http://ipm.osu.edu/fruit/index.html

THE OHIO STATE UNIVERSITY Newsletter Extension

Fruit ICM News

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In This Issue:

Calendar

June 9: Plasticulture Strawberry, Blueberry, Blackberry, Raspberry Twilight Meeting; OSU South Centers, 1864 Shyville Road, Piketon, Ohio 45661. Field tours are from 5:00-7:00 p.m.; supper will be served from 7:00-8:00. Contact Brad Bergefurd, at 740-289-3727, 1-800-297-2072 (in Ohio only). E-mail bergefurd.1@osu.edu. Web site: www.southcenters.osu.edu.

June 25: Ohio Fruit Growers Society Summer Tour, Glen Hill Orchard, 17156 Glen Road, Mt Vernon, OH. More details to follow later.

2003 Fruit Spray Guides Now Available

Source: http://newfarm.osu.edu/crops/cropsindex.html

For emphasis, we're repeating the following information about 2003 Fruit Spray Guides:

The Commercial Small Fruit and Grape Spray Guide for Ohio and the Midwest online at: http://www.hort.purdue.edu/hort/ext/sfg/2003_pdfs/03complete.pdf

The Commercial Tree Fruit Spray Guide for Ohio and the Midwest online at:
http://www.extension.iastate.edu/pubs/PM1282/CTFSPBODY.pdf

The Michigan State University 2003 Fruit Management Guide (formerly known as the Fruit Spraying Calendar) is now available at: http://www.msue.msu.edu/epubs/pestpubs/E154/

New Format for the Ohio Fruit ICM News

Once again, please note the information in our masthead above about printable versions of this newsletter. Thanks to Bruce Eisley**,** OSU Research Associate, Entomology for now converting my Word Perfect e-mail attachments to an Adobe Acrobat pdf version in addition to the regular html format. You will find the pdf version greatly improves the readability of this newsletter.

Apple Scab Update

Source: Dave Rosenberger, Plant Pathology, Highland, Scaffolds Fruit Journal, Volume 12, Issue 4, April 7, 2003

Further Comments on Scab Management Programs:

Several readers responded with questions and comments concerning the article on scab management that was published in last week's Scaffolds. The first recommendation in that article was as follows: "Start early: apply a protectant at green-tip or at least before the first scab infection period." Two points of clarification are needed.

The "start early" recommendation should have been modified to state that a spray should be applied "... before the first significant infection period," thereby allowing for some adjustment of starting time based on ascospore maturity information. In years with delayed spore maturity (probably **not** this year!), the first Mills infection period may not be significant if spore maturity is delayed and temperatures are cold.

The second clarification involves using predicted ascospore dose (PAD) to determine how long sprays can be delayed in spring. Contrary to what last week's article implied, the PAD system should still work fine IF the scab control the previous year was not dependent on SI or strobilurin fungicides **and if** the PAD assessments are done using actual counts rather than tractor-seat observations. Where more than one SI or stroby fungicide spray is used to control scab, there is at least a slight risk that PAD counts will under-estimate ascospore production, and delaying sprays in such orchards can be risky.

Apple scab maturity counts:

March 28 Highland, NY 96% immature, 4% mature, 0% empty asci
April 4 Highland, NY 86% immature, 14% mature, 0% empty asci

The lack of empty asci in the April 4 sample suggests that little if any spore discharge occurred during rains last week. However, we are pretty close to the 15-17% maturity threshold, where we usually begin to get significant discharge. Leaves were wet when collected on April 4, so no discharge test could be performed at that time. A tower discharge test on Monday morning, April 7, yielded a count of 59 ascospores, indicating that some spores are now ready to discharge, although numbers are still low. We usually need >120-150 spore in a discharge test before we reach threshold levels in commercial orchards.

Cold conditions (and snow!) are predicted for the next several days, so there is little likelihood of scab infections occurring over the next few days. However, significant infection could occur with the next warm rain. Spore discharge during cold wetting periods (<40 F) will be minimal. Work performed by Stensvand et al. showed that virtually no ascospores are released during wetting periods with temperatures below 36 F, and only a small proportion (up to 20%)of mature ascospores are released when temperatures are below 39 F. Given the predictions for continued cold weather in the Hudson Valley and the fact that we still have relatively few spores ready to discharge, significant infection is unlikely until we have wetting periods with mean temperatures in the mid-40's or above. However, growers should use any periods of decent weather to apply copper or a protectant fungicide so that trees will be protected if we get a warmer wetting period near the end of the week.

