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Crop Conditions:

With a very mild winter so far, most crops are in very good shape for the upcoming season.

2006 Spray Guides: The revised 2006 Midwest Commercial Tree Fruit (ID-168) and Midwest Commercial Small Fruit and Grape (ID-169) Spray Guides are now available. The new issues contain the latest pesticide label information available at printing time but, as always, you should read and follow the label directions. Several changes have occurred this year and all commercial growers should have a copy of the revised versions. The spray guides will be available at the regional meetings, through your local Cooperative Extension office, or directly from Agricultural Communication Service, Media Distribution Center at 1-888-EXT-INFO. (1-888-398-4636). The current version of both the Small Fruit and Grape Spray Guide and the Tree Fruit Spray Guide are also available on the web at <http://www.hort.purdue.edu/fruitveg/bulletinsmain.shtml>. Any changes in pesticide registrations that have occurred since printing will be listed under a special button on that web page. (Bordelon)

Successful Indiana Horticultural Congress:

Thanks to all who attended the recent Indiana Horticultural Congress. Although attendance was down a little this year, we still had over 600 attendees and a sold out trade show. We

will be sending out surveys to some participants and exhibitors soon to gather your opinions so that we can further improve the Congress. If you have thoughts on what you would like to see, please email them to Peter Hirst (hirst@purdue.edu)

Best apple cider in the state: It's official – the best apple cider in Indiana comes from Beasley's Orchard, Danville, IN. That was the decision of the judges at the recent cider contest held in conjunction with the Indiana Horticultural Congress. This was the second year in a row that the top award went to Beasley's. Other ciders receiving special mention were made by Apple Hill Orchard and Doud's Countyline Orchard.

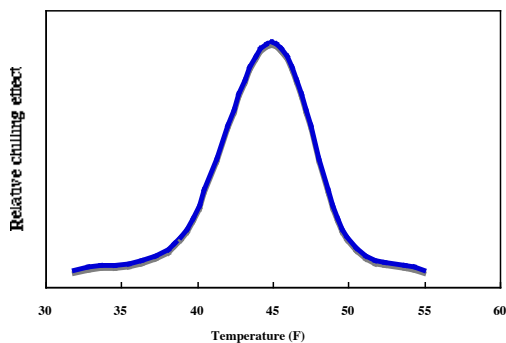
Does a warm winter mean less chilling?

We've all heard that this is the warmest winter for over 100 years, and many are wondering what effect this will have on the growth of our fruit trees this spring. Let's start off with a refresher on why cold conditions are important then discuss the implications of the warm winter.

As many of you already know, trees know when winter is over by measuring the amount

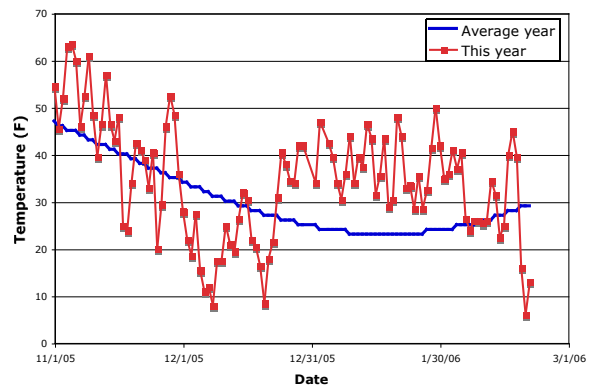
of cold. They do this by accumulating what we call “chilling hours”. Each species, and variety, has a certain number of chilling hours it must accumulate before it can grow and develop normally in the spring. For example, Redhaven peach has a requirement for about 950 chilling hours with some low-chill peach varieties requiring 400 hours or less. The required chilling hours for some other crops are: apple 800-1700, grape 100-400, blueberry 600-1200, sweet cherry 500-1300, sour cherry 600-1500, pear 600-1500, strawberry 200-300, apricot 300-900. After the chilling requirement is met, the plant is all primed and ready to go, and all it’s waiting for are warm temperatures.

Once we know approximately how many chilling hours are needed, the question then becomes “What temperatures work best for chilling?” This is not merely a case of the colder the better. As you can see from the graph below, the best temperatures for chilling are around 45 F. When the temperature drops below 32 F, there are hardly any chilling hours being accumulated. So in a ‘normal’ winter, the temperature could stay below freezing for most of January. This could mean an entire month with very little chilling accumulation.



