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***FFF 07-03***

***May 21, 2007***

***Crop conditions:*** Damage to fruit crops is now widely apparent. Very light crops of all fruit types are being reported, especially in the lower 2/3 of the state. In the Lafayette area apples are 15-20 mm, strawberries and blueberries are in bloom and grapes range from 4-6 inch shoots to budbreak. In southern areas grapes are nearing bloom with shoots out to 16 inches or more, and blueberry and strawberry bloom is finishing.

***Indiana Hort. Society Summer Meeting:*** The summer meeting has been scheduled for July 2-3. We will visit two outstanding orchards, with well developed direct retail marketing outlets. On July 2, we will visit Beiersdorfer Orchard in Guilford IN (just to the west of Cincinnati) and on July 3 we are being hosted by Wesler Orchards in New Paris, Ohio (less than a mile east of the state line near Richmond IN). More details of the meeting including farm history and a program schedule will be in the next issue of FFF, but in the meantime save the dates on your calendar and check out their websites:

<http://www.beiersdorferorchard.com/>

<http://www.weslerorchards.com/>

(Hirst)

***Vegetative growth control on crop loss apple trees:*** In those years when the crop is lost due to freeze or frost, Apogee and Ethrel can be used to reduce growth. Apogee is an effective vegetative growth control material. It must be applied in water with a buffering agent and a surfactant. It is not compatible with some materials such as calcium fertilizer. The full seasonal rate is 12 oz/100 (48 oz/acre on full size trees). It is mostly used on full bearing cropping trees at 2/3 the full rate and adjusted for TRV (Tree Row Volume) size trees. Ethrel can reduce vegetative growth and will increase return bloom. It is applied at 5, 7, and 9 weeks after full bloom at 1 pt/acre. Unfortunately, bearing apple trees that have lost their crop will generally come back with an abundant bloom and don't need the Ethrel enhancing bloom effect.

To help control the excessive vegetative growth that occurs after crop loss consider applying Apogee split into four sprays at near full seasonal rate. For example, on 75% TRV size trees, the full seasonal rate would be 36 oz/acre split into four sprays (12 + 8 + 8 + 8, 1st spray at 12 oz/acre, then followed by 8 oz/acre, etc.). These sprays would be applied starting at petal fall with the first spray and applied every two weeks. Growers have found

that lower seasonal rates will work fine at 24 to 30 oz/acre (example: 8 + 6 + 6 + 6). Ethrel can be added to the lower rates at 1 pt/acre with the third and fourth spray. This will provide additional vegetative control. On 75%TRV trees, the following program will provide good vegetative control, but also increase return bloom. The first spray should be applied at KBPF of 8 to 12 oz/acre of Apogee, second spray two weeks later of 6 to 8 oz/acre Apogee, third spray two weeks later of 6 to 8 oz/acre Apogee + 1 pt/acre Ethrel, and the fourth spray two weeks later the same as the third.

If temperatures are above 85F, do not apply the Ethrel – wait for cooler conditions. Apples on lightly cropped trees will be advanced in maturity. Ethrel will also hasten apple maturity of any fruit on the trees. It is often the early season varieties that are most affected (varieties that ripen before Empire). If that is not desired, do not treat with Ethrel. (Phil Schwallier, Michigan State University)

***Applying Apogee:*** There are four points that I would like to make about applying Apogee in apples. First is timing, second is rate per acre, third is thinning relationships and fourth compatibility.

**Timing.** Apply Apogee when vegetative shoot growth is less than 3 inches. This is about a 7 to 10 day window commencing at the king bloom petal fall stage. Most years all varieties can be treated at this time. The second application should be applied two weeks later and the third application two weeks after the second. Sometimes a fourth application is needed, but that is optional based on crop load and tree vigor. Excessive rainfall and light crops will promote vegetative growth; therefore an additional fourth application may be needed.

**Rate.** Rate per acre is usually calculated on a tree row volume basis and adjusted to 2/3 of the label full rate. This 2/3 rate/acre is a season long rate per acre. For example, if your trees

are 75% tree row volume then 24 ounces per acre is the seasonal rate ( $48 * .75 * 2/3$ ). Best results occur when seasonal rate is split into three or four sprays. For example, 8 + 8 + 8. When fire blight is a severe risk, the first application at king bloom petal fall timing should be increased, perhaps as much as 150% of a split rate. For example, increased from 8 ounces per acre to 12 ounces per acre. Subsequent sprays, the second and third sprays could be reduced, so the seasonal application would be  $12 + 6 + 6 = 24$  ounces per season.

**Thinning.** Apogee tends to increase fruit set, therefore more aggressive thinning is needed. Increase your thinning by 10 or 15%.

**Compatibility.** Apogee is not compatible with calcium or boron in the tank. Also, we suggest that Apogee be applied after a thinner. If the two-week timing interval is also the ideal time to thin, make your thinning application first and then a couple days later follow with Apogee. Remember to include the label recommendations for AMS and surfactants.

