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

THE OHIO STATE UNIVERSITY Newsletter Extension

Fruit ICM News

Volume 7, No. 9
March 14, 2003

In This Issue:

Calendar

March 25: In-Depth Fruit School on Apple Mineral Nutrition, Saratoga County Extension Office, Ballston Spa, NY. Contact Max Welcome at 607-255-5439 or e-mail: MW45@Cornell.edu.

March 27: In-Depth Fruit School on Apple Mineral Nutrition, Orlean County Fairgrounds, Albion, NY. Contact Max Welcome at 607-255-5439 or e-mail: MW45@Cornell.edu.

March 28-29: Berry School, video sites include OSU Learning Center, South, Piketon, OH; 244 Kottman Hall, OSU Columbus Campus; and OARDC Wooster, 1680 Madison Ave. Contact Sandy Kuhns at 1-800-297-2072 (Ohio only) or 740-289-4591 or e-mail kuhn.37@osu.edu

April 2: North-Central Ohio Fruit Crops Breakfast; Vanson's Restaurant, Monroeville, OH, 8:00 a.m. Breakfast from the menu, program at 8:45 a.m. Guest presenter, Dr. Celeste Welty, Ohio State University Extension Entomology, will discuss codling moth management for Ohio apple growers.

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

Sprinkling for Frost Protection of Low Growing Crops

Source: Information from a handout provided by Dick Funt of Ohio State University at the 2003 Illinois

Sprinkling for frost protection is effective for two reasons: 1) heat is released at the plant surface where it is most needed for protection and 2) the fluid involved is water, a readily available resource to many growers.

How does it work? When a blossom or fruit that is coated with liquid water begins to drop below 32° F, the freezing point of water, the water film begins to freeze, liberating heat of fusion. Sufficient heat is released to maintain a 32° F temperature at the interface between the water and the newly forming ice, even though the air temperature in the vicinity continues to fall. In fact, one can count on the temperature of the interface between the water and the ice (water vapor being involved also, so the so-called triple point of water is achieved) being 32° F near sea level and very close to 32° F even a few thousand feet above sea level.

The trick is to supply water at least as rapidly as it is being frozen to ice. However, freezing is not the only energy-transferring process that may take place when ice and liquid water are exposed to unsaturated air. Evaporation, an energy consuming process, also occurs. When equal amounts of water are evaporated as are frozen, 7 1/2 times as much energy is consumed as is liberated. In other words, if as little as 1/7 of the water evaporates as it freezes to ice, the process results in cooling and ceases to be a protection method. The amount of evaporation is controlled by air dryness and wind speed at the plant level. Fortunately, both decrease with decreasing height. Wind speed decreases near the soil level and the relative humidity increases. Therefore, sprinkled low-growing crops show less tendency to be harmed by evaporative cooling than taller-growing crops.

How much water is needed for protection? This answer remains poorly defined, even though it is possible to estimate the amount of water needed for given wind, temperature, and humidity conditions. Lack of uniformity of coverage creates problems. Uniformity is poor to start with and becomes progressively worse with increasing wind drift. It is the coverage of the particular blossom of fruit that must be maintained at a minimum level.

One factor in coverage is rotation rate, a compromise between distance and frequency of wetting. In general, the rotation rate of the sprinkler head should be no less than 1 rpm. A second factor in coverage relates to the uniform distribution of water around the sprinkler. Uniformity at the top of the plant canopy may be improved by increasing the overlap of patterns. Since low-growing crops have a shallow canopy depth, this also means that fairly good distribution will be maintained throughout the depth of the canopy.

When to start and stop? Low-growing crops cool more rapidly than does the air nearer eye level where we conventionally place thermometers. Therefore, it is recommended that unshielded minimum-indicating thermometers be placed on a narrow board in the horizontal plane at crop height. Do not be alarmed if evaporative cooling causes an initial drop in temperature of several degrees shortly after placement. This often will occur when the air is dry, but recovery to 32° F generally occurs in a matter of minutes.

Since each 0.10 acre-inch of water that is applied amounts to 2,715 gallons, there is incentive to refrain from starting until absolutely necessary. Otherwise, soils may become water-logged before the frost season is over. Because the actual critical temperature for blossom and fruit loss of most crops is suspected to be about 4° F below 32° F, it is suggested that sprinkling can be withheld until temperatures in the canopy drop to 30° F. To cut the decision this closely, however, demands good temperature data taken from adequate numbers of thermometers exposed properly, and the use of nozzles which will rotate in below freezing weather. Unless soil drainage is good, there is incentive to turn off the water as soon as possible. It may be turned off when the ice is melting and continues to melt after the water has been

turned off. Damage from heavy ice accumulations normally is minimal on low-growing crops because they generally support themselves from the ground through pillars of ice.