So that brings us to this year. In the graph below, I have plotted average daily temperature in an average year (average of the last 30 years) and also the average daily temperature this winter for Lafayette, IN. I suspect similar trends occurred in most parts of Indiana. In the early part of the winter, from mid-November to mid-December, we were actually a bit colder than normal. For most of this period the temperature was below freezing which means that

little chilling accumulation would have taken place. All that changed during the last week of December. Since then, temperatures have stayed between 30-50 F for the most part, compared with 30 F, which is more typical. With a lot of temperatures around 40 F, we can expect a lot of chilling to take place. Just in the last couple of days temperatures have dropped dramatically. These temperatures are too cold for any chilling accumulation to occur.



Our natural inclination is probably to assume that warmer temperatures result in less chilling, but from the above discussion I think it’s clear that the opposite was true this year. So the overall result is that the chilling requirement has probably been met for most of our crops already. There are two risks associated with this. The first is that the trees will not have hardened off sufficiently to withstand very cold conditions if they come. I think the current temperatures around 10-20F are exactly what we want right now. These temperatures are cold enough to harden the trees off some more, yet not cold enough to cause widespread damage. The second risk is that with the chilling requirement fulfilled, all trees need to grow are warm conditions. If we have warm temperatures now, there’s a risk that trees could start to grow, and then will suffer damage from the inevitable cold conditions that follow. Of course you’re going to try to pin me down and ask, “How long will it need to be warm to make trees grow?” My guess would be that it would probably take more than a week with temperatures above 60 F and perhaps 4-5 days above 70 F. So don’t get too alarmed if we have just a couple of warm days. The good news is that with most peach orchards, we have very little bud damage for this time in the season. The

bad news is that there is still a long way to go until the time of fruit set, so don't go spending your money just yet. (Hirst)

Prune! There's something poetic about the chill of winter motivating you to go out and quench the smoldering embers of fire blight that overwintered from the previous year. Okay, maybe not, but I have to do something to motivate you to go out there, and if it's bad prose, so be it! Fire blight bacteria overwinter in cankers on twigs, branches, or trunks of host trees. In spring, when the weather is sufficiently warm and wet, fire blight bacteria multiply in diseased tissues and ooze from branch and twig surfaces in a light tan liquid (sometimes called 'honeydew.'). The bacteria can be transmitted to nearby blossoms and succulent new growth by splashing rain or insects. This whole process can be minimized, or even eliminated (theoretically) if you prune out the infected tissue.

Infected tissues can be recognized by dry, blackened growth, often with the leaves still attached. Fire blight cankers, sunken lesions on the trunk and shoots, are key sites where the bacteria survive the winter. These cankers developed from shoots that were killed by the bacteria the previous year. There is a differing of opinions, and a differing of data as to how much to prune, but I promote a philosophy of "when in doubt, cut it out." A single drop of honeydew can easily contain 1 billion (yes, that's billion) bacteria—why risk it? Remove infected shoots or cankers by cutting at least 12 inches away from the canker or blighted branch and into healthy tissue, or even back to the next branch.

The next few weeks are ideal for pruning, as the disease is inactive, and there is little likelihood of spreading the disease with your pruning tools. That means even if you cut into wood that contains fire blight bacteria, it's probably not going to spread to your next cut. You could all but eliminate this risk by sterilizing your blade between cuts: Dip or spray the pruning tool before each cut with a 10% solution of bleach (one part bleach to nine parts water), trisodium phosphate (TSP) or even Lysol. Don't forget to dry and oil tools after

use to prevent rust, particularly if you used bleach or TSP.

Carefully evaluate your trees, and keep notes so you don't have to rely on just your memory! Trees that consistently exhibit fire blight symptoms over several years should be removed and destroyed. Think of these plants as your "Typhoid Marys" that serve as an infection source in the orchard. Over time, these trees become unproductive from constant pruning and infection, putting the orchard at risk.

Walk through the orchard at different times, and at different times of day. It's amazing what you miss, and how different things look in the evening versus the morning light. Keep in mind that of the new varieties, and many of the rootstocks they are grafted on to, are very susceptible to fire blight. Failure to prune now can set you up for disaster later, if the conditions are right. (Beckerman)

