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

THE OHIO STATE UNIVERSITY Newsletter Extension

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In This Issue:

Calendar

August 5: Young Grower Tour, northwest Ohio. Designed for, but not limited to, producers and their spouses age 40 and under. The tour will showcase the innovative growing techniques of northwestern Ohio fruit and vegetable growers. Board buses beginning at 8:00 a.m. at the OARDC Vegetable Crops Branch 2 miles south of Fremont. Stops will include the Antesberger Farm, Knipp Farms, Hirzel Canning Company (where barbecue chicken and brat lunch will be served), Northern Ohio Pickle Company, Bench's Greenhouse, Rimelspach Produce Company. Buses return to OARDC-Fremont at approximately 4:30 p.m., where dinner will be served. Cost is only $10 per person. Call OFGS or OVPGA at (614) 249-2424.

New Website for Trap Reports

Bruce Eisley, Research Associate, Ohio State University Extension Entomology Department, has posted Ohio tree fruit trapping summaries on the web at:

http://www.ag.ohio-state.edu/~ipm/fruit/frpest.htm

Widespread Drought Reports

Source: Dr. Dick Funt, Horticulture & Crop Science, Ohio State University

The states east of Ohio in Maryland, Pennsylvania and New Jersey have drought equal or greater than Ohio. Governor Ridge of Pennsylvania has declared as of last week 55 out of 67 counties on emergency water restriction on non agricultural use . A few apple trees on M9 with good to full crop are collapsing under the stress in Adams County, the top county in the state This region received some showers on Wednesday of last week, with 1 to 2 inches in Gettysburg. Reports in New Jersey say that ponds and wells have gone dry from irrigation use, and therefore unable to continue to protect crops from drought just as the peak of the peach harvest will start in one to two weeks. In Canada, strawberry growers have not renovated fields because the ground is too hard to cultivate.

In Columbus, peaches are ripening and are of average size and have had no irrigation for two weeks. Last week we received about one inch of water. Peaches are under heavy bird damage and hornets and bees are also destroying the fruit, with 10 to 25 % of the fruit being eaten. About 5% of the current crop is affected, with more expected this week I have spotted a ground hog at high noon standing on his back feet trying to eat the peaches as well. I was not able to take some non chemical action on him. In past dry seasons these animals and insects, seeking moisture, go for the ripe fruit and are difficult to control. Picking the fruit early can help reduce the overall damage; also, attempts to control birds has been difficult.

Drought Conditions Persist

Source:

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

Conditions in Ohio as of July 24, 1999

Region	Category of Drought
NW Ohio	Near Normal
WCentral Ohio	Moderate
SW Ohio	Severe
SCentral Ohio	Severe
Central Ohio	Severe
NCentral Ohio	Near Normal
NE Ohio	Moderate
Central Hills	Moderate
NE Hills	Moderate
SE Ohio	Severe

Strawberry Renovation in a Drought

Some growers had been concerned that, because of dry conditions, especially in the southeastern part of the state, they had not been able to renovate. So, the following questions had been asked. How long can strawberry renovation be delayed without injury to the plant or to next years crop? Are there alternatives

to tillage, such as using Gramoxone (paraquat) to narrow rows?

The answer is based on information from people who have worked on renovation research and other small fruit experts in several northeastern states and Canada. First, the consensus was that if growers had not yet mowed the plants, they would be better off just skipping that step this year. Since foliage is needed for flower bud development, it may be better to keep what leaves you have, especially if you do not have irrigation (or cannot use it) as is the reason this question was asked in the first place. Mowing too late (past mid-July) in any year hurts more than helps.

A number of growers have been using Gramoxone to narrow the rows, rather than tillage, with good results. In addition, tillage could be used in the fall if we get rain. One individual had been using Scythe herbicide, rather than Gramoxone, also with good results. Thanks to Marvin Pritts, Dick Funt, Deborah Breth, Kevin Schooley, and Stan Hokanson for their input.

Source: Kathy Demchak, Fruit Times Newsletter

Foliar Analysis

The closure of the Research-Extension Analytical Lab in Wooster should not deter your use of foliar analysis as a fruit crop management tool. Dr. Diane Miller, Associate Professor of Horticulture and Crop Science has offered to assist with the interpretation of foliar and soil testing done at Penn State or Michigan State. Diane had the opportunity to work with Professor Garth Cahoon while he was at OSU, and believes in the value of monitoring nutrient levels.