Relevant Literature: Stensvand, A., D.M. Gadoury, T. Amundsen, L. Semb, and R.C. Seem. 1997. Ascospore release and infection of apple leaves by conidia and ascospores of *Venturia inaequalis* at low temperatures. Phytopathology 87 1046-1053.

Bacterial Canker of Stone Fruit

Source: Bill Turechek, Plant Pathology, Geneva, Scaffolds Fruit Journal, Volume 12, Issue 4, April 7, 2003

After last weekend's ice storm, stone fruit growers, particularly sweet cherry and apricot growers, should be prepared to protect trees from bacterial canker. The 2-day ice storm damaged and cracked many trees throughout Monroe, Wayne, Ontario, and Seneca counties of NY; these (unusually) large wounds can serve as entry sites for the bacteria. Below is an overview of the disease and its management.

The Disease:

Bacterial canker is an important disease of sweet cherry in New York and Michigan, as well as in the neighboring province of Ontario. Although it is most serious on sweet cherry and apricot, it also affects tart cherry, peaches, plums, and prunes. Moreover, *Pseudomonas syringae* pv. *syringae* is a serious pathogen on many other fruit, vegetable, and ornamental crops. The most conspicuous symptoms on stone fruit are limb and trunk cankers, blossom blast, "dead bud," and leaf spotting. Cankers can girdle and kill entire limbs, reducing fruiting capacity of the tree. Infection of the trunk, particularly on young trees, often results in tree death. Infections of the blossoms cause blossom blast and loss of fruiting spurs. Infections of dormant flowering and vegetative buds result in a condition called "dead bud," in which buds fail to break dormancy in spring.

Two species of bacteria are associated with bacterial canker: *Pseudomonas syringae* pv. *syringae* (*P.s.s.*) and *Pseudomonas syringae* pv. *morsprunorum* (*P.s.m.*). A third pathovar, *P.s.* pv. persica, is problematic on peach but is not prevalent in the Northeastern states. *P.s.s*. and *P.s.m.* are disseminated widely in stone fruit production regions throughout the world. Although the two pathogens are lumped together as causing a single disease, the literature indicates clearly that there are substantial etiological differences between the two bacteria, enough so that orchard management practices may need to be tailored to the bacteria present. For example, anecdotal evidence scattered throughout the literature and some of our preliminary results suggest that *P.s.m.* is the primary bacteria involved in leaf spotting and may not be as aggressive in colonizing woody tissue as is *P.s.s.*

Both pathovars overwinter in bark tissue at canker margins, in apparently healthy buds and/or systemically in the vascular system. In spring, i.e., under cool and wet conditions, bacteria multiply, emerge from their overwintering sites, and are disseminated by wind and rain to blossoms, young leaves, and bark tissue. Populations of the pathogen fluctuate systematically over the course of a year. *P.s.s.* populations reach their peak around budbreak in early spring, decline to sometimes undetectable levels by midsummer, and then replenish again in autumn, but not to the same level as in spring.

Bacteria of both pathovars survive without causing symptoms (i.e., an epiphytic phase) on the surface of symptomless blossom, leaf, and bark tissues from bloom through leaf fall. *P.s.s.* can also live epiphytically on a variety of weed hosts. However, Little et al. (1998) found that many of the *P.s.s.* strains isolated from weed hosts in plum orchards were dissimilar to those causing cankers on *Prunus* hosts according to genetic characterization. The role of wild *Prunus* spp. as a source of inoculum in bordering hedgerows is not well known, although some pathologists suspect that they serve as significant source of inoculum.

Stone fruits are most susceptible to infection during late winter and early spring.

P.s.s. typically enters tree limbs and the trunk through pruning wounds in spring or sites of freeze injury in early winter and spring. Several reports have indicated that leaf scars exposed in the autumn after leaf fall are particularly susceptible to invasion by *P.s.m.*, resulting in cankers at the base of axillary buds.

However, others were not able to verify these findings and suggest that *P.s.m.* enters the host through leaf stomata or wounds and migrates to substomatal cavities, enabling them to endure adverse environmental conditions during warm and dry periods. The bacteria then spread from infected leaves through the petiole and reach axillary buds by systemic invasion well before leaf fall throughout the season. Cankers subsequently appear at the base of infected buds.