Pruning Grapes: March is the most common month for pruning grapes. The threat of extremely cold weather has passed and we can evaluate any winter injury to vines that may have occurred. By April, buds will begin to swell and it is important that pruning is completed prior to bud swell to avoid damage to the tender buds. Winter injury in grapes is negligible so far this year. Nevertheless, growers should assess bud damage prior to pruning so that adjustments in the balanced pruning formula can be made based on the amount of bud loss. Typically, if less than 25% of the buds are damaged you can prune normally. If 25-40% of the buds are damaged then you'll want to adjust the number of buds retained accordingly. For example, if 40% of the buds are damaged then 60% are live. If you need 40 buds per vine for the proper crop load then you'll have to leave 68 buds to end up with 40 primary shoots. To determine how to adjust the bud number multiply the inverse of the percent live buds ($1/.60$) times the desired number of buds ($1/.60=1.7$; $1.7 \times 40 = 68$ buds). If more than 40% of the buds are damaged then you'll probably want to do minimal pruning now and wait until after budbreak to determine where live buds occur in order to have an adequate number for balancing the vines.

Spring freeze damage can also be a significant economic problem for grape growers. Damage has occurred in Indiana sporadically over the past few years. Damage was severe statewide in 2002, and last year temperatures dropped into the upper 20s on May 2-5 and caused damage across the center part of the state. A technique called long pruning or double pruning helps avoid spring frost and freeze damage, especially on varieties that tend to bud out early. The procedure utilizes the apical dominance of buds on the cane. The first buds to begin growing are those on the tip of the cane, while buds closer to the base begin growth later. This type of pruning is only applicable to spur or no-tie training systems. To perform long pruning, select canes to be used for fruiting spurs during the normal pruning practice, but leave those canes long, with 10-15 more buds than desired. Spurs are normally pruned to 4 to 6 nodes for fruiting, but if they are not cut back, then the extra buds will help delay the development of the desired basal 4 to 6 buds, which helps avoid frost injury. After the date of the last probable spring freeze has passed, the canes are shortened to the desired length to properly adjust the bud number for the vine. Growth of the basal buds can be delayed by as much as two weeks if weather conditions are favorable. While this procedure requires an extra trip through the vineyard, it can mean the difference between a full crop and little or no crop. (Bordelon)

Pruning Brambles: This is a good time to finish pruning summer-bearing brambles. Last years fruited canes should be removed now if they were not removed last summer or fall. Remove weak or spindly floricanes and thin to 4-6 canes per foot of row. Laterals on blackberries and black and purple raspberries should be trimmed back to about 2/3 to 3/4 of their original length to promote flowering on strong wood. Red raspberry canes can be tipped if desired, but should not be tipped more than 1/4 of the cane length. If the planting is trellised, the canes should be tied to the wires now before growth starts. Fall bearing types can be mowed to the ground now for a fall-only harvest, or the fruited tips can be removed if a summer and fall harvest is desired. Remove and destroy the prunings to help prevent anthracnose and botrytis. (Bordelon)

Raspberry Anthracnose: The most important spray you will apply this season for control of anthracnose on brambles is the delayed dormant spray of lime sulfur. This is one spray that you can't afford to miss. Liquid lime-sulfur at 20 gallons per acre should be applied when new leaves are exposed 1/4 to 3/4 inches; if you are late in your application and don't spray until a few leaves have unfolded, cut the rate to 10 gallons per acre. NOTE: There is greater risk of lime-sulfur burn, when applied at this later time. Other possible choices are Bordeaux 8-8-100; Fixed coppers such as Cuprofix Disperss, Kocide, Nu-Cop, Copper-Count-N or C-O-C-S; and Sulforix at 3 gal/100 gal water (this is least effective). (Bordelon and Beckerman)

Pruning Blueberries: Spring is the best time to prune blueberries. Winter injured wood is easily identified and should be removed. Try to establish an even number of canes of various age classes. A well-pruned blueberry bush should have about 15-25 canes (depending on age, cultivar and growth habit) with approximately 1/3 in the 5-7 year-old class, 1/3 in the 2-4 year-old class, and 1/3 new canes for renewal. Pruning should open the center of the bush to encourage new canes to grow upright. Also, remove low, drooping branches. Detailed pruning to remove weak growth in the tops of the canes will reduce the number of fruit and improve fruit size. (Bordelon)

Straw removal on strawberries: Studies done in Illinois indicate that proper time to remove straw from matted row strawberries is when the bare-soil temperature at 4 inches averages about 40-43°F. This usually coincides with mid to late March in central Indiana. Plants will begin pushing new leaves as the soil temperatures rise steadily through the month, so the straw should be raked off the tops of the beds and into the row middles. Leaving some straw on top of the beds for plants to grow up through provides a clean surface for fruit. Straw should be removed from strawberry beds before the plants grow enough to cause yellowing of foliage. Allowing the leaves to become etiolated (yellowed with long petioles) due to late straw removal can reduce yields by as much as 25%. However, uncovering the plants early may promote early growth and increase

chances of frost or freeze injury. The Illinois research found that the difference between early removal and late removal increased first harvest by only 3 days, so there is no real advantage. After the straw is removed the frost protection irrigation equipment should be set up and tested. (Bordelon)