Drought Effects on Apple Trees

The weather map is "orange' throughout almost the entire United States and these high temperatures in Ohio, combined with our lack of rainfall can mean trouble for our apple crop. An immediate, gentle, three inch rain would do a lot to reduce our problems. Southern Ohio growers, with their apple crop further along are losing the window of opportunity for improvement by rain.

Over the growing season, for adequate tree growth, flower bud formation and fruit quality, apple trees need roughly 1 - 1.5 inches of rain per week. Most areas of the state are way below this for the 1999 season. Obviously, a deluge of rain in September won't make up for dry conditions encountered in July.

Elena Garcia of the University of Vermont put together a nice, general overview of apple trees and water relations http://orchard.uvm.edu/uvmapple/newsletter and some of that information is presented in the next paragraphs. Then I will deal with some specific effects of drought that Ohio fruit growers are likely to have to deal with.

".. Even though fruit trees are made up of mostly water (table 1), only about 0.15 acre inches of water is harvested in the crop. About 95-95% of the water taken up by a fruit tree is lost to the atmosphere through transpiration.

Table 1. Loss of water by transpiration

Leaves	25-50%
Shoots and wood	10-20%
Roots	20-30%
Fruit	80-85%
A mature tree	85-87%

Transpiration, the loss of water from the leaf tissue into the atmosphere, has two important functions in the plant. First, the cells in the leaves are cooled because water is being evaporated. This maintains the cells at an optimum temperature for metabolic processes such as photosynthesis to take place. If transpiration is limited due to water stress in the plant, photosynthesis will be limited and reductions in plant growth, fruit quality and yield will result. Secondly, since water is moving from the roots to the different parts of the plant, this movement facilitates the passive movement of important minerals and dissolved chemicals throughout the plant. Nutrient deficiencies are likely to be present under water stress situations.

During the winter months, apple trees use very little water. Water absorption from the soil by roots increases as leaf surface of the plant increases in the spring and most of the water comes from the upper soil layer which is warmer and has greater feeder root penetration. The "potential" water available to the plant depends on the root volume and the soil water holding capacity.

The roots of deciduous trees such as apples are usually extensive and have been found at depths of six feet. In sandy soil, roots have been found to extend laterally two to three times the branch spread and 1.5 times in loam or clay soils. When roots are deep and extend well laterally and there is a good supply of winter precipitation, there is usually no need for irrigation. However, where rooting is shallow, such as the root systems of growth-controlling rootstocks of high-density plantings, the need for irrigation will be higher than for standard, low-density plantings. Today, many orchards, particularly those with the shallow-rooted dwarf trees, provide some means of water application to protect the trees from water stress.

The ability of the soil to retain water is called the water-holding capacity and this capacity to hold water varies with the different textures of the soil. Table 2 shows the relationship of soil type to its water holding capacity and the moisture available to the plant.

Table 2. The Relationship of Soil Type to Water Holding Capacity and Moisture Availability to Plants (From: Temperature-Zone Pomology)

Soil Type	Water Content At Field Capacity	At Permanent Wilting	Available Water
Sandy Loam	12%	4%	8%
Loam	24%	12%	12%
Adobe Clay	38%	19%	19%

During the growing season, the water status with a tree changes from day to day and hour to hour, whereas the soil water changes slowly. Tree water usage increases mainly with increased air temperature, air movement, sunlight intensity and with lower relative humidity. Table 3, which appeared

in the March issue of Cornell Northeast Tree Fruit Newsletter (K. Lugerman) gives you an indication of how much water is needed when canopy size and evapotranspiration (evapotranspiration is the total loss of water by evaporation from the soil surface and transpiratin from plants from a given area, and during a specified period of time) are considered.

Table 3. Typical Water Consumption Rates Per Tree Per Day

Canopy Diameter (Ft.)	When Evapotranspiration is (in inches per day) 0.15	0.20	0.25	0.30	0.35
	The approximate gallons of water use per tree per day is:				
1	0.06	0.08	0.10	0.12	0.15
2	0.25	0.33	0.42	0.5	0.6
3	0.6	0.75	1.0	1.1	1.3
4	1.0	1.5	1.7	2.0	2.5
6	2.5	3.0	4.0	4.5	5.5
8	4.0	5.5	7.0	8.0	9.5
10	6.5	8.5	10.5	12.5	14.5
12	9	12	15	18	21
14	12	16	20	24	28
16	16	21	27	32	37
18	20	27	37	40	47
20	25	33	42	50	58
22	30	40	50	60	70
24	36	48	60	72	84