In a summary; Apogee is an excellent tool to help control vegetative growth and especially suppress fire blight spread among shoots and within shoots. Follow these tips to get the most out of Apogee. (Phil Schwallier, Michigan State University)

***Freeze damage follow up report:*** It's still too early to tell for sure how much crop loss we will experience in grapes. The early varieties that had most of their primary shoots damaged are pushing secondary and latent buds. On some varieties, these shoots are fruitful. On others, clusters are sparse. Overall, it is likely that yields will be reduced at least 50% on some varieties, less on others. Damage is worse in the southern part of the state as more varieties had begun growing when the Easter freeze hit.

Blueberries in the Lafayette area seemed to have handled the Easter freeze fairly well. Quite a few flowers survived and were blooming this week. However, there is obvious damage to the vegetative shoots and there may not be enough foliage to support a full crop of fruit. As we said earlier, we will just have to wait and see the full extent of the freeze injury.

Brambles range in damage. Blackberries suffered from both winter injury and Easter freeze damage, and likely will have a total crop loss this year. Black raspberries seem to have handled both the winter cold and Easter freeze relatively well and will produce a decent crop. Red raspberries are variable. Some suffered both winter and spring freeze damage and will likely not produce a crop. Others appear to be recovering from the Easter freeze damage and look to be developing normally. Flower buds are not yet visible so it's too early to tell if they will have a normal crop. Fall bearing types will likely not produce a summer crop but should have a good fall crop.

Interestingly, currants and gooseberries seemed to have handled the Easter freeze very well. Even though shoots were out, they were not damaged by the cold temperatures and appear to be progressing normally.

Overall, the damage may not be as severe on small fruits as we originally thought, but again, we still need more time to be sure. Some crops suffered extensive damage in many areas and yield losses are a certainty. Growers are reporting frustration in dealing with the Farm Services Agency. There seems to be some misunderstanding about reporting crop damage and filing insurance claims for losses. Since many fruit crops are uninsured, the only reason to report losses is for possible disaster declaration. (Bordelon)

***New department head named for horticulture:*** Dean Randy Woodson has named Dr. Bob Joly as the new head of the Department

of Horticulture and Landscape Architecture at Purdue. Bob has been interim department head since the departure of Ed Ashworth about 6 months ago. Dr. Joly has been on the faculty of the horticulture department for 22 years, and has distinguished himself as a great teacher, winning a number of prestigious awards for his teaching. He has also conducted research on how plants handle stress, especially with regards to water stress. Although Bob has had little direct experience with extension in the past, he is learning fast, believes in the mission of extension, and is supportive of our extension programs. Many of you may have met Bob at the Indiana Horticultural Congress back in January, and he plans to attend the summer meeting of the Society in July.

***New president for Purdue:*** On May 7, Dr. France A. Córdova was named as the incoming president of Purdue University, taking over from Dr. Martin Jischke who has held the position since 2000. She will be just the 11<sup>th</sup> president in the history of the university. Since 2002, Dr. Cordova has been the chancellor of the University of California, Riverside. A world-renowned astrophysicist, she was previously the chief scientist at NASA, the youngest person to hold that position. Dr. Cordova and her husband have 2 college-aged children. She assumes her new position on August 1.

***Apple Movement Remains Strong, Inventories Below Last Year:*** The number of fresh apples in storage continues to remain below last year's inventory, according to the U.S. Apple Association's (USApple) May 1 survey of apple storage facilities. Total freshmarket apple holdings of 26.1 million bushels on May 1, 2007, were 5 percent less than at the same time last year and 2 percent below the five-year average. Total U.S. holdings of fresh and processing apples on May 1, 2007, were 40 million bushels, 7 percent less than May 1, 2006, and 2 percent less than the five-year average of 40.7 million bushels. Total processing holdings as of May 1, 2007, were 13.8 million bushels,

a 9 percent decrease from May 1, 2006, and 1 percent less than the five-year average for processing holdings for that date. Holdings of fresh-market and processing apples in CA storage on May 1, 2007, were 37.6 million bushels, a 4 percent less than on May 1, 2006, and 1 percent less than the five-year average for that date.

On a regional basis, fresh holdings in the Northeast were 22 percent higher than holdings on May 1, 2006, and 4 percent higher than the five-year average for that date. Southeast May 1, 2007, fresh holdings were 5 percent less than on May 1, 2006, and 30 percent less than the five-year average for that date. In the Midwest, May 1, 2007, fresh holdings were up 75 percent as compared to holdings on May 1, 2006, and 44 percent more than the five-year average.

April 2007 fresh apple movement of 10.2 million bushels was 1 percent higher than April 2006 and 2 percent above the five-year average. Movement of fresh-market apples from controlled atmosphere (CA) storage was 3 percent higher than in April 2006 and 3 percent above the five-year average. Movement of fresh apples in the Northeast was 18 percent more than in April 2006, and 14 percent higher than the five-year average. April 2007 movement in the Southeast was 33 percent less than 2006 and 66 percent lower than the five-year average. April 2007 movement of freshmarket apples in the Midwest was 71 percent more than April 2006 and 19 percent more than the five year average for the month.