Disease Management:

***Cultural control*:** Bacterial canker is difficult to control. Resistant cultivars offer the best option for disease management. Unfortunately, almost all stone fruit varieties in commercial production, particularly apricot and sweet cherry, are susceptible to the disease. To slow the rate of epidemic development, growers should prune cankered limbs well below the visible canker if possible. Avoid pruning in early spring and fall when bacteria are most active, and sterilize pruning tools before pruning healthy trees.

Removal of wild *Prunus* species in hedgerows and forest stands adjacent to sweet cherry orchards is also recommended, because it is presumed that these plants serve as a source of inoculum. The area around the base of young trees should be kept free of weeds and trash. This helps keep the trunk and crown dry and potentially reduces epiphytic populations of *P.s.s.*

If you are planning on planting a new orchard this season, plant on sites that do not have sandy, poorly drained, or waterlogged soils, or on sites that may suffer extended periods of drought. In newly planted orchards, train trees to wide crotch angles to prevent the formation of wounds in the crotches; injury to the bark perhaps provides the best avenue for infection. Wide crotch angles also help to minimize bark injury due to winter injury. Painting tree trunks with a bright white latex paint to reflect the winter sun and minimize temperature fluctuations at the bark surface should be done sometime after harvest. Any inexpensive white latex paint will do.

Chemical control: As is true for many bacterial diseases, there are a limited number of bactericides available to battle bacterial canker. Several copper-based bactericides, such as Bordeaux mixture, cupric hydroxide, cuprous oxide, tribasic copper sulfate, and mixtures of cupric hydroxide and EBDC's are recommended for disease control. In New York, current recommendations generally call for copper applications in the fall "before heavy rains begin" and another at late dormant. Another application is labeled for shortly after harvest in orchards where disease is severe. This program does not provide adequate protection against disease. In Australia, researchers have tried spray schedules consisting of 2 autumn, 1 winter, and 2 prebloom spring sprays with copper hydroxide on apricot and Bordeaux mixture on cherry. In the three years this program was tested, a 67% reduction in disease was observed.

For trees heavily damaged by last week's ice storm, growers may consider pruning back damaged branches before budbreak and then applying (with a small, handheld applicator) copper to the smoothed cuts. This can provide protection from invading bacteria as the wounds heal. This *additional* treatment should not replace an early application of copper to the entire orchard.

Copper Resistance**:** Resistance to copper is known to occur in populations of the bacterial canker bacteria in other states. Copper resistance is a quantitative rather than a qualitative trait; that is, copper resistance can be combated with the application of higher rates of copper. However, using higher rates of copper bactericides is discouraged because higher rates are known to be highly phytotoxic. Some growers have experimented with using half, quarter, and even lower rates during the season (usually after harvest) to try to get better control of the disease. Although these low-rate applications may not have resulted in phytotoxicity, keep in mind that the pathogen does **not** grow well in the heat of the summer, so the timing of these applications is questionable.

Surveys for copper resistance have not been conducted in NY. However, use of low rates of copper during the growing season is not recommended because low-rate applications could speed selection of copper-resistant strains of the pathogen.

Little, E.L., Bostock, R.M., and Kirkpatrick, B.C. 1998. Genetic characterization of *Pseudomonas syringae* pv. *syringae* strains from stone fruit in California. Applied and Environmental Microbiology 64:3818-3823.

On Ice

Source: Art Agnello, Entomology, Geneva, Scaffolds Fruit Journal, Volume 12, Issue 4, April 7, 2003

In view of the significant weather events of the past week, we're reprinting the following article from our 1999 Apple In-Depth School proceedings, which reviews a number of principles behind weather and pest management interactions.

Weather Effects on Pest Activity and Control Measures
Of all the factors that can possibly have an effect on the development of a given pest population, the weather must certainly be one of the most critical. Nearly every discussion of how moderate or how severe an insect or mite problem is, was, or might be in a given season, starts with a general estimation of the temperature, wind, humidity and rainfall conditions to which that pest is subjected. We all have plentiful anecdotal evidence of how the spring rains of one year prevented one insect from taking off, or how the summer heat encouraged another. The point here is not to document specific effects, which are complex and abundant, but rather to indicate the need to take weather patterns into account when planning pest management programs, both before (prevention) and after (rescue) the fact.

Developmental Rates and Thresholds
Mammals are warm-blooded, developing at a constant rate regardless of the environmental temperature, because they are able to maintain an internal temperature that allows their biochemical reactions to progress normally. Insects, which are exothermic, remain at the same temperature as their environment.