Assumptions: Crop factor = 0.85; Evapotranspiration 80% of Pan Evaporation

Stomata Activity. Stomata are pores on the leaf epidermis through which gas exchange (carbon dioxide, oxygen and water vapor) takes place. Since these gases are involved in respiration, photosynthesis, and transpiration, the opening and closing of the stomata regulate these processes in the plant. Stomata are open less wide and for a shorter duration on trees (a) in dry soils vs. those in a moist soil and (b) on plants during high temperatures and low relative humidity vs. Those on a cool, humid day. When dryness is severe, stomata may not open at all to prevent water loss from the leaves. When stomata are less active or closed due to drought, both photosynthesis and transpiration are reduced as much as 40% before the leaves show any wilting and over 90% at wilting. When the stomata are closed, food and energy loss by respiration are increased.

Vegetative growth and water. If there is not adequate stored soil moisture early in the season, a drought at this time will result in reduced shoot length and leaf size. However, if there is sufficient soil moisture early in the season followed by a late season drought, shoot growth may be a good in a non-irrigated tree as in an irrigated one because shoot growth is completed within six weeks after growth began. Trunk diameter may be reduced by a mid or late summer drought.

Nutrient supply. When less water is available to carry the nutrients from the soil particles into the tree, nutrient deficiencies are aggravated. Uptake of water soluble nutrients, such as nitrogen, boron, magnesium or potassium is most affected.

Fruiting. Reproductive growth is usually more sensitive to water stress than vegetative growth. Because flower bud initiation and differentiation is a photosynthate requiring process, water stress occurring during mid-summer and fall may result in decreased cropping the following year. In Washington state, severely drought stressed trees failed to bloom, and if they bloomed, the flowers had many abnormalities. Fruit set is also sensitive to water stress. In a study conducted in England on Cox's

Orange Pippin, fruit set was reduced 65% for trees receiving no rain or irrigation from March to June.

Fruit growth. Under adequate moisture conditions, apple fruit growth occurs at an almost linear rate during the entire season. During the first three to five weeks after bloom, fruit increases in size due to cell division, with some cell expansion beginning at this time. The growth of the fruit 25 - 30 days after petal fall is mostly due to cell expansion. This cell expansion is highly dependent upon an adequate supply of moisture which provides weight and diameter increases of the fruit, and one of the first responses to water deficit by an apple tree is that fruit growth slows down. As a matter of fact, fruit circumference growth is used as a sensitive and practical measurement of water stress in the tree. Water stress during any time of the season may impair the ability of the fruit to increase in size.

Fruit cracking. Fruit cracking may result after water is supplied by rain or by irrigation following an extended dry period.

Pre-harvest drop. Apple drop just before harvest is common on trees affected by water stress. The effectiveness of "stop-drop" sprays such as NAA is reduced.

Yield and quality. Any tree subjected to water stress can be expected to have reduced yield and poorer fruit quality. Table 4 shows the effect of apple quality for varying periods of drought before harvest.

Table 4. Effect of apple quality of varying periods of drought before harvest (From: Tree Fruit Irrigation. Proc. Of the Washington State University Irrigation Management Shortcourse)

	Date of last irrigation							
	None	5/29	6/15	7/13	7/27	8/10	8/24	9/7
Wt./fruit (lb.)	0.16	0.28	0.35	0.41	0.38	0.38	0.42	0.38
Sol. Solids (%)	19.5	16.8	13.6	12.5	12.6	11.8	12.2	11.5
Firmness (lb.)	23.5	21.5	21.0	20.5	20.5	21.5	20.0	20.5
Water Content (%)	74	76	81	81	82	82	82.0	82.0
Starch (rating)	2.7	2.8	2.4	2.2	2.2	2.2	2.4	2.0

Now, let's consider some additional specific problems:

Calcium-deficiency physiological disorders. Corking is worse in apples under conditions of moisture stress. Leaf injury may occur from calcium chloride sprays during hot, dry summers. When injury is noticed, reduce calcium chloride to one-half the rate in the next spray or delete calcium chloride from the cover sprays until one-half inch of rain has fallen.

Sunburn. Sunburn occurs when fruit is exposed to direct solar radiation. Green and yellow cultivars are particularly susceptible, but even red cultivars may sunscald on hot, sunny days. If the injury is mild, the flesh itself may not be damaged, but longer exposure can result in severe injury to both skin and flesh, with sunken areas and dead tissue extending a centimeter or more into the fruit. As limbs bend under the weight of the growing fruit, the fruit in the interior becomes exposed and susceptible to injury.