On a varietal basis, May 1 fresh Red Delicious holdings were 13 million bushels, a 10 percent increase from 2006, but 1 percent below the five-year average. May 1, 2007, fresh Granny Smith holdings of 4 million bushels increased 8 percent May 1, 2006, and were 35 percent more than the five-year average. Fresh Golden Delicious holdings of 3 million bushels decreased 43 percent as compared to

last year's holdings and were down 36 percent as compared to the five-year average. Fresh Fuji holdings of 2.2 million bushels on May 1, 2007, decreased 12 percent as compared to last year's holdings on that date and were down 4 percent as compared to the five-year average. Gala holdings on May 1, 2007, were 1.3 million bushels, a 10 percent decrease from May 1, 2006, levels, but a 59 percent increase from the five-year average. Fresh Empire holdings were 512,000 bushels, 73 percent higher than 2006, but the same as the five-year average. McIntosh holdings on May 1, 2007, were 332,000 bushels, up 46 percent from holdings on May 1, 2006, but down 15 percent from the five-year average. (US Apple Association and Ohio Fruit ICM News)

#### ***Effects of the Easter Freeze on Fruit Crops in***

***Kentucky:*** The Easter freeze, which extended over 5 nights from April 5th to the 9th was a particularly difficult freeze for Kentucky fruit growers. Temperatures during the two weeks preceding the freeze often reached 80 F and advanced floral developmental stages two to two and a half weeks ahead of normal. These temperatures also made the new growth particularly tender. Kentucky as well as a good portion of the midwest experienced a series of advective freezes, when a cold polar air mass moved into the area with considerable wind. It is very difficult to try and protect flowers from this type of freeze, because there is no inversion. Heat will not stay in the orchard if supplied and overhead sprinkling is worthless, because of excessive evaporative cooling from the wind. Some matted row strawberry growers raked the straw mulch back over their plants and achieved fairly good protection and some plasticulture strawberry growers covered plants with a floating row cover and sprinkled over the row cover affording excellent protection.

Temperatures dropped below the critical temperatures for 90% kill for the floral stages of development often on two and sometimes on three nights. Not only did the temperature drop

below the critical temperatures, but it stayed down there for 6 to 8 hours on some nights increasing injury. The injury was also increased by the wind which accelerated the freezing rate.

Losses varied, across the state, because floral development in western and southern Kentucky was a week or more ahead of Lexington and Lexington was about a week more advanced than northern Kentucky. Additionally, a few areas like Owensboro were slightly warmer than other areas of the state. Pollination weather following the freeze has generally been good.

Apple injury varied by variety from 100% crop loss to essentially no crop loss on a few varieties, because some varieties bloom later than others and some varieties had a wide range of floral developmental stages on the tree at one time. Growers report that varieties that had better levels of survival were Pink Lady, Arkansas Black, Enterprise, Golden Delicious, Gala, Jonathan, Grimes Golden and Lodi. Frost marking and ringing is liable to be serious on surviving fruit. Some growers have reported very serious fire blight infections, even on more resistant varieties like Red Delicious.

Pear injury was very serious and essentially 100% of the crop was lost on European and Asian pears. Asian pears also sustained serious wood damage on smaller caliber twigs and shoots. Peaches, plums, cherries and pawpaws sustained a 100 % crop loss. The exception is a full peach crop on a few varieties in the Owensboro area. There is very little variation in bloom time between blooms on the same tree and between varieties with these crops.

Blackberries sustained serious crop losses; however there are a few blooms on thornless varieties. Thornless varieties show some wood injury and we will need to see if the plants can support the few remaining flowers. With serious winter injury blackberry canes can collapse

and die when the weather gets hot and the plant can not move enough water to support new growth. Raspberries appear to have come through the freeze with little or no injury to the crop. Fall bearing varieties have had the new shoots arising from the ground killed, but these will regenerate and produce a full crop, although it may be a little later than normal.

The blueberry crop was particularly hard hit, considering that this is one of our most consistent producing crops from year to year. Early maturing varieties such as Duke also bloom earlier and like many other varieties lost their entire crop. In our variety trial in Lexington there are very few berries and some experimental Rabbiteye and Southern highbush blueberries had their leaves killed and sustained serious wood injury and tip dieback. On the other hand the exceptionally late maturing and blooming Elliot and Aurora varieties have a full crop. A few growers in the Henderson area and in northern Kentucky had very good flower bud survival due to warmer temperatures and slow floral development respectively.

We are projecting an average of about a 50 % crop loss on matted row strawberries. Most of the primary berries were killed. These are the largest berries and represent about 30 % of the crop yield. Additionally, many of the secondary flowers were also killed. Thus, expect berry size to be on the small side this season. Later maturing strawberry varieties also bloom later and these varieties should show less injury.

Persian walnuts are showing serious wood injury. Some pecans are fine, while others have lost their crops and have wood injury. We are waiting to see how the other nut crops have fared. (John Strang, Kaan Kurtural, and Joe Masabni, Univ. Kentucky, Kentucky Fruit Facts)

**SW Michigan Fruit Report:** Peaches are out of the shuck and fruit are up to 14 mm in diameter. The peach crop looks better and better. Large numbers of Oriental fruit moth adults are still being caught in pheromone traps. Egg hatch began May 5, 2007. No peach leaf curl has been reported. Tart cherries are out of the shuck. Fruit are about 10 mm in diameter. Now that the fruit is clearly visible the crop looks much better. Sweet cherries are out of the shuck. Fruit are about 12 mm in diameter. Plum fruit are about 12 mm in diameter. Apple bloom is ending. Fruit are 8 to 12 mm in diameter. Pear fruit are 10 mm in diameter. Very little bloom remains.