Once the system is started, it is disastrous to stop until melting can be assured. Therefore, either a gravity system (storage pond, well above crop level) must be employed or some auxiliary pumping equipment must be on standby which can be moved on line in a matter of minutes.

Unfortunately, sprinkling systems generally are designed to provide a fixed application rate so that regardless of the conditions, the maximum amount of water is applied. If a means of varying the application rate without disrupting the uniformity of the distribution can be developed, it would be a boon to this method.

References:

Braud, H. J. and P. L. Hawthorne. 1965. Cold protection for Louisiana strawberries. La. State Univ. Agr. Exp. Sta. Bul. 591. 44 pp.

Gerber, J. F. and J. D. Martsolf. 1965. Protecting citrus from cold damage. Univ. of Fla. Agr. Ext. Serv. Cir. 287. 29 pp.

Rogers, W. J. and H. L. Swift. 1970. Frost and the prevention of frost damage. USDC, NOAA, NWS Cir. 35 pp. (Available from Supt. of Documents, U. S. Govern. Printing Office, Wash., D. C. 20402).

Table 1 represents a relatively conservative estimate of the amount of water necessary for crop protection when the problem of distribution and other factors are considered.

Table 1. Precipitation rate in inches per hour necessary for frost protection.

Air temperature at crop canopy	Wind speed in miles per hour (measured at crop height)					
	0 to 1	2 to 4	5 to 8	10 to 14	18 to 22	30
27 degrees F	0.10	0.10	0.10	0.10	.20	.30
26	0.10	0.10	0.14	0.20	.40	.60
24	0.10	0.16	0.30	0.40	.80	.60
22	0.12	0.24	0.50	0.60	1.20	1.60
20	0.16	0.30	0.60	0.80		
18	0.20	0.40	0.70	1.00		

Adapted from Gerber and Martsolf (1965).

Pesticide Groups for Berries - Part I:

Source: K. Demchak, PSU, Dept. of Horticulture, Fruit Times Newsletter, Vol. 22, No. 1, January 7, 2003

You will see, on some of the newer pesticide packaging, words such as "Group 11 Fungicide," as with Cabrio, for instance. Growers often ask with what other pesticide they should alternate a particular material, and this labeling should help to answer their questions. However, the labeling is voluntary, so

only time will tell how many packages bear this information. The "activity groups" into which pesticides fall are based on the mode or target site(s) of action that each pesticide has. To delay the buildup of resistance to a particular chemical, it should be alternated or combined with a material with a different mode of action (one that falls in a different activity group). With fungicides labeled for berry production in PA, the activity group and fungicides currently in each category are listed below. This information was obtained from *Pesticide Registration (PR) Notice 2001-5, Guidelines for Pesticide Registrants on Pesticide Resistance Management Labeling* on EPA's web site http://www.epa.gov.

Fungicides:

- Group 1: Inhibition of tubulin formation: benomyl (Benlate) and thiophanate-methyl (Topsin M)
- Group 2: Affect cell division, DNA and RNA synthesis, and metabolism (dicarboximides): iprodione (Rovral) and vinclozolin (Ronilan)
- Group 3: Demethylation inhibitor: myclobutanil (Nova)
- Group 4: Phenylamides - affect RNA synthesis: metalaxyl (Ridomil)
- Group 9: Anilinopyrimidine: cyprodinil (one of the active ingredients in Switch)
- Group 11: Quinone outside inhibitors: azoxystrobin (Quadris and Abound) and pyraclostrobin (Cabrio)
- Group 12: Phenylpyrroles: fludioxinil (the other active ingredient in Switch)
- Group 17: Hydroxyanilide: fenhexamid (Elevate)
- Group M: multisite activity: fosetyl-Al (Aliette), fungicides containing copper or sulfur as the active ingredient, thiram (Thiram), ziram (Ziram), captan (Captan or Captec), and dodine (Syllit)

You'll notice that Group M fungicides are the ones about which we generally (but not always) worry less about resistance buildup, and often recommend for combination or alternating with other fungicides that have a more specific activity. Fungicides that fall into the same activity group should not be alternated with each other for resistance management purposes.

Pesticide Groups for Berries - Part II

Source: K. Demchak, PSU, Dept. of Horticulture, Fruit Times Newsletter, Vol. 22, No. 2, February 4, 2003

This discussion covers the groups that berry insecticides and miticides fall into based on target site of action for resistance management purposes. Only groups which contain insecticides labeled for berries are listed below. This information was almost entirely obtained from *Pesticide Registration (PR) Notice 2001-5, Guidelines for Pesticide Registrants on Pesticide Resistance Mgmt.Labeling* on EPA's web site http://www.epa.gov, also with info from IR-4.