Source: Dr. Diane Miller, Associate Professor, Horticulture and Crop Science

Fruit Observations

Insect Key

AM: Apple maggot
CM: Codling moth
DWB: Dogwood borer
LPTB: Lesser peachtree borer
OBLR: Oblique banded leafroller
OFM: Oriental fruit moth
PC: Plum curculio
PTB: Peachtree borer
RBLR: Redbanded leafroller
SJS: San Jose scale
STLM: Spotted tentiform leafminer
TABM: Tufted apple budmoth
VLR: Variegated leafroller

Site: Waterman Farm, Columbus
Source: Dr.Celeste Welty, OSU Extension Entomologist
Traps Used: AM = red balls, SJS = tent trap, others = wing traps

Apple: 7/22 - 7/28

RBLR: 14 (up from 10)
STLM: 449 (down from 2370)
SJS: 221 (down from 1299)
CM (mean of 3 traps): 8.7 (up from 3.7)
AM 0 (unchanged)
TABM: 2 (up from 1)
VLR: 9 (up from 1)
OBLR: 2 (up from 0)

Peaches:

OFM: 4 (same as last week)
LPTB: 6 (up from 0)
PTB: 18 (up from 0)

Site: East District; Erie & Lorain Counties
Source: Jim Mutchler, IPM Scout
Traps Used: AM = red balls, SJS = tent traps, STLM = wing traps, Others = Multipher traps

Apple: 7/21 - 7/27

RBLR: 3.9 (up from 3.8)
STLM: 675 (up from 249)
SJS: 27.3 (up from 25.6)
CM (mean of 3 traps): 2.2 (up from 1.4)
OBLR: 0.5 (down from 8.0)
VLR: 0 (down from 1.0)
AM (sum of 3 traps): 0.5 (up from 0.5)

Peach:

OFM: 12.5 (down from 35.0)
RBLR: 2.5 (down from 2.8)
LPTB: 32.5 (up from 32.0)
PTB: 4.5 (down from 6.8)

Other pest activity: green apple aphid, potato leafhopper, Japanese beetle, Oriental fruit moth strikes

Beneficials at work: Lacewings everywhere, orange maggot, multitudes of Stethorus punctum and other lady beetles, predatory mites

Site: West District; Huron, Ottawa, & Sandusky Counties
Source: Gene Horner, IPM Scout
Traps Used: AM = red balls, SJS = tent traps, STLM = wing trap, Others = Multipher traps

Apple: 7/21 - 7/27

RBLR: 15.9 (up from 2.3)
STLM: 1064 (up from 231)
SJS: 0.9 (up from 0.6)
CM (mean of 3 traps): 2.0 (Up from 0.7)
OBLR: 1.0 (down from 1.5)
VLR: 15.5 (up from 5.0)
AM (sum of 3 traps) 0.6 (Up from 0)

Peach:

OFM: 6.0 (down from 7.5)
RBLR: 10.0 (up from 9.0)
LPTB: 16.0 (up from 10.0)
PTB: 2.5 (down from 6.5)

Other pest activity: Green apple aphid, two-spotted spider mite, Oriental fruit moth strikes, apple rust mite

Beneficials at work: Lacewing eggs, predator mites, other lady beetles, predatory wasps, banded thrips

Ohio Apple Scab, Fire Blight, and Sooty Blotch Activity- SkyBit Products

Central District

Apple Scab:
July 1-3, 6, 7, 10, 19-24, 27-29 possible infection & damage
July 4, 5, 8, 9, 11-18, 25, 26 active but no infection
Based on Forecasts; July 30-August 5 active but no infection

Fire Blight:

July 1-7, 9, 10, 15-24, 26-29 possible infection and damage; July 8, 12, 14, 25 not active
July 11, 13 active but no infection
Based on Forecasts; July 30 - August 1 active but no infection
August 2 - 5 possible infection and damage

Sooty Blotch:
July 1-27 active but no infection, July 28, 29 possible infection and damage
Based on Forecasts; July 30 - August 5 possible infection and damage

Eastern Highlands

Apple Scab:
July 1, 4, 5, 8, 11 - 19, 21, 24-27 active but no infection
July 2, 3, 6, 7, 9, 10, 20, 22, 23, 28, 29 possible infection & damage
Based on Forecasts; July30, 31, August 3-5 active but no infection
August 1, 2 possible infection and damage