They do not generate body heat and therefore depend on favorable external temperature.

At a certain temperature, which varies among species, an insect's biochemical reactions cannot proceed and development stops. This temperature is known as the insect's developmental threshold or developmental base. Charting the ambient temperature makes it possible to track insect development, which is directly proportional to the amount of time accumulated above the developmental threshold (up to some maximum not often reached during the season). We divide this time arbitrarily into heat units or degree-days (DD).

Degree-Day Calculation Methods

There are different ways to determine the quantity of heat units accumulated, which is equivalent to the area under a temperature-vs-time graph on a given day. The methods are listed below in order of their precision in measuring small changes during the day or departures from idealized heating and cooling trends.

Average or Max/Min Method: This method is the simplest and least precise. It assumes that the daily temperature graph is linear and that the area beneath it is triangular.

DD = [Daily max temp + Daily min temp*]/2 **-** Devel. Threshold (* If Daily min temp < Devel. Threshold, substitute Devel. Threshold)

Sine Wave (Baskerville-Emin) Method: This method is more precise and assumes that the daily temperature cycle takes the form of a sine wave. The area beneath this curve is determined by integration, which requires calculus. This method makes the same use of daily maximum and minimum temperatures and developmental threshold as does the Average Method. Using the Sine Wave Method tends to accumulate more DD's than the Average Method, particularly during the early part of the season.

Continuous Integration Method: This method is the most precise and requires multiple temperature readings hourly or more frequently throughout the day to obtain a temperature versus time graph that is truly representative of a field situation. The area beneath the curve is still calculated using integration. The data collection is most efficient if handled by a computer.

Relating Degree-Days to Life Cycle and Development: These methods are attempts to correlate a pest event or activity with another event that can be measured more precisely. Events in an insect's life cycle often occur after the same heat units have accumulated each year, but many years' observations must be collected to measure this precisely. Degree-days can be used to predict events wherever weather data are available.

Temperature: By monitoring temperature and pest activity simultaneously for many years, it is possible to build up a data base of events and the range of accumulated DD's that correspond with them (refer to Table 14 in the 2003 Tree-Fruit Recommends, or see NY Food & Life Sci Bull. No. 142, "Fruit pest events and phenological development according to accumulated heat units").

Phenology: Some events occur reliably at the same time as other, easily observed biological events in the field; for example, mites hatch from late tight cluster to pink; European apple sawflies lay eggs from late bloom to petal fall. These rules of thumb often draw on the evolved relationships between pests and their hosts.

Biofix: This is a distinct, easily monitored event in the life history of an organism, used to fine-tune our predictions of its activity; for example, first flight, first egg laid, first mine observed.

Direct Influence of Weather on Pest Activity

First of all, in NY particularly, early spring is considered to be the die-is-cast period; the growth of most prebloom arthropod populations is pretty much determined for the first half of the season by what sort of spring weather occurs. European red mite, rosy apple aphid, spotted tentiform leafminer, tarnished plant bug, San Jose scale, and mullein bugs are only the most obvious of the species that suffer from a cold, wet, rainy and windy (in other words, typical) spring.

They may be slowed considerably until the summer generations, or they might fail to show up at all in some cases. Conversely, a warm, dry, quick spring can result in nearly spontaneous generation of most of these pests. After the petal fall period, the rate of heat unit (Degree Days) accumulation is a primary factor in the duration of plum curculio oviposition (hotter = shorter period) and the speed of summer mite population growth. This latter case is especially crucial, as the first summer ERM eggs are generally hatching in June so the population is already primed to expand; additionally, the trees are particularly susceptible to foliar feeding stress, so a failure to act against a threshold-level infestation early will result in a long, hard battle for the rest of the summer.

Moving into midsummer, an abundance of rainfall will obviously stimulate foliar growth, which may have some advantages to the tree's development, but can also encourage undesirable infestations of pests such as green aphids, leafhoppers, and even leafrollers. Hot and dry weather can be a mixed blessing, since it's associated on the one hand with localized outbreaks of twospotted spider mites, and on the other it tends to discourage emergence of apple maggot adults and woolly apple aphid aerial colonies if the ground is hard and dried out. The objective is to keep in mind which problems the prevailing conditions might require you to watch out for (and which to de-emphasize) as you go through the year. You can prevent a lot of needless effort in some cases, and effectively respond to otherwise serious infestations in other cases, simply by being aware of these basic trends.