Michigan State University Blueberry IPM Scout Training Workshop Offered in Indiana: Through a collaborative arrangement between Purdue and Michigan State Universities and the USDA Risk Management Agency, blueberry growers in Indiana will have an opportunity to attend an intensive 2-day workshop to learn IPM scouting principles for blueberries.

The workshop will cover all aspects of plant growth and development, insect and disease development and identification, insect and disease control options, weed monitoring and management, pesticide safety and regulations, good agricultural practices for food safety, leadership training, and cross-cultural education. This 2-day workshop will be followed by a hands-on field day in early June (date TBD). This condensed intensive format is being offered instead of the regular 10-week program. Registration is \$100 (compared to \$250 for the 10 week program) and includes sessions, notebooks with topics translated into Spanish, the hands-on session in June and catered lunches. To pre-register, make checks payable to Michigan State University and mail them to MSU Trevor Nichols Research Complex, c/o Blueberry IPM Training Program, 6237-124th Avenue, Fenwickville, MI 49408. (On-site registration will also be available, but please contact one of the organizers below to confirm a spot.)

The workshop will be held March 7-8, 2006. at the Pinney Purdue Agriculture Center in Wanatah, Indiana, 11402 S. County Line Rd. 219-733-2379. The times are 9:00 am – 5:00 pm March 7 and 8:00 am – 5:00 pm March 8. Note: that part of Indiana is on “Slow Time” (Central Standard Time).

For local lodging please call the Hampton Inns & Suites at 219-531-6424. Located at US 30 and St Rd 49 on the east side of Valparaiso less than 10 minutes from the Pinney-Purdue farm. Mention the Blueberry IPM Workshop

to get a reduced rate of \$89 plus tax. For more information in MICHIGAN, please call Dr. Anamaría Gómez at (269) 561-5040 or email gomezrod@msu.edu. In INDIANA, please call Dr. Bruce Bordelon at 765-494-8212 or email bordelon@purdue.edu.

Indiana growers with a private applicators license can earn one Private Applicator Recertification Program (PARP) credit for attending this program.

Water, Water Everywhere...: Water suitable for agricultural uses seems to be hard to come by these days if you read all of the reports out there about water quality for fresh fruits and vegetables. We emphasize water’s importance for fresh produce food safety through the GAP (Good Agricultural Practices) program across the country, yet we (those of us who are trying to be helpful) still seem to be generating as much confusion as we are solutions. So in this article I hope to address some of the questions I am hearing with some new information and a little perspective.

In January of this year, at the Ohio Fruit and Vegetable Grower’s Congress, we featured Dr. Trevor Suslow, Extension Research Specialist from UC Davis to speak on the topic of Water Quality and Fresh Produce Safety. Those who were able to attend heard him report on research findings that demonstrated both bacterial survival and increasing bacterial numbers at refrigerated temperatures for certain strains of infectious organisms. Clearly, this news underscores the importance of the goal of preventing microbial contamination, since our best efforts to control microbial contamination (washing and refrigeration) are not foolproof (although both are still necessary).

Recommendations published by Dr. Suslow and other researchers, and the continued reporting of food-borne illness are driving large-scale growers to adopt water quality practices that are even more diligent than those we have recommended in the GAPs program. Growers with known contamination issues are testing their water sources for fecal coliform bacteria and E. coli at least twice a month if from open sources and monthly if from closed wells. Dr. Suslow is recommending that growers who

have not identified a microbial contamination issue test just as frequently for at least a year before reducing the frequency to once a year for enclosed wells and at least 3 times a season (Midwest) for open water sources.

Treatment of water to be used for agricultural purposes (irrigation, spray) is an important precaution if you hit the action threshold of 1000 fecal coliform bacteria per 100 ml and/or 126 E. coli bacteria per 100 ml. Prior to employing your treatment options, re-test for whatever microorganisms are indicated. If you are testing a well, inspect and make sure there is no opportunities for surface water to breach the well. Shocking the well with chlorine should address the problem. Retest. With an open water source, it would be necessary to add a filtration system to the water pulling from the source and follow that with an automatic chlorination system, so you can chlorinate the water for sensitive applications. Again, retest.

