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

THE OHIO STATE UNIVERSITY Newsletter Extension

Fruit ICM News

Volume 6, No. 27
August 15, 2002

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Calendar

Sept. 17-19: Farm Science Review, Molly Caren Agricultural Center, London, OH. Crops are ready to harvest and exhibitors are waiting in line for Ohio State University's 2002 Farm Science Review. The Review, an agricultural trade show, sold out of exhibitor space far in advance, with 574 commercial exhibitors featuring everything from machinery to seed to work clothes. The Review also showcases education experts and farm and conservation agencies.

Mulches in Small Fruit Crops

Source: Kathleen Demchak, Senior Extension Associate, Penn State University, The All Ontario Berry Grower, Volume #0.08 - August 2002

Mulches include applied organic matter, living mulches, and plastic mulches. Organic forms of mulch offer many benefits to small fruit plantings. They help to conserve soil moisture, minimize soil temperature fluctuations, and eventually become a source of nutrients for the crop plants. Mulch buffers the soil pH, improves the soil structure, and holds minerals in the soil, reducing the amounts of nutrients leached.

The carbon : nitrogen (C:N) ratio of the mulch largely determines when nitrogen in the mulch becomes available. This is the amount of carbon in the organic matter as compared to the amount of nitrogen. The cutoff for nitrogen tie-up is 30:1, meaning that mulches with a C:N ratio greater than this will tie up nitrogen. If the C:N ratio is less than 20:1, the mulch is a source of nitrogen for the plants. The C:N ratio for any material decreases as it decomposes. C:N ratios for legumes range from 9:1 to 19:1, so they are a nitrogen source for plants. The C:N ratio for various types of straw can be anywhere from 20:1 to 50:1; for aged, dark brown, hardwood sawdust is around 60:1; and for fresh sawdust ranges from 300:1 to 700:1. This is why fresh sawdust should not be applied to plants, and why additional nitrogen is needed when plants are mulched with sawdust.

Straw mulch is used in strawberries for winter protection. Soil temperatures remain warmer in mulched plantings, and soil freeze/thaw cycles causing root breakage are minimized. Besides protecting the crowns from wind and cold, mulch also provides weed control, helps to keep the berries clean during harvest, and helps control of leather rot and anthracnose.

Apply mulch when strawberry plants are dormant (leaves appear somewhat flattened and some cultivars turn reddish). The soil temperature should be around 40°F for several days. Usually these events occur sometime during late November to mid-December. The mulch should be loosely applied between 3 and 6 inches thick, and should be free of weed and grain seeds. As a rule of thumb, it takes about 1 ton of straw per acre to apply 1 inch of mulch. Any type of straw can be used, though wheat is best. Rye straw compacts, and oats and barley break down quickly, and may be nearly gone by harvest.

Remove mulch when the soil temperatures again reach 40°F, usually in late March or early April. Growers sometimes delay mulch removal in order to delay bloom. While this works to a limited extent, bloom will be delayed by only a couple of days, and yields will be decreased if mulch removal is delayed too long.

In bramble production, straw mulch should be applied during the establishment year. Raspberry root growth is decreased if soil temperatures are too high. Tissue cultured raspberry plants are sensitive to herbicides. Mulching raspberries decreases soil temperatures, increases soil moisture, and provides weed control. The mulch should be applied to a depth of 2-4 inches. After the establishment year, foliage from the plants will shade the ground, giving many of the same benefits that mulch does during the establishment year. Do not mulch raspberries after the establishment year, especially if soils are heavy. Root rots may otherwise set in.

Mulching is important for blueberry production on mineral soils. Blueberry roots are fine, have no root hairs, need soil with an open structure, don't tolerate dry soil, and don't tolerate heat. In nature, blueberries grow in soils with a high organic matter content. Blueberries grow best at a soil pH of 4.5-5.0, but may tolerate a wider range if they are mulched. If blueberries are grown in a mineral soil and are mulched, the roots are often found at the interface of the soil and mulch. The roots will cover a wide area, but may be quite shallow. If mulching is discontinued, the roots will become exposed, dry out, and be exposed to high temperatures. Many sources of organic matter work well, though those with a high pH or salt content should be avoided. Sawdust or bark is most commonly used, in which case additional nitrogen will probably be needed. The mulch should be applied 3-5 inches deep and 3-4 feet wide. About 1 inch will be lost per year, so it should be replenished every 2-3 years.

Living mulches have been tested in strawberry production. Benefits include wind protection, use as a winter mulch grown "in place," and weed control between the rows. Results from these experiments varied quite widely with the type of crop grown as the living mulch. Yield increases have been found on occasion, but more commonly yields of strawberries have been depressed or stayed the same. Until more data is obtained, this practice is not recommended except on a small-scale basis for growers who wish to

try it.