Weather Effects on Pesticide Activity

The effect of rainfall and humidity on pesticide behavior is a topic that is much debated, but about which few hard details exist. Certainly, everyone gets nervous by a long, hard rainfall immediately following a pesticide spray. How much rain does it take to wash off a residue? Does it need to be reapplied? If so, how soon? The truth is, the factors that determine the need for a re-spray are usually very specific to each case, and generalizations never give a specific enough answer. Research on this topic has shown that there are intrinsic differences between insecticides, and that advice on whether to respray if rain falls after an insecticide application is mostly dependent on the insecticide and its formulation, and not so much on the intensity of the rainfall. The guidelines we use are heuristic and anecdotal -- in other words, fuzzy -- but they may help you decide on the advisability of going back in with a respray. In general, we assume that a spray deposit is pretty much solidly in place on the plant surface if allowed to dry for 2 hr after being applied; at any length of time before this point, there may be cases where thorough drying has not taken place. After 2 hours, the potential loss in efficacy from a rain will generally vary with the duration and frequency of the rain, but not necessarily with how hard the rain falls.

Thermometers for Determining Temperatures

Source: Kathy Demchak, Fruit Times, Vol. 22, No. 4, April 8, 2003

Question: I'd like to buy an accurate thermometer for monitoring temperatures in my field during frost protection season. Are any available that are more accurate than typical store-bought thermometers, and affordable enough for field use by growers? (Ken Bupp, Penn-Vermont Farm, Bucks Co.)

Answer: I thought the answer would be easy. In fact, I thought once I found the right model, I'd just buy one myself. However, the conclusion that I came to was that I'd stay with my min-max thermometers, but make sure that I calibrated them. Here's a bit of a review of thermometer types and information to keep in mind when buying a thermometer.

First, don't confuse resolution with accuracy. Resolution tells you how fine the divisions are to which the thermometer can be read. Accuracy tells you how far off from correct the device could be. For example, a certain digital thermometer may give you a resolution of 0.1 degrees, but have an accuracy of + or - 2 degrees. So you may think you're getting very correct results if you get a thermometer with fine resolution, but instead you may just be very exact about being off by a couple of degrees! Accuracy is the important figure for knowing whether you're correct.

The liquid-in-glass thermometers, generally $20 or less, that you buy in a store, or from a grower supply catalog, can vary in their readings. However, they usually vary less than dial thermometers, and are a good value. Just be sure to calibrate them.

Even most typical scientific liquid-in-glass lab thermometers, with accuracy traceable to NIST (National Institute of Standards and Technology) standards, are only accurate to + or - 1 degree C (+ or - 1.8 degrees F). You can calibrate them by immersing them in a water and crushed ice slurry, which you know will be at 32 degrees F.

Be sure to allow enough time for the thermometer to equilibrate fully, even if need to keep adding ice to the mixture to keep the temperature at 32 F. Also, make sure that the thermometer is fully immersed, keeping in mind that the bulb is probably at the top of the thermometer, not at the bottom as with others. It can also be laid horizontally in the ice slurry.

Sometimes you'll see a notation that a thermometer is accurate to a certain percentage within its range. That means that if, for example, it's listed as accurate to within 0.5% in its range of -60 to 140 degrees, it would be accurate to within 0.5% of this 200 degree range, or, to within plus or minus 1 degree of any temperature read between -60 and 140 degrees.

Thermocouple thermometers are generally capable of measuring a wide range of temperatures, and have a very good percentage accuracy, such as being within plus or minus 0.05% of the temperatures in their ranges. Normally this would be wonderful, but because they may be capable of reading ranges of hundreds of degrees, the accuracy in terms of degrees may not be much different than that of a liquid-in-glass thermometer. So, calibration in an ice-water bath is still needed before use, though they can be calibrated directly. The thermocouple probes themselves are quite cheap, but by the time you also buy the device that produces the readable output, you'll likely spend around $200 or more.

Thermistor thermometers are probably the best option for accuracy, as they are designed to read a relatively narrow temperature range, and have a good % accuracy, so that there are models that will be accurate to within plus or minus 0.5 degrees F, costing between $60 and $100. Calibration is still recommended.

One last note - the number display on digital thermometers, regardless of what type they are, is not meant to withstand below freezing temperatures, so the display could 'black out' when you need it the most! So, you can't leave thermometers with digital displays in the field during frost events, and possibly not even on the truck seat all night.

Thanks to technical support at Hanna Instruments, Inc. for a most enlightening discussion on this topic.