Blueberries are at full bloom and bees are very active. Strawberries are at full bloom. Raspberries: Summer raspberry flower buds are visible. Fall raspberry shoots are about 6 to 12 inches high. Blackberries and summer raspberries are showing more decline due to winter cold and the Easter freeze. Cranberry buds have burst and are elongating. Grapes: Concord shoots are about 6 to 10 inches long and flower clusters are elongating. Vinifera have 4 to 6 and French hybrids have about 4 to 8. (Mark Longstroth, Bill Shane, Greg Vlaming in Ohio Fruit ICM News)

**Tree Fruit Situation in Ohio:** Congressman Zach Space, Ohio's 18th Congressional District and member of House Agriculture Committee, conducted a phone conference call last Friday (4/20) to learn about the impact of spring freezes on fruit and vegetable farmers in his district and other areas of the state. A critical message from the meeting is that every fruit (tree, small or grape) and vegetable farmer who believes the freeze caused economic damage to his/her business should immediately contact his/her local Farm Service Agency (FSA) office to report damage. This has to be done within 15 days of when you suspect that you have damage. This should be done whether or not you have FSA crop coverage (different forms for with and without coverage). The

local FSA offices then report to USDA and this is the line of action for any disaster declaration. As of Friday only 14 Ohio counties had reported likely damage. If you have not reported your likely damage to your local FSA office yet, please do it immediately. Congressman Space also strongly suggested contacting your Congressional District representative and/or Senators and make them aware of your particular situation. Issues worthy of discussion include your immediate needs, and also improvement of perennial crop insurance programs and disaster assistance programs.

Here are apple horticultural suggestions IF YOU DO NOT HAVE LIVE BLOSSOMS. The warm temperatures Saturday and Sunday saw the collapse of most freeze damaged spur leaves and blossoms – in case you were still unsure what was alive and what was dead – it is now apparent and it is not pretty. Keep an observant eye out for how the spurs re-leaf; currently the shoots are leafing out.

\* If you have vigorous rootstock/variety combinations with no crop, you should plan a serious growth control program. Options to select among singly or in combination include Apogee (probably 2 applications, beginning at 3" new growth), scoring (single cut with a linoleum knife completely around the trunk somewhere between the soil and the lowest scaffold branches, beginning at 4-6" new growth) and root pruning (blade depth 12 inches roughly 36-40 inches on both sides of the tree, 10 days after petal fall).

\* If you have moderately vigorous rootstock/variety combinations with no crop, Apogee (probably 2 applications) will be the desired treatment.

\* If you have weak rootstock/variety combinations, this may be the year the trees finally fill their space.

Challenges will be to control vegetative growth this season and avoid a snowball bloom next year (accentuated by scoring). That snowball

bloom will be difficult to thin, resulting in a biennial bearing habit in trees.

Horticultural suggestions **IF YOU HAVE SOME BUT NOT MUCH LIVE BLOOM.** This is a tough situation too. Blossoms may open that don't have live stigma, styles and ovaries, and so cannot develop into a fruit, although the petals are not damaged. Partial damage of female flower parts is also possible and will result in lopsided developing fruit. Freeze rings result from damaged "apple" tissue (botanically the receptacle). Management and marketing factors will need to dictate your decision to work with this fruit or to attempt to remove it by thinners. Tree management suggestions are the same as above.

Horticultural suggestions: **IF YOU STILL HAVE CONSIDERABLE LIVE BLOOM.** This is the situation most of you in northern and eastern Ohio have thankfully. Primary spur leaves supply the apple during the cell division growth phase. Dave Ferree's studies showed that urea included in the early sprays can increase fruit size about 7%. These studies were on trees that were not nitrogen deficient by the normal measure. This can begin at pink blossom stage. Five lbs of urea/100 gal or per acre (back off to 3 lbs if temperatures are above 75-80 F). It is more important to have multiple sprays during the 35-50 day cell division period than to apply higher rates. These sprays have not caused excessive growth or deleterious effects to fruit quality. (Diane Miller, The Ohio State Univ.)

**Codling Moth Biofix Reached:** In my pheromone traps at the Meigs Farm in Lafayette, I reached biofix for codling moth on May 3. On that date, I caught the third moth in that trap. I have since caught nine additional moths, so I am sure that my designation of May 3 as the biofix date is a reflection of the start of significant moth activity. In order to properly time my first cover spray for maximum control of codling moth larvae, I now need to start ac-

cumulating degree days. The proper timing (in number of degree days after biofix) for that spray depends on the insecticide you are using because many of the insecticides have different modes of action. The following table gives the proper timing for most of our available codling moth insecticides.

<u>Degree Days (Base 50) After Biofix</u>	<u>Insecticides</u>
50 – 75	Dimilin Rimon
100 – 200	Intrepid Confirm
150 – 250	Calypso Assail Clutch
250	Guthion Imidan Avaunt Pyrethroids (Asana, Baythroid, Danitol, Decis, Proaxis, Warrior) Virus (Cyd-X, Carpovirusine, Virosoft CP4)

To properly calculate degree days, you take the high and low for each day, add them together, divide by two, and then subtract 50. If the low for the day is below 50, adjust the low to 50 before adding the high and low together. The following table illustrates how this is done with the data from this year for the Meigs Farm here in Lafayette.