Sod planted between the rows in bramble and blueberry production could loosely be considered a living mulch, and is valuable for weed control between the rows. Hard fescue, in particular, has worked well as a non-encroaching slow-growing sod.

Plastic mulch is used in strawberries and can be used for day-neutral strawberry production. Black plastic is most commonly used; other colors of mulch have been tried on a limited basis. Black plastic reduces weed competition except through the planting holes, warms the soils, and increases soil moisture. This obviously can only be used in systems where runner production and daughter plant establishment is not needed. The ability to fertigate also must be factored in, as nutrients cannot otherwise be applied post-planting. Plastic mulch also has been used in bramble production during the establishment year, though the benefits are questionable as new primocanes will find it difficult to emerge and the mulch will need to be removed. Plastic mulch should not be used in blueberry production, as the application of an organic mulch will deliver many of the same benefits in a more suitable manner. If plastic mulch is used, eventually blueberry roots will end up growing in two tiers, both above and below the plastic.

Modified Atmospheres for Berry Crops

Source: Dr. Jennifer DeEll, Fresh Market Quality Program Lead, Ontario, The All Ontario Berry Grower, Volume #0.08 - August 2002

Modified atmosphere (MA) packaging or storage generally refers to enclosure within a sealed semi-permeable plastic film, in which the O_2 is lower and/or the CO_2 is higher than the concentrations found in fresh air. This is due to either the respiration of the enclosed product or an injection of desired gas concentrations. The equilibrated gas mixture is maintained throughout shipping and/or storage and no further measurements or control take place.

MA with 15-20% CO_2 and 5-10% O_2 reduces the growth of Botrytis cinerea (gray mold) and other decay-causing organisms in berries during transport and storage. In addition, such MA reduces the respiration and softening rates of berries, thereby extending the postharvest life. However, exposure of berries to < 2% O_2 and/or > 25% CO_2 can cause off-flavors and brown discoloration, depending on berry type and cultivar, duration of exposure, and temperature.

Whole pallet covers and consumer packages for containment of the MA are commonly used. The standard CO_2 treatment for strawberries is to completely enclose pallet loads of berries in sealed plastic bags, pull a slight vacuum, then add CO_2 to create a 12-15% CO_2 atmosphere within the bag and around the fruit.

It is important that the berries are thoroughly cold prior to treatment, as the plastic pallet cover will impede further cooling and condensation can form when the fruit are not fully cooled. After more than 28 years, the proprietary Tectrol TM pallet bag system technologies from TransFRESH Corp. in Salinas, California, has become an industry standard, protecting berry quality and value all the way through to distribution.

Approximately 60% of the strawberries shipped out of California are treated with 15-20% CO_2 within

pallet covers, using such technology. Photo of atmosphere injection system from TransFRESH used for the TectrolTM atmosphere pallet systems at: http://www.transfresh.com/TransFRESH%20Web/Pallets/tectrol_atmosphere_system_equipm.htm

Table 1: Current MA recommendations and commercial use for berry crops (adapted in part from Kader, 2001)

Berry	Optimum temp (°C)	Reduced O_2 (%)	Increased CO_2 (%)	Commercial Use	Notes
Blackberry	0	5 to 10	15 to 20	Limited use within pallet cover during transport	Rapid cooling to °C should be done before modification of atmosphere
Blueberry	0	2 to 5	12 to 20	Limited use within pallet covers during transport	Prompt cooling to near °C prior to MA establishment & maintenance of such temperatures during transport essential to reduction of postharvest losses.
Cranberry	3	1 to 2	0 to 5	None	Further research is needed to identify potential benefits & limits to CO_2
Raspberry	0	5 to 10	15 to 20	Increasing use within pallet covers during transport	Proper temperature management is prerequisite for successful handling of raspberries
Strawberry	0	5 to 10	15 to 20	Around 60% of strawberries shipped out of California are treated with 15 to 20% CO_2 within pallet covers following cooling to near 0°C	Proper temperature management is the prerequisite for successful handling of strawberries

Phytophthora Root Diseases of Berry Crops

Source: Michael Celetti, Plant Pathologist, Horticultural Crops, The All Ontario Berry Grower, Volume #0.08 - August 2002

The wet and cool conditions experienced this spring were ideal for infection and development of berry crops by the soilborne pathogens Phytophthora spp. Red stele of strawberries and Phytophthora root rot of raspberries are two diseases that thrive in wet, cool soil. Phytophthora spp. are sometimes referred to as water molds, however they are not classified in the "Mold" family. They survive as resistant oospores (persistent sexual resting spores) in soil for long periods or as mycelium (mold) in recently infected plant debris. During favorable conditions, the mycelium and oospores germinate to produce a structure called a sporangium. Under moist but not wet conditions, roots can become infected if they come in contact with

the sporangium. However, when soils become saturated for a sustained period of time (30 minutes to 6 hours), sporangium produce and release many zoospores with tails that swim toward and infect the root tips of berry plants. This is why plants growing in poorly drained; heavy, wet soils are at more risk of becoming infected by Phytophthora spp.