Near-Anoxia, Hypoxia, and 1-MCP Improve Long-Term Storage of 'Cortland' and 'McIntosh' Apples

Source: Guy Levesque1, Jennifer DeEll, and Dennis Murr, Department of Plant Agriculture, University of Guelph, 2OMAF, Simcoe, Ontario Orchard Network, Vol 7, Issue 1

The potential of oxygen and temperature acclimation using sequential controlled atmosphere (SeCA) or initial low oxygen stress (ILOS) and 1-methylcyclopropene (1-MCP) was investigated to improve quality retention in 'Cortland' and 'McIntosh' apples, two cultivars poorly adapted to long-term storage. Good firmness retention and few storage disorders were evident in 'McIntosh' after 174 days storage in SeCA (O_2 and CO_2 were reduced every 58 days; 3.0% O_2 + 2.5% CO_2, then 1.5% O_2 + 1.5% CO_2, and finally 0.7% O_2 + 1.0% CO_2), in which temperature was also gradually lowered from 3C to 0C.

A combination of ILOS (0.5% O_2 + no CO_2 for 2 weeks at 0C) and 1-MCP (0.15, 0.30, or 0.60 ppm for 24 hours at 0C) in 'Cortland' apples prior to storage (3.0% O_2 + 2.5% CO_2 for 16 days and then 3.0% O_2 + 4.5% CO_2 for 134 days), resulted in the retention of harvest firmness and extremely low incidence of physiological disorders, especially superficial scald.

Quebec-grown 'Cortland' apples stored continuously at 0C developed low temperature breakdown (LTB), and neither 1-MCP nor ILOS prevented the development of LTB. However, in 'McIntosh', an acclimation period of at least 30 days at 3C prior to storage at 0C successfully inhibited the development of LTB and also eliminated core browning, another low temperature-related disorder.

Assessing and Responding to Winter Cold Injury to Grapevine Buds

Source: Kevin Ker, M.Sc., P.Ag, Ker Crop Management Services Inc ©2003 February

There are three ways to deal with cold:

Delay pruning as long as feasible so that the danger of cold injury is reduced. I realize that pruning is underway at many sites, but if you do not have time to do full assessments (based on my preliminary observations across Niagara) I would be pruning vinifera to 100% more buds/canes than normal (double the number you would normally leave) and sensitive cultivars such as Merlot and Sauvignon Blanc to 200% more buds/canes. In low-lying areas or marginal sites, leave 100% more buds/canes on all cultivars. If you suspect possible cold damage, examine the buds and proceed on the basis of actual injury.

Assess cold injury of grape buds: Choose buds similar to those you will save during pruning. This means the lower nodes of canes of the better quality on the vine. The canes you select should be similar to those you would have left at end of pruning work and tied for the upcoming season.

Sample based upon differences in your vineyard. This can be by variety, rootstock, or based upon site and soil differences (lower vs. upper sections, better or less well drained, etc.) If you select different cultivars keep them separate for counting. Collect at least 100 nodes from each cultivar or area of vineyard. Take 10 canes from 10 separate vines. Each cane should have at least 10 nodes (buds) so that your sample total for each cultivar or area is 100. This makes it easier to establish percentage injury and identify areas with more or lesser damage. Cut these canes close to the 2nd year wood so the bottom node on the sample cane would be as close as possible to permanent wood. The lowest bud on the cane is number one for count purposes.

By now damaged buds should be easily identified after a freeze injury episode. Use a hand lens to confirm if buds are dead or alive. Dr. Bob Pool of Cornell University has excellent examples of live and injured buds on his website at: http://www.nysaes.cornell.edu/hort/faculty/pool/budcoldinjury/Assessingbudcoldinjury.html. He has a good write up as well on trunk injury and other cold injury items.

Cut the buds and record the number of live and dead primary buds. People often also record the status of secondary and tertiary buds. This is worthwhile information, but not as important as primary bud survival.

Compensate for bud injury: If you know buds have been injured, you can retain more to compensate for the proportion of dead buds. Remember even when there is no cold damage; it is not uncommon for 10% or more of the buds not to develop. With the severe weather events we have experienced, most growers should be leaving at least double the number of canes as practiced in a normal year.