Fire Blight:
July 1- 4, 6, 7, 9, 10, 14, 18-20, 22-24, 26, 28, 29 possible infection and damage
July 5, 8, 11-13, 15-17, 25, 27 not active, July 21 active but no infection
Based on Forecasts; July 30, 31 not active; August 4 active but no infection
August 1-3, 5 possible infection and damage

Sooty Blotch:
July 1-29 active but no infection
Based on Forecasts; July 30, 31, August 1-5 active but no infection

Northeast District

Apple Scab:
July 1, 2, 6, 7, 9, 10, 19, 20, 22-25, 29 possible infection & damage
July 3 - 5, 8, 11-18, 2126-28 active but no infection
Based on Forecasts; July 30, 31, August 3-5 active but no infection
August 1, 2 possible infection and damage

Fire Blight:
July 1, 2, 6, 7 , 9, 10, 18-25, 27-29 possible infection and damage
July 3 - 5, 8, 11 - 17, 26 not active
Based on Forecasts; July 30, 31 not active, August 4 active but no infection
August 1-3, 5 possible infection and damage

Sooty Blotch:
July 1-29 active but no infection
Based on Forecasts; July 30-August 1 active but no infection
August 2-5 possible infection and damage

North Central District

Apple Scab:
July 1, 2, 6, 7, 10, 19-22, 24, 25, 29 possible infection & damage

July 3 - 5, 8, 9, 11-18, 23, 26-28 active but no infection
Based on Forecasts; July30-August 5 active but no infection

Fire Blight:
July 1, 2, 6, 7, 9, 10, 19-22, 24, 25, 27-29 possible infection and damage;
July 3 - 5, 8, 11-18, 23, 26 not active
Based on Forecasts; July 30, August 1 not active, July 31 active but no infection
August 2-5 possible infection and damage

Sooty Blotch:
July 1-29 active but no infection
Based on Forecasts; July 30-August 5 active but no infection

West District

Apple Scab:
July 1, 2, 18, 20, 22-25, 27, 29 possible infection & damage
July 3-17, 19, 26, 28 active but no infection
Based on Forecasts; July 30, 31, August 2-5 active but no infection
August 1 possible infection and damage

Fire Blight:
July 1-3, 6, 9, 16-25, 27-29 possible infection and damage; July 4, 5, 7, 8, 10-15, 26 not active
Based on Forecasts; July 30 not active
July 31-August 5 possible infection and damage

Sooty Blotch:
July 1-29 active but no infection
Based on Forecasts; July 30 active but no infection, July 31-August 5 infection & possible damage

Degree Day Accumulations for Selected Ohio Sites January 1, 1999 to date indicated

	Actual DD Accumulations July 21, 1999		Forecasted Degree Day Accumulations July 28, 1999			
Location	**Base 43° F**	**Base 50° F**	**Base 43° F**	**Normal**	**Base 50° F**	**Normal**
Akron - Canton	2591	1767	2817	2579	1944	1736
Cincinnati	3030	2109	3285	3265	2315	2293
Cleveland	2593	1780	2745	2523	1896	1677

Columbus	3156	2226	3368	2859	1954	1964
Dayton	2905	2040	3153	2927	2238	2032
Elyria	2729	1917	2961	2657	2100	1814
Fremont	2475	1698	2735	2579	1909	1763
Mansfield	2509	1690	2745	2555	1876	1719
Norwalk	2611	1807	2845	2414	1992	1699
Toledo	2707	1894	2905	2511	2050	1699
Wooster	2669	1838	2909	2442	2030	1614
Youngstown	2390	1598	2608	2383	1767	1571

Phenology

	Range of Degree Day Accumulations	
Coming Events	**Base 43° F**	**Base 50° F**
Codling moth 2nd flight peak	1587-3103	1061-2212
Apple maggot flight peak	2033-2688	1387-1804
Obliquebanded leafroller 2nd flight begins	2124-3040	1412-2076
Oriental fruit moth 3rd flight begins	2172-2956	1553-2013
Peachtree borer flight subsiding	2230-3255	1497-2309
Redbanded leafroller 3rd flight begins	2389-3113	1722-2209
Spotted tentiform leafminer 3rd flight peak	2415-3142	1728-2231
San Jose scale 2nd flight subsides	2494-3257	1662-2303

Redbanded leafroller 3rd flight peak	2514-3225	1818-2625
Obliquebanded leafroller 2nd flight peak	2634-3267	1789-2231

Thanks to Scaffolds Fruit Journal (Art Agnello)

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