<u>DATE</u>	<u>HIGH</u>	<u>LOW</u>	<u>AVERAGE</u>	<u>DEGREE DAYS</u>	<u>CUM. DEG.</u>
<u>MAY 3</u>	<u>71</u>	<u>52</u>	<u>61.5</u>	<u>11.5</u>	<u>11.5</u>
<u>MAY 4</u>	<u>74</u>	<u>51</u>	<u>62.5</u>	<u>12.5</u>	<u>24</u>
<u>MAY 5</u>	<u>74</u>	<u>53</u>	<u>63.5</u>	<u>13.5</u>	<u>37.5</u>
<u>MAY 6</u>	<u>76</u>	<u>52</u>	<u>64</u>	<u>14</u>	<u>51.5</u>
<u>MAY 7</u>	<u>70</u>	<u>44 (50)</u>	<u>60</u>	<u>10</u>	<u>61.5</u>

If I were treating with Rimon, I would be getting my sprayer out today (May 8) and making that application. If I were using Assail, I would continue to accumulate degree days until I had between 150 and 250 and then spray. If I were using Imidan, I would wait until I reached 250.

And, if I were using a pyrethroid, I would use something else because I would want to conserve my predator mites.

Don't get too hung up on putting a spray on at the exactly prescribed time. We usually only accumulate 10-15 degree days each day this time of year, so being off by one or two days doesn't mean you will not get good control. Chemical industry personnel and researchers are still refining the proper timing for many of the newer insecticides, so it is not a real exact science at this point. However, based on our current level of knowledge, the timings listed above are the best recommendations we can give.

***Insect Control in Short Crops:*** I have delayed writing this article so we would all have a better idea of what our crops really looked like before making any decisions. First, if you have completely lost your crop, then I recommend that you scale back your insecticide spray schedule drastically. One of the reasons I talk a lot about knowing what your target insects are for each spray is so that you know which sprays you can cut out in years like this. If you have basically no crop, eliminate all sprays targeting pests that attack the fruit. For apples, this would mean eliminating all sprays aimed at plum curculio, codling moth, apple maggot, most of the leafrollers, tarnished plant bugs, and stink bugs. In other words, petal fall and most cover sprays can be eliminated. For those insects that affect other parts of the tree, you should continue to spray so that you can maintain the health of the tree. Mite control is still important.

If you have a short crop that you are planning to harvest and market, I recommend that you treat with insecticides just as you would if you had a full crop. If you deem an insecticide spray to be necessary when you have a full crop, then that spray should be necessary when the crop is short. I know that it is hard to justify in your mind spending just as much for insecticides when the yield will only by a

fraction of a normal crop, but the same insects are going to be attacking the fruit regardless of how many fruit are on the tree. If your crop is so small that the cost of a full spray program is going to cause you to lose money, then you should consider whether it is worth trying to harvest that crop.

Having said that, here are a couple of specific suggestions that might help you save money on your pesticide bill. These suggestions are appropriate for those of you with a full crop as well.

1. Don't apply a miticide until you have a population of mites that exceeds the thresholds; for example, 2.5 mites per leaf in early season, 5.0 mites per leaf in mid season, and 7.5 mites per leaf in late season in apples. We have a number of excellent rescue miticides available now if your population exceeds the threshold.
2. Monitor codling moths with pheromone traps. If your trap catches drop to zero, then no egg laying is occurring and you don't need to apply insecticides for codling moth control. You should also be able to better time your sprays by accumulating degree days (see previous article).
3. Monitor apple maggot with sticky traps and lures. Apple maggot is not always a problem everywhere every year. Many of our later summer cover sprays are loosely targeted at apple maggot and we don't know if we even have them. If you are not catching apple maggot flies in the sticky traps, don't spray for them.
4. For any of the second tier of pests, such as rosy apple aphid, scales, leafminers, leafhoppers, etc., don't spray until you know you have a problem. This may mean that you need to spend a little more time scouting your orchard, but that is an excellent way of reducing spray costs.

If you have specific questions, please don't

hesitate to call or email. (Foster)

***Lime-Sulfur for Tree Fruit Management:***

Unfortunately, for those of you that lost most, or all of your crop, disease management doesn't end. The key is managing the diseases in the most cost-effective manner to insure a good harvest next year, weather permitting. To do so, implementing organic approaches minimize the risk of fungicide resistance while still providing acceptable levels of disease control in the foliage. For many growers, and even more consumers, organic disease management does not provide acceptable levels of disease control for commercially produced fruit in most years in the Midwest. However, this year's absence of fruit lowers the bar for disease management. Sulfur alone has been used for the control of plant disease since ancient times. Although it did fall out of favor after the discovery of Bordeaux in the late 1800's, the re-discovery of lime-sulfur in the early 1900's (almost 100 years after its initial discovery), and again in the later part of the 20th century for use in organic production is a testament to its efficacy and the resulting enthusiasm for it that continues through this day.