Insecticides and Miticides: Where subgroups are listed, compounds between subgroups can generally be alternated with each other for resistance management.

- Group 1: the acteylcholine esterase inhibitors (interrupt the transmission of nerve impulses).
- Group 1A: Carbamates: carbaryl (Sevin), methomyl (Lannate)
- Group 1B: Organophosphates: azinphos-methyl (Guthion), chlorpyrifos (Lorsban), diazinon, malathion, naled (Dibrom), and phosmet (Imidan)
- Group 2: GABA-gated chloride channel antagonists (cause repetitive nervous discharges).
- Group 2A: Chorinated cylodiones: endosulfan (Thiodan, Phaser)
- There is a Group 2B, phenylpyrazoles, but no insecticides labeled for berries fall into this group.
- Group 3: Sodium channel modulators, which also results in repetitive nervous discharges, leading to paralysis. This group consists of the synthetic pyrethroids, and pyrethrins: fenpropathrin

(Danitol), bifenthrin (Brigade), esfenvalerate (Asana) and one of the active ingredients in Pyrellin.
- Group 5: acetylcholine receptor modulator: spinosyns (Success, SpinTor)
- Group 6: Chloride channel activators: Avermectins (interfere with insect nerve receptors): abamectin (Agri-Mek)
- Group 10: Mite growth inhibitors with unknown or non-specific target sites of action: hexythiazox (Savey)
- Group 11: Bt microbials with various subgroups depending on the strain: Bt (Dipel, others)
- Group 12: Organotin miticides: fenbutatin oxide, aka hexakis (Vendex)
- Group 18: Ecdysone agonist disruptor (disrupts insect molting): tebufenozide (Confirm)
- Group 20: Site II electron transport inhibitors - dicofol (Dicofol and Kelthane)
- Group 21: Site I electron transport inhibitors - rotenone (the other ingredient in Pyrellin)

The following articles are made available through web research funding provided by the Ohio Fruit Growers Society. Look for future articles on 1-MCP (SmartFresh) and other grower-suggested subjects. More suggestions are welcomed.

Trapping Plum Curculio

Source: Neil Carter, Tender Fruit and Grape IPM Specialist, Ontario Hort Matters, Volume 3, Issue 2

http://www.gov.on.ca/OMAFRA/english/crops/hort/news/hortmatt/2003/02hrt03.htm

Plum curculio (PC) were a growing pest problem again in 2002 in many stone and pome fruit orchards. Plum curculio are a small, warty, grey- brown weevil (a type of beetle) with a long snout. The adult weevils create a characteristic crescent-shaped feeding scar on fruit. The larvae are plump, white, legless grubs that cause damage to fruit that is similar to oriental fruit moth damage.

When I last wrote about plum curculio in the *Tender Fruit Grapevine* Sept./Oct. 2001 issue, I briefly mentioned 'Circle traps,' designed by Kansas pecan grower, Edmund Circle, that can be used to monitor this pest. Several people have asked me about the traps and where they can get them. These traps (see pictures available at the web site above) are not a substitute for monitoring fruit for PC damage, but they can be useful for timing control options.

Pros: These traps are useful in areas with high curculio pressure and early in the year around the time of first PC emergence. So if you had problems with curculio damage (and you are sure that the damage is PC) make a note on your field maps so that pest scouts next spring can focus their attention on the problem areas of your orchard. This is most often an orchard edge along a ravine or bush where the weevils overwinter. These problem edges are the best place for the Circle traps.

At a problem site in 2001, a series of three traps caught 9 weevils in two days, accurately indicating the first emergence of adults that year. In 2002, one trap at a different problem site caught 19 plum curculio adults in two days indicating the need for control measures. These traps are relatively cheap and easy to make (see website below), and unlike some other PC trap designs, Circle traps are off the orchard floor and out of the way for ground cover management.

Cons: These traps will not give accurate timing of curculio emergence if the weevils are in locally low numbers. Traps may catch no weevils at all, yet damage will be found in the orchard. The traps will also not catch enough weevils to provide any control of this pest. They are a monitoring tool like sticky traps - good for knowing when the insects are active, but not for providing information on population levels or control of the pest. Again, these traps are definitely not a substitute for good pest scouting of fruit to

check for curculio damage.

Hows: Tie the traps securely on a tree with relatively smooth bark, otherwise weevils walking up the tree will go under the mesh and not be trapped. Check the trap frequently when conditions are good for plum curculio emergence (above 61 degrees F) following rain around shuck fall) and for at least 4 weeks after. Make sure you know what this pest looks like; other weevils, especially pale green weevils, will be caught.