Berry plants infected with Phytophthora frequently appear stunted during the second or third year of growth and occur in patches. They wilt very quickly under hot weather conditions. Symptoms are first noticed in low areas of a field or row where water accumulates for extended periods after irrigation or a heavy rain. Eventually the disease moves along the row from the initially infected plants.

Raspberry plants infected with Phytophthora root rot may be difficult to diagnose. Infected plants produce few primocanes. The few floricanes and primocanes produced often appear wilted with leaves looking scorched along the margins, between veins. Eventually the leaves turn completely yellow as the disease progresses over the seasons. Scraping the epidermis of infected raspberry roots will reveal a reddish-brown tissue with a distinct margin where it meets the healthy white tissue. This reddish-brown tissue may also extend into the crown.

Managing root diseases caused by Phytophthora requires an integrated approach. To avoid root diseases caused by Phytophthora, select well drained fields with light soils. If well-drained or light soils are not available, consider growing resistant or tolerant cultivars in the areas of the field where water may accumulate or plant in raised beds. Always grow disease-free nursery stock or transplants to avoid introducing the pathogens into your fields. If the disease is observed, Aliette WDG (Fosetyl-Al) and Ridomil Gold 480 EC (metalaxyl-M) are two very effective fungicides registered in Ontario (and Ohio) for red stele control in strawberries and Phytophthora root rot control in raspberries.

As with any pesticide, always read and follow the product label prior to use. Pay attention to timings. Ridomil should not be applied in the spring to bearing strawberries or raspberries. For best results, Aliette should be applied before infection takes place, either in spring or early fall.

Food Safety During Harvest

Source: Craig Hollingsworth, UMass Extension, Healthy Fruit, Volume 10, Issue 19

Good sanitation practices during harvesting can help to reduce the risk of microbial contamination of fresh produce. Soil, fertilizers, harvesting equipment, water, workers, pets, and pests can all be sources of harmful microorganisms that can cause foodborne illness. Therefore it is important that growers set up measures to help prevent these sources of microorganisms from contaminating produce. Good sanitation practices include cleaning and sanitizing all food contact surfaces, encouraging worker hygiene and training, and keeping animals out of fields, orchards and packing house.

What do we mean by "food contact surface,", "cleaning," and "sanitizing?"

- A food contact surface is a surface that comes into contact with the fresh produce any time during harvesting, packing, or transporting.
- Cleaning means to remove soil and residues from food contact surfaces by washing and scrubbing with soap or detergent, then rinsing with clean, potable water.
- Sanitizing means to treat a food contact surface with a sanitizing solution that will kill most microorganisms. Surfaces must be cleaned first before they can be sanitized. Soil and soap residues

can inactivate the sanitizing solution.
- A sanitizing solution is made by mixing a small, measured amount of a sanitizer with potable water according to the directions given by the manufacturer.
- A sanitizer is a chemical compound designed to kill microorganisms. The most commonly used are chlorine bleach and quaternary ammonium compounds.

Take a walk through your harvesting operation and check for these signs of potential food safety hazards:

- Pets, livestock, poultry, or wildlife in fields; human or animal waste in fields and orchards
- Sick or unclean workers
- Dirty harvest containers
- Produce laden with dirt or manure
- Broken and dirty harvest equipment

What can you do?

- Wash, rinse, and sanitize when possible and practical all crop containers before harvest.
- When sanitizing, use an approved sanitizer according to the manufacturer's directions. Common sanitizers include chlorine bleach and quaternary ammonia. Store sanitizers and solutions away from the produce.
- Cover harvest containers to keep crop dust, animals, insects, and birds out.
- Clean harvesting aids each day with potable water. This means they should be free of visible soil and residue.
- Keep harvesting equipment in good working order. Set up a maintenance schedule.
- Train workers to follow good hygiene practices.
- Do not haul produce in equipment that has been used to transport garbage, manure, or animals.

Adapted from the New England Extension Food Safety Consortium.

SmartFresh Gets Registered

Source: http://www.fruitgrowersnews.com

Apple growers are going to have new storage tool to help keep apples longer and fresher in cold storage, thanks to the recent registration of SmartFresh. On July 17th, AgroFresh Inc. received U.S. EPA registration for its SmartFresh technology. It has also received state registrations in Washington, Pennsylvania, Virgina, West Virginia, and Ohio as of August 12.