Why did sulfur fall out of favor? The key may be in the notes of William Forsyth 'Gardner to His Majesty [King George IV].' In his book 'Treatise on the Culture and Management of Fruit Trees,' Forsyth advises that when faced with a possible powdery mildew outbreak, one should "wash or sprinkle the trees well with urine and lime-water mixed...take tobacco one pound, sulphur two pounds, unslaked lime one peck and about a pound of elder buds...It should then stand two or three days to settle; then take off the scum and it is fit for use." It may be modern day prudishness, but I don't believe it was the sulfur that made this concoction fall out of favor!

As you can imagine, sulfur must be a fairly effective fungicide: Why else would people tolerate the rotten-egg odor? The key to its efficacy is that it prevents spore germination. For

this reason, it must be applied prior to disease development for effective results. It kills the pathogens through direct contact. With the rising cost of fuel and labor, most of you are not going to want to spray every 7-10 days. A 14-day interval has worked satisfactorily in small organic trial plots. Turner Sutton, of NCSU, suggests that a 21-day schedule may be satisfactory for "what we want to accomplish in frozen out orchards; i.e. it's not going to result in disease-free fruit but should keep things from getting out of hand."

Sulfur-based fungicides are very effective for control of powdery mildew on most fruit crops. They are not highly effective for control of most other fruit crop diseases, although our trial at Meig's, and Michigan State's Organic Trial both report good (but not great) scab control with lime-sulfur.

Sulfur is available as a dust or can be purchased in liquid form; it is also available as a wettable powder, which allows you to decide how you wish to apply it. Sulfur and lime-sulfur for use as a fungicide is available under many trade names (e.g., Microthiol Disperss, Thiolux for sulfur; BSP Sulforix, Polysul Lime-Sulfur for lime sulfur). When properly used, the micro-fine wettable sulfurs or flowable sulfurs result in less burn to foliage and fruit than liquid lime sulfur. However, their use during hot weather (above 80 degrees F) may result in some leaf burning and/or fruit russetting. That said, Turner Sutton reports that its use in organic production in North Carolina (at a 6 lb rate) has not resulted in any phytotoxicity.

As with copper in Bordeaux mixture, lime is used as a safener to reduce the toxicity of the sulfur to the plant, while increasing its lethality to the fungus. Lime-sulfur is made by mixing hydrated lime (to help it penetrate plant tissue) and sulfur with water. This mixture is then boiled and the clear liquid is extracted for use. It is important to note that simply mixing the

hydrated lime with elemental sulfur will not result in calcium polysulfide without boiling. Hopefully, the thought of toxic sulfur fumes (which are corrosive, too!) and unbelievable smell are enough to convince the enterprising home chemist from ever attempting such a thing! Fortunately, lime-sulfur can be easily bought at most nurseries (for home growers) and chemical supply companies. It is most commonly sold as a premixed liquid concentrate of 30% calcium polysulfide. Although this is probably its most stable configuration, it is not a very stable fungicide. For this reason, you should only buy what you can use within the growing season.

When using lime sulfur during the growing season, care must be taken to apply the product in the early morning or late afternoon to avoid burning. Never apply lime sulfur during dry weather, or when temperatures reach or exceed 80 degrees F in a 24 hr period. This statement can be found in all the lime-sulfur labels, but our experience at Meig's, and Turner Sutton's experience in North Carolina, makes me question this statement. Both lime and sulfur are corrosive, and damaging to the eyes, in addition to being harmful if swallowed, inhaled, or absorbed through the skin. As always, thoroughly read the label before purchasing, handling, or applying lime-sulfur or sulfur. Do not use sulfur if you have applied an oil spray within the last month--the combination is phytotoxic (plant-killing). Likewise, remember to NOT use sulfur when temperatures are expected to exceed 80°F. The compatibility of sulfur with other products, except oils, is considered good.

When applying sulfur, extra care must be taken to prevent drift. Sulfur is very toxic to foliage of certain grape varieties (mainly American grapes) including Concord, Chancellor, and Foch. Care, if not avoidance of sulfur for newer American vinifera-hybrids, should be the rule until reputable studies demonstrate the safety and efficacy of sulfur for control

of powdery mildew and other diseases. In the case of grapes, or other fruit for wine purposes, sulfur may pose problems during fermentation, and impart a bouquet of rotten eggs to the finished wine. Other sulfur-shy plants include varieties of gooseberries, currants, apricots, raspberries, and cucurbits. Sulfur is relatively safe on most other plants.

A final word of caution: Users of sulfur and sulfur-based fungicides should remember that sulfur is lethal to some beneficial insects, such as spiders and mites. Just as there are beneficial fungi, beneficial insects often prey upon insect pests that affect your yard and garden. Indiscriminate use of sulfur can result in the killing of these beneficials. Finally, when used appropriately, sulfur is not injurious to honeybees.