Where: So far the only catalogue where I've seen the Circle traps is Great Lakes IPM, 10220 Church Road, Vestaburg, Michigan 48891. (989-268-5693, www.greatlakesipm.com) at a cost of $9.50 US each. Complete details on making Circle traps along with additional information on PC and other PC traps can be found at: http://agweb.okstate.edu/pearl/insects/crop/f7190.htm.

FQPA - Organophosphate Timeline

Source: Glenn Morin and Robin Spitko, *New England Fruit Consultants, Montague, MA, Massachusetts Fruit Growers Annual Meeting Proceedings*, http://www.massfruitgrowers.org/nefrtmtg/proc--2002-03/a04.pdf

Revised Cumulative Risk Assessment:

FQPA requires that EPA, when setting pesticide tolerances, take into account "available evidence concerning the cumulative effects of such residues and other substances that have a common mechanism of toxicity." Historically, the potential health risk associated with exposure had focused on **single pathways of exposure**, i.e. through food, water or residential use for **individual chemicals**, not on the potential for individuals to be exposed to **multiple pesticides** by **all pathways concurrently.**

On June 18, 2002, the EPA held a technical briefing on the Revised Cumulative Risk Assessment for the organophosphate pesticides (OP) in Alexandria, VA. Preliminary results from the assessment, which reviews more than 1,000 pesticide food tolerances, indicate that the regulatory actions already taken by the EPA during the past six years have substantially reduced the risk posed by these pesticides and will meet the tough standards set forth in the FQPA.

Highlights of the Revised CRA include:

- There will be no wholesale cancellation of OPs as a result of this assessment;
- OPs in drinking water are not a major source of cumulative exposure;
- Residential use is not of great concern given the cancellation of chlorpyrifos and diazinon for these purposes;

A few questions concerning dietary exposure remain that **may** require further mitigation, but these are specific product/commodity combinations that should not greatly affect tree fruits.

Cumulative risk assessment has not been finalized. The public comment period just ended in September and several OP individual risk assessments have not been completed and therefore have not been incorporated into the cumulative assessment. The CRA document should be finalized by the end of this year.

Finalization of Azinphosmethyl IRED

On August 2, 2002, EPA announced the finalization of the Interim Registration Eligibility Decision (IRED) for azinphosmethyl (AZM). This document outlines the regulatory actions the Agency will take to restrict the future use of AZM based on their review of the compound as mandated by the FQPA. The basic provisions of the IRED were first made public in October 2001, and although there were some minor revisions in the final document, the tree fruit crops were minimally affected.

Highlights of the azinphosmethyl IRED include:

- Time-limited registration (cancelled 12/05 unless submitted data indicate registration should be continued): almonds, **apples**, blueberries, Brussels sprouts, **cherries**, nursery stock, parsley, **pears**, pistachios, and walnuts;
- Phased-out (canceled 8/05 and cannot be used after 12/05): cotton, cranberries, **nectarines**, **peaches**, potatoes, southern pine seed orchards, and caneberries;
- Cancelled (no more sales after 9/1/02 but existing stocks can be used): alfalfa, beans, birdsfoot trefoil, broccoli, cabbage, cauliflower, citrus, celery, clover, cucumbers, eggplant, filberts, grapes, melons, onions, pecans, peppers, **plums**, quince, spinach, strawberries, and tomatoes.

The exact conditions under which AZM use on apples will be allowed during the next four years are currently unknown, as EPA has yet to finalize the label. However, it is **very likely** the label will include the following:

- A reduction in the total amount of product allowed per acre / per season
- A 14-day restricted-entry interval for most activities except possibly fire blight shoot removal
- An extended pre-harvest interval for PYO operations;
- More restrictive language regarding spray drift management

It is our understanding that the registrants of azinphosmethyl are fully committed to the product and will continue to work with EPA with respect to the crops that have either a time-limited registration or are scheduled to be phased-out. The registrants are currently conducting numerous studies requested by EPA to generate data in support of the continued use of AZM beyond 2005.

Candidates for Reregistration

EPA plans to make risk management decisions for many of the candidate pesticides listed below during the fiscal years 2002 and 2003. Any uncompleted FY 2002 candidate pesticides will have become 2003 candidates as of October 1, 2002, when the ne w fiscal year began. These decisions will be made through either the reregistration or tolerance assessment programs and will take the form of either REDs, IREDs or TREDs.