% Dead Primary Buds	Compensation
0 - 20%	Do not change normal pruning practice
20 - 80%	Increase the number of buds retained in proportion to the injury. For current situation (2003) I suggest leaving 100% more buds than necessary. (i.e. four canes left instead of 2, double number of buds left per vine and leave a few more sour renewals from trunks
>80%	Prune away only those nodes which may limit the space of adjacent vines or which will produce fruit so low that it hangs to the ground

A key thing to remember is that some vines may have experienced trunk injury, which may not appear for another year or more. For this reason, it is highly recommended to establish renewal trunks from sucker growth even on multiple trunk vines. The potential for crown gall to develop is very high. Also, the galls may not appear for a year or more so development of replacement trunks especially on younger vines is important.

If significant injury is noted, do not apply any fertilizer until you can see the amount of growth that actually breaks and gets past 3-leaf stage. For many, the best strategy will be to delay any fertilizer until after bloom and crop size can be established. Also, develop a plan to establish sod early if you plan to cultivate this spring. All measures to manage growth will be critical to avoid the development of bull wood and poor cane quality for next year. With possible trunk or permanent wood damage, I expect to see a number of shoots or entire vines collapse this spring/early summer once water and heat stress occurs.

Prepare now for reestablishment of vine shape and canopy architecture. It is easier to do this once vines have begun to grow than guessing what will or will not survive. Vines will look ragged this year, but sun exposure and balanced shoot growth should still be your target for long-term production.

Control San Jose Scale Now or Wait for Crawlers

Source: Adapted from Ric Bessin, U.K. Extension Entomologist, Fruit Facts, April 2003

When we experience the advent of warm weather, we might progress very quickly through the early apple stages. San Jose scale is one insect that has become a serious threat in many commercial apple and peach orchards. This is partly due to the loss of the use of Lorsban post-bloom and Penncap-M for control of scale crawlers. San Jose scale numbers have been increasing in some orchards. This insect is particularly damaging, as it injects a toxic saliva into the trees. Left uncontrolled in commercial orchards, this pest can kill trees in a matter of just a few years.

One indication of the problem was the noticeable scale on fruit harvested last fall. The scale cause a red halo around the site of feeding due to the toxin they inject. This is very apparent on light-colored apples. Management of scale begins with a dormant application of oil. In addition to the oil, Esteem has been recently registered for both pome and stone fruits for application from green-tip through pink (pome fruits) and delayed-dormant (stone fruit). Another option with pome fruit is to wait to spray until crawler emergence.

Generally crawlers emerge in late May, and growers can use double-sided, black tape on infested limbs to signal crawler emergence.

Pest Phenology

Coming Event	Degree Day Accum. Base 43 F
Tarnished plant bug adults active	71 - 536
Spotted tentiform leafminer1st adult catch	73 - 433
Rosy Apple aphid nymphs present - 1st egg hatch	91 - 291
Pear psylla 1st egg hatch - nymphs present	111 - 402
Green apple aphids present	127 - 297

Thanks to Scaffold Fruit Journal (Art Agnello)

Degree Day Accumulations for Ohio Sites April 9, 2003

Location	Degree Day Accumulations Base 43 F	
	Actual	Normal
Akron-Canton	176	132
Cincinnati	300	256

Cleveland	134	126
Columbus	269	177
Dayton	249	176
Kingsville Grape Branch	82	102
Mansfield	161	127
Norwalk	125	110
Piketon	321	276
Toledo	105	98
Wooster	201	119
Youngstown	139	113

Fruit Observations & Trap Reports

Insect Key
AM: apple maggot
CM: codling moth
ESBM: eye-spotted budmoth
LAW: lesser apple worm
LPTB: lesser peachtree borer
OBLR: obliquebanded leafroller
OFM: oriental fruit moth
PTB: peachtree borer
RBLR: redbanded leafroller
SJS: San Jose scale
STLM: spotted tentiform leafminer
TABM: tufted apple budmoth
VLR: variegated leafroller

Site: Waterman Lab, Columbus
Dr. Celeste Welty, OSU Extension Entomologist

Apple: 4/2/03 to 4/9/03 tight cluster stage on 4/9
RBLR: 15 (up from 0)
STLM: 129 (up from 0)

Peach: 4/2/ to 4/9/03 bloom stage on 4/9
OFM: 0 (same as last week)

Site: Wayne & Holmes Counties

Ron Becker, IPM Program Assistant

Apple: 4/1 to 4/8/03
STLM: Holmes = 400

Wayne = 0

Site: East District: Erie County
Source: Ted Gastier, Huron County Ag. Agent

Apple: 4/2 to 4/9/03 silver to early green tip 4/9
STLM: 0 (same as last week)
OFM: 0 (same as last week)

Peach: 4/2 to 4/9/03 swollen bud stage 4/9
RBLR: 0 (same as last week)
OFM: 0 (same as last week)

New Weather Forecasting Product Available on the Web

Source: http://is1715.nws.noaa.gov/tdl/synop/OH.MRF.htm.