Using potable water is necessary in the packinghouse to avoid introducing a microbial contamination problem that did not exist coming out of the field or orchard. Since washing does not eliminate microorganisms, the goal in the packinghouse is simply to keep the water clean enough not to cause or increase microbial contamination. Repeatedly, research is showing that the most reliable method for accomplishing this is a chlorination system that is closely monitored maintaining free chlorine levels of 150 to 200 ppm.

Monitoring the free chlorine level and pH of the water on a continuous basis is simply an essential part of the process. Measuring chlorine alone gives you only half of the picture: a half that may mislead you regarding the effectiveness of the sanitation of your water. If the pH is within 6.8 to 7.2, the level of free chlorine that is in the most effective form (hypochlorous acid) is at its highest. Most of our water sources tend to run basic, so acetic acid can be used to bring the pH into range.

And why am I writing about chlorine so much and not other sanitation methods? Because, current research is not showing any other methods to be as effective for the treatment of water under agricultural conditions as is

chlorination. If you are using copper ionization, please know that high levels of organic material can render it ineffective. Researchers are recommending that you supplement a copper ionization system with chlorination to improve disinfection of the water, particularly in packinghouse operations. If you are considering purchasing a copper ionization system ask the dealer to demonstrate its effectiveness in agricultural applications. A system should be able to effectively result in a five-fold reduction of fecal coliform and particularly E. coli. Ultimately, the goal is to minimize the risk and recognize the potential impact of the decisions you make regarding how to manage your water sources.

(Shari L. Plimpton, Ohio and Indiana Specialty Crop Food Safety Initiative, Mid American Ag and Hort Services)

Food Safety Practices for Fruit and Vegetable

Farmers: Fruit and vegetable farmers across Indiana will have the opportunity to learn about microbial risks associated with fresh fruit and vegetables and what they can do to minimize those risks on February 27, from 7 to 9 p.m. Eastern Standard Time. Dr. Shari Plimpton from the Center for Innovative Food Technology will present An Introduction to Good Agricultural Practices for Food Safety at 7 p.m. and Managing Water on the Farm to Reduce Risk of Microbial Contamination at 8 p.m. Farmers who grow or pack produce for sale at farm stands and farmers markets or to grocery stores and brokers should find the information useful. The program will be presented in Pfenner Hall, Room 241, on Purdue's West Lafayette Campus, and will also be available for viewing as a videoconference in Elkhart, Franklin, LaGrange, Orange, Scott, Washington, and Jennings Counties. Pre-registration is encouraged and can be made by calling (888) EXT- INFO.

Red Delicious Apples More Than Merely

Tasty: The Red Delicious not only is America's most common apple, it's also among the richest apple varieties in health-promoting antioxidants. A Canadian study, published in the Journal of Agricultural and Food Chemistry, tested antioxidant levels in eight different types of apples.

Red Delicious led the pack, followed by:

- Northern Spy
- Cortland
- Ida Red
- Golden Delicious
- McIntosh
- Mutsu

At the bottom of the barrel were Empire apples. To get the most out of a Red Delicious apple, however, you have to eat the peel. The researchers found that the skin of a Red Delicious contains six times the anti-oxidants of the flesh. In every variety tested, the skin packed significantly more antioxidants than the flesh. If you must peel your apples, consider Northern Spy or Cortland, both of which topped Red Delicious on antioxidant content in the innards alone. (from Tufts University Health and Nutrition Letter)

Value added agriculture in Washington State:

We all know that apples are big business in Washington State, but marijuana has now broken into the state's top 10 agricultural commodities. According to CNN, law enforcement

officers harvested 135,323 plants last year, with a value of \$270 million. A single plant can be worth up to \$2000. The crop value of \$270 million ranks marijuana as the state's number 8 agricultural commodity, just above sweet cherries (\$242 million) but well behind apples in the top spot, at \$962 million. (Hirst)

Upcoming Meetings:

March 7-8: MSU Blueberry IPM Scout Training Workshop. Pinney Purdue Agriculture Center, Wanatah, IN. Contact Bruce Bordelon, 765-494-8212.

April 4: East Indiana Horticultural Society. Minnestrista Cultural Center, Muncie. Contact Dave Clamme, Delaware County Extension Educator. Email: dave.clamme@ces.purdue.edu, Phone 765-747-7732.

April 12: Martinsville Orchard School, Martinsville. Contact Jim Barbour, Phone 317-275-9291, jbarbour@purdue.edu

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