SmartFresh is considered a breakthrough in apple storage technology. The product is used in apple storage facilities to maintain the crunch, juiciness, and taste of apples during and after storage. "The apple industry has done a fantastic job of using available storage technologies to deliver high quality apples into the market," says Gray Wirth, AgroFresh business director. "With SmartFresh, apple packers can take their fruit to the next level and ensure their high quality apples maintain their fresh-picked qualities right through to the consumer."

To understand the role of SmartFresh, it is helpful to understand how fruits and vegetables ripen, age, and eventually spoil. The key is the fruit's own internal production of a naturally occurring plant substance

called ethylene, and the fruit's sensitivity to outside sources of ethylene, such as cars, cigarette smoke, and other ethylene-producing fruits. This continuing cycle of ethylene in the air has made storage, shipping, and quality of fresh produce a delicate balancing act. For more information about AgroFresh, this commercial web site is available: http://www.rohmhaas.com/agrofresh/home.html

Pest Phenology

Coming Events	Degree Day Accum. Base 50° F
Spotted tentiform leafminer 3rd flight begins	1537-2123
Codling moth 2nd flight subsides	1705-2635
Redbanded leafroller 3rd flight begins	1728-2231
Apple maggot flight subsides	1904-2573
Redbanded leafroller 3rd flight subsides	2013-2402
Oriental fruit moth 3rd flight subsides	2018-2377
Spotted tentiform 3rd flight subsides	2228-2472

Thanks to *Scaffolds Fruit Journal* (Art Agnello)

Ohio Drought Watch: August 10, 2002

Source: http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/palmer.gif

State District	Situation
Northwest	Moderate drought
North-central	Moderate drought
Northeast	Moderate drought
Central Hills	Moderate drought
Northeast Hills	Moderate drought
Rest of State	Near normal

Degree Day Accumulations for Ohio Sites August 7, 2002

Location	Degree Day Accumulations Base 50F	
	Actual	Normal
Akron-Canton	2082	1965
Cincinnati	2563	2574
Cleveland	2135	1926
Columbus	2510	2213
Dayton	2421	2287
Kingsville Grape	1893	1833
Mansfield	2086	1946
Norwalk	2063	1924
Piketon	2496	2499
Toledo	2289	1923
Wooster	2168	1826
Youngstown	1966	1781

SkyBit® Sooty Blotch Prediction for North-Central Ohio

Observed:
Aug 1-14: possible infection & damage

Predictions based on weather forecasts:
Aug 15-23: possible infection & damage

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: 8/7 to 8/14/02

RBLR: 51 (up from 36)
STLM: 50 (up from 48)
CM (mean of 3 traps): 19.0 (up from 14.7)
TABM: 2 (same as last week)
SJS: 0 (down from 10)
VLR: 3 (down from 4)
OBLR: 3 (up from 1)
AM (sum of 3 traps): 22 (up from 13)

Peach: 8/7 to 8/14/02

OFM: 17 (same as last week)
LPTB: 7 (up from 4)
PTB: 10 (up from 4)

Site: East District: Erie & Lorain Counties
Source: Jim Mutchler, IPM Scout

Apple: 8/6 to 8/13/02

CM (mean of 3 traps): 9.3 (down from 10.5)
STLM: 825 (down from 950)
SJS: 48.7 (down from 92)
AM (sum of 3 traps): 6.7 (up from 4.1)
OFM: 0 (down from 1.5)
RBLR: 18.1 (up from 17.5)
ERM (infested leaves per 25 leaf sample): 3.4 (up from 0.8)
OBLR: 2.7 (down from 3.9)

Peach: 8/6 to 8/13/02

OFM: 1.3 (down from 2.7)
RBLR: 15.0 (up from 5.7)
LPTB: 9.3 (up from 5.7)

PTB: 4.3 (down from 8.3)

Beneficials present - *Stethorus punctum,* native lady beetles, green lacewings, brown lacewings, orange maggots, predatory mites, multi-colored Asian lady beetles

Site: West District: Huron, Ottawa, Sandusky Co.
Source: Gene Horner, IPM Scout

Apple: 8/6 to 8/13/02
CM (mean of 3 traps): 13.0 (up from 7.6)
STLM: 37.5 (down from 79.0)
SJS: 212.5 (up from 3.0)
AM (sum of 3 traps): 8.3 (up from 4.8)
OFM: 11.6 (up from 4.6)
RBLR: 11.0 (up from 10.8)
OBLR: 2.6 (up from 1.6)
ERM (infested leaves per 25 leaf sample): 3.6 (up from 0.4)

Peach: 8/6 to 8/13/02
OFM: 23.0 (up from 10.4)
RBLR: 17.8 (up from 16.4)
LPTB: 5.6 (up from 3.2)
PTB: 1.5 (down from 4.0)

Beneficials present - lacewings, banded thrips, brown lacewings, predatory mites, multi-colored Asian ladt beetle

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