Note: We found our first scab out at Meig's May 7. Those of you in the southern part of the state are probably in the repeating stage of infection, whereas those of you North of us may not even be seeing the signs of this disease—yet. This observation is ten days later than last year, suggesting that despite our early spring, apple scab may be behind schedule. According to models, primary infection in the form of ascospores should be done in most of the state, save the northernmost points. (Beckerman)

***New Thinner For Pears:*** MaxCel recently received approval from EPA for use as a chemical thinner on pears. MaxCel has been tested primarily on Bosc and Bartlett varieties and it is recommended that it be used only on these varieties in 2007. Pears are difficult to thin chemically, so the rate of MaxCel is generally higher for pear than for apples. The rate range for Bartlett is 96-128 fluid ounces per 100 gallons, and the range for Bosc is 64-96 fluid ounces per 100 gallons. The recommended timing is when fruits are 8-12 mm in diameter, and as with apple, sprays should be applied when the forecast calls for several days with daytime highs in the 70s. (Jim Schupp, Penn State University)

***New Brands Of Plant Growth Regulators:***

Fine Americas Inc. of Walnut Creek, California has entered the plant growth regulator market for fruit. They are a subsidiary of Fine Holdings Ltd. of Worcester, UK. They are marketing a cytokinen, 6-benzyladenine for thinning (exilis Plus®); a GA3 formulation for cherries called falgro®; a GA4A7 mixture for reduced russetting in apples called novagib®; and a GA4A7 plus 6-benzyladenine mixture for improving typiness of apples called perlan®. Valent BioSciences Corporation has also released a new formulation of Provide (gibberellinsA4A7) in the form of water dispersable granules. Provide® 10 SG has a 10% active ingredient and can be used in a similar fashion as the liquid formulation for reduction in russetting and cracking of Stayman apples.

We do not have first hand knowledge on how these materials perform in Pennsylvania since they have not been in any university trials. We wanted you to be aware of the products. (Rob Crassweller, Penn State Univ.)

***Chateau Herbicide is Now Available for***

***Bearing Fruit Trees:*** A couple of years ago, I wrote about the newly labeled herbicide Chateau for use on grapes and non-bearing tree fruits. I have tested it in spring and fall applications on all tree fruits and grapes and was very impressed with its long residual activity. In one experiment I applied various herbicides in the fall after fruit harvest but before soil freezing. The purpose of this experiment was to evaluate fall herbicide application as means to keep the orchard or vineyard clean in early spring to free up time for growers for pruning, pesticide sprays, etc. Of the herbicides applied, Chateau performed best and lasted till early June in Western Kentucky before it was deemed necessary to control weeds. Other treatments such as Surflan, Treflan, and Karmex, didn't last as long and weed control was needed as early as early May. In experiments where herbicides were applied in spring, Chateau was found the most effective in con-

trolling weeds, both broadleaves and grasses. Two applications at 6 oz/A, one in early spring and the second in mid-season (July 1) provided the cleanest plots by harvest time. Now that Chateau is labeled on bearing fruit trees, growers and producers are encouraged to test its effectiveness in their orchard and vineyard and compare it to their traditional herbicide control methods. The following information is taken from the Chateau label for bearing fruit trees and grapes. Chateau 51WDG (fl umioxazin 51% ai) is labeled for control of annual broadleaves and suppression of grasses at 6-12 oz in 15-75 gal of water spray volume application. The preferred timing is in the fall to maximize the potential for rainfall to activate and set the herbicide. Do not apply to trees less than 1 yr old, or to mature trees after bloom through final harvest, unless with hooded or shielded application. Apply alone at preemergence or tank mix with Roundup or Gramoxone at postemergence with a crop oil 1% v/v or NIS 0.25% v/v. Do not incorporate. Do not allow drift to contact foliage or green bark. Max. rate is 24 oz per season. Min. 30 days between applications. PHI = 60 days. Chateau is harmful if residue is applied to foliage, especially in grapes. A special label is available for tank cleaning after Chateau use. Additional label information and supplemental label information for newly-added crops such as strawberry can be found at <http://www.cdms.net/manuf/1prod.asp?pd=7449&lc=1>

We highly recommend you print and read the whole label and keep a copy in your spray record for quick reference. (Joe Masabni, Univ. Kentucky)

***National Value-Added Agriculture Confer-***

***ence:*** The 9th Annual Value-added Agriculture Conference will be held June 3-5, in Lexington KY. This is a conference for resource providers, counselors, and practitioners who mentor entrepreneurs in value-added agricultural business ventures. The audience included a diverse audience of economic development professionals, small business development counselors,

cooperative development centers, extension educators, and entrepreneurs.

Tracts will focus on three main themes: Value Added in Community Development, Bio-Economy, Toolbox Tips for Value Added Entrepreneurs

Registration will begin Sunday, June 3rd at 4:00 p.m. at the Embassy Suites. There will be a reception on Sunday evening sponsored by Market Maker. Conference registration will continue on Monday, June 4th at 7:00 a.m. A full cook-to-order breakfast will be available both Monday and Tuesday to all hotel guests. Dinner and Entertainment, including “A Taste of Kentucky,” will be provided on Monday evening at the Kentucky Horse Park <http://www.kyhorsepark.com/>. Additional tickets for spouse and children are available for purchase at \$35/each. Tradeshow exhibits will be open Sunday/Tuesday.

For more information please contact, Jennifer Hunter at (859) 257-7272 X 246 or [jhunter@uky.edu](mailto:jhunter@uky.edu).