FY 2002	FY 2003
endosulfan (7/02)	fenvalerate
thiophanate-methyl	formetanate HCL
ziram	permethrin
dimethoate	thiram
fenbutatin oxide (5/02)	malathion
fenarimol	carbaryl
	esfenvalerate

The slide presentation for this talk can be viewed at: http://www.massfruitgrowers.org/nefrtmtg/proc--2002-03/a04pp/

Food Quality Protection Act / OP Timeline of Events 1996 2002

August 1996 - **Food Quality Protection Act** (FQPA) passes. EPA must systematically reassess tolerances for all active ingredients registered at the time in accordance with more stringent safety standards, including special protection for children.

August 1998 - **Tolerance Reassessment Advisory Committee** (TRAC) established.

August 1999 **- Methyl parathion:** Revised risk assessment released. Primary concern was acute dietary risk to children. EPA accepted registrant's voluntary cancellation for apples, peaches, pears, nectarines, cherries, plums, and others effective 12/99.

August 1999 **- Azinphosmethyl:** Revised risk assessment released. EPA concluded unacceptable dietary risk to children, unacceptable ecological risk (deleted uses on cotton, sugarcane, ornamentals, Christmas trees, shade trees, and forest trees) and of concern for risk to agricultural workers.

December 1999 **- Dimethoate:** Revised risk assessment released. Dietary issues not a concern. EPA cited problems with ecological risks and worker exposure.

February 2000 - **Phosmet:** Revised risk assessment released. Acute dietary risk not an issue. Primary concern was for post-application workers who may contact residues.

June 2000 - **Chlorpyrifos:** Revised risk assessment released. EPA identified both dietary and non-dietary risks especially to children. Registrant signs MOA to voluntarily cancel post-bloom uses on apples (except DWB trunk sprays) as well as most residential uses and most outdoor non-residential uses effective 12/00.

December 2000 - **Diazinon:** Revised risk assessment released. Dietary of minor concern. Major issues were drinking water contamination from residential use, ecological risks (bird kills), and worker exposure. EPA accepts voluntary termination of all indoor uses and a 4-year phase-out of lawn and garden uses (combined total approx. 75% of total use) and cancellation of agricultural crop uses yet to be determined.

December 2000 - **Malathion:** Revised risk assessment released. Dietary not a concern. Some residential problems as well as post-application exposure to workers and ecological concerns (fish and aquatic invertebrates).

September 2001 **- Chlorpyrifos:** IRED released. Dietary exposure below level of concern. Risk mitigation centered around agricultural workers, i.e. increased PPE, engineering controls, etc.

October 2001 **- Azinphosmethyl:** IRED released. EPA proposes 3-tier regulatory process including cancellation of 28 crop uses, phase-out of 7 crop uses, and 4- year, time limited registration for 8 crop uses. Restrictions concerning REI, PHI, and total 45 amount of product allowed, amongst others, are proposed. Registrant did not agree and negotiation/litigation resulted.

October 2001 **- Phosmet:** IRED released. EPA proposed 5-year, time- limited registrations for apples, apricots, nectarines, peaches, pears, and plums. Proposed REI increase from 1 to 3 days for all of above crops. PHI remained the same for all. Continued registration for 33 other crops. Registrant agrees to

terms and signs off. New label to become effective 6/30/02.

March 2002 **- Dimethoate:** EPA published cancellation order for all indoor uses, certain agricultural uses (housefly treatments on farm structures, farm animals and manure piles), and certain outdoor non-agricultural uses.

July 2002 **- Diazinon:** IRED released. Tolerances remain the same for apples, apricots, cherries, nectarines, peaches, pears, and plums. Limited to one application per season (wooly aphid only on apples). REI increases from 1 to 4 days. Cancellation of all granular registrations, and cancellation of foliar uses on all vegetable crops.

August 2002 **- Azinphosmethyl:** IRED finalized. Similar to proposed IRED released 10/2001.

The following articles include ideas about stem-end cracking in Gala. You will find interesting differences of opinion about the use of Retain.

Growing Gala in Ontario

Source: Margaret Appleby, IPM Systems Specialist, OMAF, Brighton, Ontario Network for Commercial AppleGrowers,
http://www.gov.on.ca/OMAFRA/english/crops/hort/news/orchnews/2003/on0203.htm#gala

Production of Gala has increased steadily over the past decade. Gala's crisp texture, sweet and aromatic flavor and unique color are a hit with the consumer and the demand for Gala by the grocery chains and roadside markets continues to grow. At last year's Ontario Horticultural Crops Conference in Hamilton, a grower panel with Mike Versteegh from Denfield, Harold Schooley from Simcoe, Jack Vanderwindt from Port Hope, and Jim Hughes from Waupoos shared some successes and challenges they have had growing Gala over the years.