The National Weather Service is now providing 7-day weather forecasts for many Ohio sites. Of particular interest to fruit growers are the inclusion of wind velocities and temperature ranges. These tend to have a high degree of accuracy and are important components of IPM programs. Unfortunately, precipitation forecasts for a specific site are inherently less accurate.

Ohio sites include:
Akron Canton
Akron Fulton International Airport
Ashtabula
Cincinnati Lunken Field
Cleveland
Cleveland Burke Lakefront Airport
Columbus
Columbus / Bolton Field
Cuyahoga County Airport
Dayton
Dayton Wright Brothers
Dayton Wright Paterson
Defiance Memorial Airport
Findlay
Hamilton
Harry Clever Field
Lancaster
Lima
Lorain/Elyria
Mansfield
Marion
Newark
Ohio State University
Rickenbacker Air Force Base
Toledo
Toledo / Metcalf Field
Wilmington

Wooster
Youngstown
Zanesville

A sample of the Cleveland forecast on April 10, 2003 follows on the next page. An explanation of the abbreviations is directly below the chart.

Cleveland 7-Day Forecast, April 10, 2003

FHR	24	36 48	60 72	84 96	108 120	132 144	156 168	180 192	
WED	10	FRI 11	SAT 12	SUN 13	MON 14	TUE 15	WED 16	THU 17	CLIMO
X/N	52	35 57	38 50	31 54	38 67	52 71	50 65	46 62	37 58
TMP	47	40 50	41 44	36 48	42 61	55 63	53 58	49 55	
DPT	30	31 36	36 29	30 32	36 44	48 48	47 46	43 42	
CLD	CL	CL CL	CL CL	CL CL	CL CL	CL CL	PC OV	CL CL	
WND	15	11 12	10 13	9 10	10 14	12 18	12 15	10 15	
P12	0	23 5	6 4	7 0	22 19	30 30	35 37	37 33	31 32
P24		23	14	10	31	38	56	53	47
Q12	0	0 0	0 0	0 0	0 0	0 0	3		
Q24		0	0	0	0	0			
T12	0	3 0	2 0	0 1	0 4	8 8	12 14	11 14	
T24		7	3	0	3	9	14	18	
PZP	4	0 0	1 1	5 1	1 1	1 1	0 0	1 0	
PSN	11	16 0	1 10	24 3	0 0	0 0	0 0	0 0	
PRS	9	13 8	15 23	19 11	10 3	1 4	2 3	2 2	
TYP	R	R R	R R	RS R	R R	R R	R R	R R	

FHR = Forecast hour, i.e. how many hours from the model run time
X/N = daytime max/nightime min temperatures
TMP = temperature valid at that hour
DPT = dewpoint valid at that hour
CLD = mean total sky cover over the 12-hr period ending at that time, CL=mostly clear, PC=partly cloudy, OV = mostly
WND = maximum sustained surface wind (WND) during a 12-h period cloudy
P12 = 12-hr probability of precipitation (PoP) ending at that time
P24 = 24-hr PoP ending at that time
Q12 = 12-hr quantitative precipitation forecast (QPF) ending at that time
Q24 = 24-hr QPF ending at that time
T12 = 12-hr probability of thunderstorm ending at that time
T24 = 24-hr probability of thunderstorm for the 1200-1200 UTC time period ending at that time
PZP = conditional probability of freezing pcp occurring for the 12-hr period ending at that time
PSN = conditional probability of snow occurring for the 12-hr period ending at that time
PRS = conditional probability of rain/snow mix occurring for the 12-hr period ending at that time

TYP = conditional precipitation type for the 12-hr period ending at that time, R=rain or drizzle, RS=rain/snow mixture
CLIMO = for information on climatology, please click here.

The Ohio Fruit ICM News is edited by:

Ted W. Gastier
Extension Agent, Agriculture
Tree Fruit Team Coordinator
Ohio State University Extension Huron County
180 Milan Avenue
Norwalk, OH 44857
Phone: (419)668-8210
FAX: (419)663-4233
E-mail: gastier.1@osu.edu

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