***What’s happening to our bees?!?!:*** Listening to the news, it seems like it’s getting hard to keep bees alive these days. Last year it happened again, but now there’s a new name for it: colony collapse disorder (CCD). Every three to five years it seems we have large die-offs of bee hives across fairly large regions, at least since the parasitic tracheal mites and Varroa mites entered the U.S., which happened in the mid 1980’s. Tracheal mites are not as bad now that most of our bees have pretty good resistance, but Varroa mites are still the major problem. Varroa transmit viruses and make the brood diseases worse, leading to colony population collapses that beekeepers call parasitic mite syndrome, or PMS, which usually is manifested as diseased brood in the hive, adults with virus, and inability to rear healthy brood. This past year beekeepers and researchers reported something they first called “fall

dwindling” but are now calling “CCD”. This syndrome does seem unusual. CCD is different from typical PMS because the bees fly out and fail to return to the hives, leaving only a few young bees and apparently healthy brood. This might mean that whatever is hitting the bees is killing them quickly and that different pathogens or stresses are involved than what we usually see. This problem also does not seem to be closely tied to the amount of mites in the hive. Symptoms like this have been observed before, even before the mites arrived. They used to talk about the “disappearing disease”, which meant the colony just dwindles, with very few or no dead bees lying around the hive. No one has ever figured out the cause. Jim Tew has an excellent article about this on the web: <http://www.orsba.org/htdocs/download/Dtew.htm>.

Among the things that could cause bees not to return to the hive are Nosema disease which causes dysentery, or tracheal mites, or viruses. In fact, when your bees get typical parasitic mite syndrome and show diseased brood, the colony often dwindles without many dead bees in the hive, although you often see bees crawling around with deformed wings (probably caused by deformed-wing virus). Where did all the other bees go? Last year, it seems there was rapid dwindling of bee hives in fairly large areas. The press release originating from Penn State has gotten a lot of play. The preliminary analyses of samples showed a significant amount of Varroa in hives that had dwindled, suggesting that maybe mites were a factor. They also saw various confusing symptoms in the dead bees. There is definitely something going on, but it may not be something new. Nosema, or dysentery disease is caused by *Nosema apis* (a spore-forming protozoan). In Europe they recently found *Nosema cerana* associated with dying hives. Like Varroa mites, *N. cerana* came from the Asian honey bee, *Apis cerana*. It is controversial whether *N. cerana* is the cause of those colony deaths in Europe. I recently talked to a virologist (Judy Chen) at the USDA bee lab in Beltsville and she had checked for *N. cerana* in the U.S. and said that it was common.

Tom Webster at KSU also found *N. cerana* in samples said to have CCD. We don't know how long this pathogen has been in the U.S. because nobody tested for it before! Maybe *N. cerana* is a factor in CCD. Nobody knows. Nosema is considered a minor pathogen of bees but, fall application of Fumagillin (Fumadil-B) in sugar syrup will protect your bees from both kinds of Nosema that could weaken your hives.

In 2006, CCD was primarily a problem of migratory beekeepers. Moving bees causes them to be stressed, especially when they do not have good food sources. Devon Howald from Huntington, along with Dave Shenefield of LaFountaine took about 1500 hives from IN to CA and some of them dwindled while waiting for the almonds to bloom. But the ones that had access to good nectar were OK. They hope to at least break even after spending a lot of money in freight costs. Four out of five migratory beekeepers they spoke to in CA were seeing dwindling hives. The press release that generated this "buzz" included data from a survey by Bee Alert Technologies which showed CCD was a problem in 25 states on a map. However, some of the states on that map did not report widespread symptoms of CCD. They originally said IN was affected, but have updated the map. See <http://cyberbee.net/ccd.html>, for Zachary Huang's CCD page.

The problem we had in Indiana this winter was no fall nectar flow and those who did not have time to feed their bees lots of sugar syrup early enough in the fall had colonies that starved. And it seems that the colonies had virtually no pollen in the combs which is an important source of protein for the bees during the winter. Clover Blossom Honey Company in LaFountaine may have 50% losses in many areas due to starvation. They can split their hives and make this up, but that is a lot of work. I am guilty of allowing starvation to take half of our Purdue hives. Leaving your supers on until September helps when there is a poor fall flow because it allows your bees to draw some of the honey from the supers down into

the brood nest, but if there is no nectar flow in the fall they may still need syrup. My opinion is that there is no reason for beekeepers to worry about mysterious ailments. Hopefully, researchers will be able to provide answers. We beekeepers should monitor our hives for Varroa mites and control them when they get too high, preferably with "soft" chemicals, and we need to try to find bees that can tolerate the mites (see <http://www.entm.purdue.edu/entomology/research/bee/index.htm>, E201, Parasitic Mites of Honey Bees). In the fall and early spring, we should check our bees and feed if necessary. If we do these things, our bees will be OK. If you move your bees around for pollination, you will have to be careful with their nutrition and you may have to take losses sometimes. Hobby beekeepers are responsible for a large proportion of the pollination services of honey bees and are an important part of agriculture. (Greg Hunt, Dept. Entomology, Purdue Univ.)

#### ***Upcoming Meetings:***

June 3-5-9th Annual Value-Added Conference, Lexington, KY. See article in this newsletter.

July 2-3-Indiana Horticultural Society Summer Tour. See Article in this newsletter.

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