The discussion was rounded out with Dr. John Cline, University of Guelph, providing key research findings for Gala. Here are some of the points from this interesting session:

Gala originated in New Zealand in 1962 and has many strains, from the Standard Gala with fruit that is golden yellow with a red blush to Royal Gala, with fruit that sports an all-over bright red color with darker wide striping on a golden yellow ground. Which strain is best depends on the grower, but Hughes has tried three strains, including Royal Gala and Imperial Gala. He has found striped varieties are preferred over blush or solid strains in the marketplace.

Rootstock choice by this group of growers was either M9 or M26. Other rootstocks to be considered would be Bud 9, a dwarfing rootstock with resistance to fire blight and in the semi dwarf category from the Vineland series, V2 and V1. Some rootstocks have a brittle graft union with Gala, and therefore require staking.

Establishing a new planting takes careful consideration. Spacing and training systems need to be carefully chosen in order provide good light interception and adequate support. Mike Versteegh prefers the V trellis-system and Harold Schooley the vertical axe. For Jim Hughes and Jack Vanderwindt, the slender spindle system makes up much of their plantings. Both Hughes and Schooley have experimental plots of super spindle with Gala after seeing the success with that system in British Columbia. Using quality feathered trees have proved to be the best choice, and research has shown that quality feathered trees provide 43% higher cumulative yield by the 5th leaf, in comparison with planting 1- year old whips.

Irrigation is a must in establishing new trees, and Dr. John Cline pointed out that research has found that Royal Gala trickle-irrigated trees (by their 5th leaf) produced 40% more cumulative yield than unirrigated trees. This was attributed to greater fruit size and number of fruit per tree.

Count size, Gala is where the money is. Good light exposure to increase spur vigor is important. Gala are vigorous, upright trees and tend to be top heavy. When pruning, all growers use 50% rule, which says all side branches with a diameter 50% or greater than the diameter of the trunk at point of attachment must be removed. Aggressive thinning is also necessary for size, and all but Vanderwindt used Accel plus Sevin for chemical thinning. Vanderwindt has found this approach was too aggressive and now only uses Accel. Everyone hand-thinned later in the season. Dr. Cline recommends a combination of 50-75 ppm Accel and 1-2 L /ha Sevin and then a second application of Sevin is useful for removing late bloom on 1-year old wood (lateral bloom).

Fire blight is a big concern in growing Gala, in fact many of the newer varieties are very susceptible to fire blight. All growers have had problems with fire blight in their blocks. Both Vanderwindt and Schooley make sure that cankers are removed and destroyed, and in some cases whole trees taken out if badly infected. They also advocate eliminating or reducing the nitrogen fertilizer to reduce the vigor in their Gala plantings. During the growing season, using predictive Maryblyt model to time streptomycin sprays, and controlling aphids and leafhoppers are all part of the strategy to manage fire blight. Versteegh, when planting new blocks of Gala, makes sure that other fire blight susceptible varieties such as Gingergold and Idared are not close by.

Gala typically needs multiple picks to harvest the fruit at their optimum, and stem end cracking can be a problem. All growers have used ReTain as a management tool for Gala, but all caution that using the right rate is very important. Having the rate too high can impede color development and maturity. Dr. Cline recommends a rate of 75g/ha, which is 2/3 of the recommended rate.

At the end of the day, the consensus of the group was that Gala has been an excellent variety for their operation and they would plant Gala again in the future, considering both its strengths and weaknesses.

Managing Gala Cracking

Source: Dr. A. Nathan Reed, Assistant Professor of Post Harvest Physiology, Fruit Research and Extension Center, Biglerville, Abstract of Presentation at 2002 Mid Atlantic Variety Showcase, September 4, 2002.

Two types of cracking exist in Gala: 1) Stem End Splitting (SES) and 2) Internal Ring Cracking (IRC). Cracking increases when waiting for color and size development. Cracking is a result of water uptake and its affect on the cellular arrangement within Gala. Cells in the stem bowl are cylindrical and elongated near the surface, whereas cells near the fruit equator are more spherical. The internal growth pressure as a result of water uptake causes cell to break apart, resulting in SES. IRC is a result of the formation and growth of a ridge or spur at the base of the stem. As this spur grows, it actually ruptures cells in contrast to the cell separation that occurs in SES. IRC is also common in Fuji.

Work by Preston Andrews at Washington State University has shown that the maturity within the stem bowl of Gala is significantly advanced beyond the maturity of flesh tissue near the equator of the fruit. These maturity indicators include ethylene production rates and depletion of starch. These circumstances make the objective to maximize color and size without incurring cracking difficult to achieve, especially under wet conditions.

Experiments conducted with ReTain by Andrews indicated no significant difference between treated and control with respect to cracking. ReTain treatments applied this year at the Fruit Research and Extension Center in Biglerville resulted in ReTain delaying but not reducing or eliminating cracking. A dry growing season similar to what was experienced this year, followed by late summer rains, were ideal conditions for significant cracking to occur. Some form of consistent irrigation throughout a dry growing season should reduce the amount of cracking experienced if rain occurs just prior to harvest.

