fungicide retention (and therefore efficacy) based upon the type of chemical, its ionic charge (they can have a positive, negative or neutral charge), and amount of each used. Two commonly used adjuvants include Regulaid, which is used with streptomycin applications, and LI700 which is commonly used to buffer pesticide applications, particularly when water pH is alkaline.

The propriety nature of many companies' inert ingredients reflect why certain formulations of pesticides are more effective than others in controlling certain pests, despite equal amounts of active ingredient. Surfactants are the most important and widely used of all adjuvants, and their use can result in both economic and environmental benefits by allowing for the reduction of active ingredient and improving spray performance by improving product efficacy on the target organism. However, it is important to note that some fungicide labels prohibit the use of adjuvants due to the increased potential for Phytotoxicity, or plant damage (Fig.2). An excellent review on Phytotoxicity, written by Dave Rosenberger, Peter Oudamans, and Dan Ward, address some of the issues of phytotoxicity in the orchard and vineyard, can be found at http://umassfruitnotes.com/v78n3/a5.pdf

We currently have a trial underway comparing different adjuvants/surfactants on the performance of captan for control of scab and summer diseases in apple. It is still too early to tell how well these products worked with disease control, but we are seeing some distinct differences in phytoxicity symptoms in different cultivars.

Figure 2. Captan burn. Note the fact that the new leaves have no symptoms. Disease problems would continue to spread, where chemical injury is a discrete event (unless you keep injuring the plant by repeated applications!).

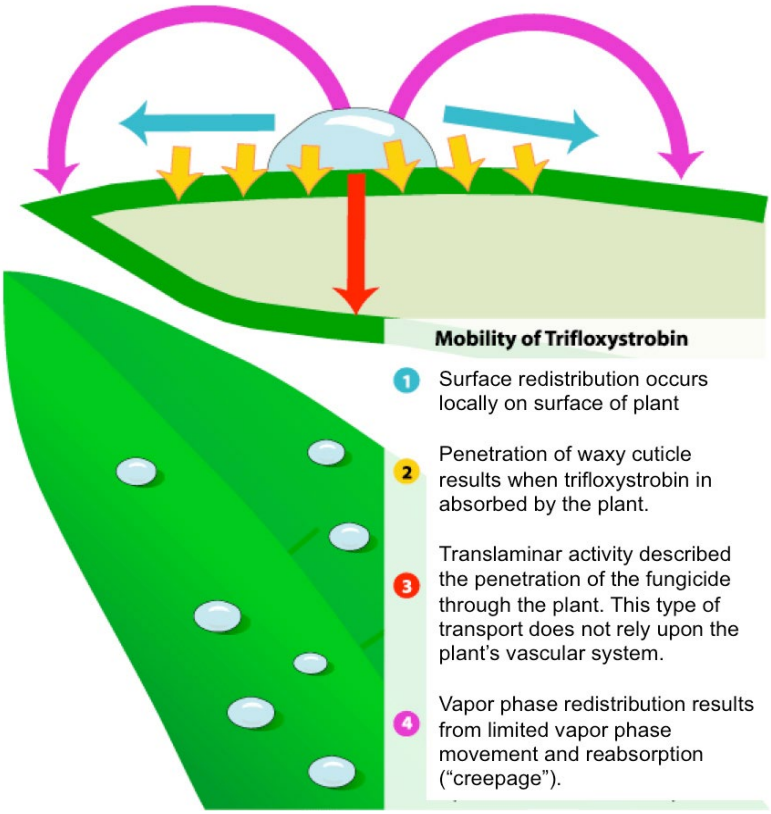

Figure 3. Mobility of trifloxystrobin (Flint), an example of a QoI fungicide. Figure modified from APS press. http://www.apsnet.org/education/AdvancedPlantPath/Topics/Strobilurin/top.htm

Redistribution

Staying on the leaf and fruit is only part of the battle—keeping it covered as it grows is the other. Redistribution is the relocation of fungicide on the plant surface. This occurs by the splashing of rain, or by "creepage," (Fig. 3) which results when fungicide extends beyond the actual sprayed area, usually by movement in the vapor phase.

A major benefit from fungicide redistribution is that fungicide coverage and protection of new growth that occurs after the previous application of fungicide. In studies performed by Smith and MacHardy (1984), captan was found to have excellent redistribution properties. In 2008, Rosenberger showed that Flint (trifloxystrobin) had both retention and redistribution properties that were as good as or better than those of mancozeb (poor redistribution, good retention) or captan (good redistribution, poor retention), whereas Scala, Vangard, Indar, and Inspire-Super did not redistribute very well through the 2.5 inches of accumulated rainfall that occurred during this spray interval.

One of the issues with using surfactants to keep fungicides sticking is that they won't redistribute. Early in the season, the ability of a fungicide to redistribute during rain is an essential component of its efficacy: Growing leaves require constant coverage that can't be achieved by spraying. Light rains will solubilize and redistribute copper, captan and Flint, providing protection to new tissue. As the season progresses, leaf and shoot growth slows or stops, but fruit expansions continues. At this point there is a need for the grower to balance fungicide redistribution to protect expanding fruit while making sure that the plant is protected during heavy rains. At this point, once again, captan and strobilurins, due to their ability to redistribute, and to redistribute and persist, make an excellent choice, especially as a tank-mix or rotation to combat any issues of resistance. (Beckerman)

Upcoming events

August 19-21, 2013.
Midwest Produce Conference and Expo. Hyatt Regency Chicago. Chicago, IL. For more information and to register go to, http://www.midwestproduceexpo.com/

January 7, 2014.
Illiana Vegetable Growers Symposium. The meeting will be held from 8:00 - 4:00 Central time at Teibel's Restaurant in Schererville, IN. Registration and additional info will be available in early December at https://www2.ag.purdue.edu/hla/fruitveg under "Events" or by phoning, 219-531-4200 x4201.

January, 21-23, 2014.
Indiana Horticultural Congress and Trade Show, Wyndham Indianapolis West, Indianapolis, IN.
http://www.inhortcongress.org

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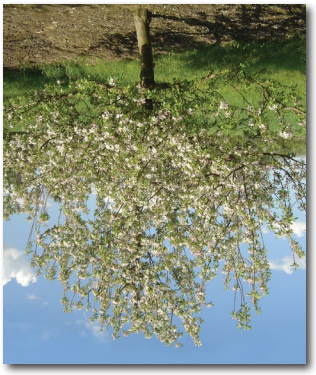

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