The multiple factors that are changing in Gala at harvest make the decision of when to pick interesting. The question that must first be answered is what is the market target of these apples? You can wait for more advanced maturity and color if you are marketing your fruit in the immediate future. If your target is mid to long term storage, then you need to harvest early, prior to the onset of the best color and more ideal sugar levels.

Cracking Management Factors:

- No single cultural practice is a remedy.
- Maintain adequate calcium applications. Calcium strengthens the cohesion between cell walls. Some experiments in WA have shown that multiple applications of 8 lbs/100g prior to harvest have reduced cracking.
- Reduce irrigation as harvest approaches. Water/rain on the fruit does not lead to cracking. Uptake of water via the roots leads to cracking.
- Avoid excessive nitrogen. The goal is to attain a balance between vegetative and fruiting growth.
- Monitor maturity factors especially starch levels of the stem bowl and the equator.

Retain

Source: http://hortweb.cas.psu.edu/courses/hort420/pgr/retain.html

Manufacturer: Valent (Prior manufacturer Abbott)

Chemical Name: (S)-trans-2-Amino-4-(2-amino-ethoxy)-3-butenoic acid hydrochloride (15% a.i.)

Mode of Action: Blocks ethylene biosynthesis.

General Information:

Retain is applied as foliar spray 4 weeks prior to anticipated normal harvest. Retain helps growers manage fruit maturation and ripening to optimize harvest time for maximum quality and storage potential of the fruit. The active ingredient of Retain is aminoethoxyvinylglycine, which is a substance isolated from a soil microorganism that specifically inhibits the biosynthesis of ethylene in plant tissues. Ethylene, as you know, is a plant hormone responsible for the processes of fruit maturation, ripening, and fruit drip among others. By temporarily turning off ethylene production, the following benefits can be achieved:

- Improved harvest
- Reduced fruit drop
- A wider harvest window that may enhance fruit size and color
- Improved storage potential and better fruit condition after harvest
- Reduction in the incidence of some physiological disorders associated with fruit senescence, such as watercore, superficial scald, and others

Factors Affecting Plant Response to Retain:

The method of application, environmental conditions, cultivars, and cultural practices will affect the performance of this product. For more information, consult your local extension specialist or farm advisor or the technical services at Valent. A full label can be viewed at: http://www.cdms.net/ldat/ld4CL003.pdf

Organic and Sustainable Foods Have More Polyphenolics Linked to Health Benefits

Source: Andy Fell, UC Davis News Service, via Joe Kovach, IPM Program

Organically or sustainably grown berries and corn contain up to 58 percent more polyphenolics, natural antioxidants that are a natural defense for plants and may be good for our health, according to a new study by researchers at the University of California, Davis. The work suggests that pesticides and herbicides may actually reduce the production of polyphenolics by plants.

"This really opens the door to more research in this area," said Alyson Mitchell, assistant professor of food science at UC Davis, who led the research team. The researchers compared levels of total polyphenolics and ascorbic acid content in marionberries (a type of blackberry) and corn grown organically, sustainably, or conventionally, and in strawberries grown sustainably or conventionally. The fruits and corn used were frozen, freeze-dried, or air-dried.

Frozen, sustainably grown, and organic marionberries and corn contained 50 to 58 percent more polyphenolics than conventionally grown crops from neighboring plots. Sustainably grown frozen strawberries contained 19 percent more polyphenolics than conventional fruit. Sustainably grown and organic produce also had higher levels of ascorbic acid. Frozen fruit and corn tended to have higher levels of polyphenolics than freeze-dried or air-dried foods. The polyphenolics in the organic crops were at levels you would expect to see in wild plants, suggesting that pesticide use reduces the need for plants to make these chemicals, Mitchell said.

Polyphenolics are natural chemicals produced by plants as byproducts of other processes. When plants are stressed, for example by insects, they produce higher levels of polyphenolics, which can taste bitter, to drive away pests.

Studies show that eating a diet rich in fruit and vegetables, which is high in polyphenolics, can reduce the risk of some cancers and heart disease. But scientists don't know exactly how polyphenolics cause these effects. "We know they're beneficial, but we don't know what types of polyphenolics are beneficial, or in what quantities," Mitchell said.

The organic foods were grown according to the definition set by the U.S. Department of Agriculture, without artificial pesticides or fertilizers used in conventional farming. Sustainably grown produce was grown with artificial fertilizers, but without pesticides.

Total polyphenolics levels were slightly higher in sustainably grown produce, suggesting that a combination of organic and conventional practices yields the highest levels. Crops grown without using pesticides or herbicides might make more polyphenolics because they are more likely to be stressed by insects or other pests, Mitchell said. "This may reflect the balance between adequate nutrition in the form of fertilizers and external pest pressures because of the lack of pesticides and herbicides," she said.

The research, which was partly supported by a gift from Oregon Freeze-Dry Inc., was published in the February 26 edition of the *Journal of Agricultural and Food Chemistry*.

Eat Your Veggies (and Fruit)

Source: Trevor Knoblich, Ohio State University Lantern, March 14, 2003

Eating healthy food does more than just make Mom happy; it could prevent cancer. For years scientists claimed healthy eating can prevent specific chronic diseases. Now a team of researchers in the human nutrition department at Ohio State are discovering why.

The team is learning that common foods such as grapes, oats, dairy products, and tomatoes contain more than essential nutrients; they also may be capable of preventing heart disease, cancer, arthritis, or Type II diabetes. "Your grandparents and your great-grandparents said to eat all your fruits and vegetables," said Minnie Holmes-McNary, associate professor of human nutrition. "They knew that it kept you healthy, but they didn't know how."

Termed "functional foods," these healthy dietary staples provide useful compounds for inhibiting disease. "Basically, it's just a food that has an added benefit over traditional vitamins and minerals," said Kim DeDino, a graduate student and dietetic intern. DeDino, along with a team of interns, cited tomatoes as an example of a functional food. Tomatoes contain vitamin C, potassium, and fiber -- nutrients required by the human body. But they also contain the non-essential phytochemical lycopene, which can effectively reduce prostate cancer.

Though there is some hope functional foods may contain clues on managing the progression of certain diseases, research at OSU focuses on their preventative properties. Holmes-McNary studies red grapes as a natural source for a cancer-inhibiting agent called trans-resveratrol. Studies have shown trans-resveratrol can fight several types of cancer - including breast, colon, and liver cancer - as well as arthritis.

Holmes-McNary and her team worked to understand why this happens. Their research indicates that resveratrol limits a transcription process in cancer cells. In other words, the compound stops cancer gene expression. "We were able to show resveratrol could inhibit the transcription process," Holmes-McNary said. "It's exciting to have a cellular target we can see changes in." She finds the properties of red grapes so beneficial, she keeps a supply at her desk.

Maureen Geraghty, a doctoral student at OSU and a licensed dietitian, emphasized that although functional foods have preventative properties, they do not serve as cures to afflictions. "It gives you a benefit to protect from a chronic disease like heart disease or cancer," Geraghty said.

Another associate professor, Martha Belury, studies dietary fatty acids as a possible preventative for Type II diabetes, the most common form of the disease. One of her primary research topics is conjugated linoleic acid, which has multiple beneficial properties. "People often mistakenly think that all dietary fat is bad," Belury said. "In fact, a few types of fat are required for growth and maintenance of your tissues." Other fatty acids have additional benefits.

Humans manufacture very small quantities of CLA, and thus require more from an outside source. These sources include beef, lamb, and dairy products. Belury explores how CLAs affect the signaling of insulin sensitivity. This may allow a diabetic more efficient use of the insulin in their bodies. CLAs could also affect fat and glucose metabolism in the liver. One of her studies, conducted over an eight-week period,

showed that people with Type II diabetes who consumed CLAs as a dietary supplement had significantly reduced body weight in comparison to subjects given a placebo, with no apparent adverse effects.

Though this might suggest images of a future where a few pills could give the body its daily needs, Belury agrees with her colleagues: Dietary sources are probably healthiest. "What you miss in a supplement is all the other good things in food," Belury said. "Plus, we all know that taste is an important part of why we all choose the foods we do."

Dietitians will soon be able to recommend a balanced diet that not only provides all the essential nutrients, but additional benefits such as prevention of some chronic diseases. "It's much more than just interest, although that's the fun part of science," Belury said. "It's getting to that level of thinking, 'Wow, you can make a difference.'"

Belury and Holmes-McNary also said Ohio State University is unusual because the school has all the resources necessary to build a full research program. Various departments can test functional foods from the cellular level through laboratory research and eventually clinical trials.

Degree Day Accumulations for Ohio Sites March 14, 2003

Location	**Degree Day Accumulations Base 50 F**	
	Actual	Normal
Akron-Canton	0	12
Cincinnati	0	32
Cleveland	0	13
Columbus	0	20
Dayton	0	19
Fremont	0	8
Kingsville Grape Branch	0	9
Mansfield	0	13
Norwalk	0	10
Piketon	0	40
Toledo	0	8
Wooster	0	11
Youngstown	0	10

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