



Kentucky Fruit Facts

Research & Education Center

P.O. Box 469, Princeton, KY 42445

March 2000 (3-00)

Prepared by John Strang and Jerry Brown, Extension Horticulturists; John Hartman, Extension Plant Pathologist; Tom Priddy, Ag. Meteorologist; John Strang, Editor, Marilyn Hooks and Elizabeth Griffin, Secretaries

Fruit Facts can be found on the web at: <http://www.ca.uky.edu/HLA/fruifact/>

Fruit Situation

The thirty day forecast for March predicts below median rainfall and above normal temperatures. So far this has been right. Our excessively warm February and early March has positioned plant development at least a month ahead of normal. Note the floral developmental stages in the back of the Commercial Tree Fruit Spray Guide and Disease and Insect Control Programs for Home Grown Fruit in Kentucky Including Organic Alternatives publications to determine floral hardiness levels.

As a result of the warm temperatures most growers are behind in pruning. Generally pruning should be a little lighter this season due to reduced numbers of fruit buds on some varieties and because the drought reduced tree stored carbohydrate reserves.

Growers that had heavy levels of fire blight in apples and pears last season should make every attempt to get a copper hydroxide also called fixed copper (Kocide 101, C-O-C-S, Kocide 2000 or other brand) spray on by the half-inch green stage. This will destroy fire blight bacteria residing on the tree surfaces. However, floral development is probably a little too advanced to get this spray on pears in most areas of the state now. Using copper hydroxide after the half-inch green stage can cause fruit russetting. Data collection for the MARYBLTY fire blight predictive program should be started at green tip.

Blackberries and raspberries should have a liquid

lime sulfur or copper hydroxide spray applied to them when the tips of buds show green. If liquid lime sulfur is applied after new shoots are 3/4 inch long the leaves may be burned. This is a critical spray for good disease control in brambles. (Strang, Brown, Priddy)

Meetings

Mar. 14 Apple Tree Care and Pruning, Morgan County, West Liberty, KY. Contact Chris Lindon 606/743-3292.

Mar. 16 - Commercial Apple IPM Meeting, Robert Rudd's Orchard, East Bernstadt, KY (Laurel county) See article below.

Mar. 17-18 Alternative Agriculture Workshop 2000, Whitley City, KY. 25 different sessions, 6:30-8:30 P.M. Friday, 9:00 A.M.- 3:00 P.M. Saturday, Contact Greg Whitis 606/376-2524.

Mar. 18 - Annual and Perennial Flowers for Kentucky Landscapes and Pruning in the Home Fruit Orchard, Leitchfield, KY. 8 A.M. - noon. Contact Cretia Thacker 270/259-3492.

Mar. 21 - Dealing with Changes in Agriculture - Exploring Opportunities, Talks will cover Opportunities in Fruit Production, Developing a Financial Plan, Decision Making, Marketing Considerations, Analyzing Your Old and New Enterprises, Owingsville Lions Club Park, Owingsville, KY. Starts at 6:30 P.M. Contact Gary Hamilton 606/674-6121 or Ron Catchen 606/498-8741.

Educational programs of the Kentucky Cooperative Extension Service serve all people regardless of race, color, age, sex, religion, disability, or national origin.

UNIVERSITY OF KENTUCKY, KENTUCKY STATE UNIVERSITY, U.S. DEPARTMENT OF AGRICULTURE, AND KENTUCKY COUNTIES, COOPERATING

Mar. 25 - KVS Grape Pruning Demonstration, Pilot Rock View Grapevine Nursery, Ken and Shirley Harmet, Hopkinsville, KY phone 270/269-2411. 10:00 A. M. Contact Jay Stone 270/886-6328. See the February Fruit Facts for directions.

Mar. 30 Pruning Older Apple Trees, Demonstration, Lawrenceburg, KY, 10:00 A.M. Contact Dennis Cantrill 502/839-7271.

Apr. 1 - KVS Grape Pruning Demonstration, Ken and Jane Brumback's Oak Meadow Vineyard, Cynthiana, KY (45 minutes from Lexington) phone 606/234-3181. Demonstration will begin at 1:00 P.M. See the February Fruit Facts for directions.

Apr. 6 - Grape and Apple Pruning Demonstration, Frankfort, KY. Contact Edie Greer 502/695-9035.

Apr. 15 - Kentucky Nut Grower's Association Meeting, Hardin County Extension Office, Elizabethtown, KY. Meeting begins at 10:00 a.m. EST and includes a graft wood exchange and a plant auction. Contact Tom Evans, 270/826-8953 or Les Wilmoth 270/369-7493.

Apr. 18 - Commercial Apple IPM and Blackberry Production Meeting, Dana and Trudie Reed, Reed's Apple Valley Orchard, Paris KY, mkt. phone 606/987-6480 and Wayne and Cliff Shumate's Wind Stone Farms, Carlisle, KY.

Apr. 20 - Vegetable Diseases - Strategies to Avoid Them, How to Recognize Them When You Get Them and What to Do About It + Fruit & Vegetable Insects, Pests, and Beneficials - Explore Their Lifecycles and How to Control Them, Kentucky State University Farm, Frankfort, KY. Contact 502/564-5871.

May 19-20 - Gourd Classes, First Baptist Church (May 19) and Sixth Annual Kentucky Gourd Show, Spencer County High School, Taylorsville, KY (May 20-21). Contact Spencer County Cooperative Extension Office 502/477-2217 or E-mail klilly@ca.uky.edu

June 5-7 - Heartland Wine School, Ohio State University, Columbus, OH. The Heartland Wine School is a joint project of Purdue University, Michigan State University, and the Ohio State University and was created in response to requests for a regional opportunity to train winery personnel in classic wine making principles. Extensive tasting sessions will complement the presentations. Register early to be sure your place is guaranteed - space is limited and will be allocated on a first-come-first-serve basis. To obtain a registration packet contact Roland Riesen, OARDC, Department of Horticulture & Crop Science, 1680 Madison Ave., Wooster, OH 44691. Phone 330/263-3685. E-mail:riesen.1@osu.edu

Jun. 22 - Commercial Apple IPM Meeting

Rudd's Orchard, Owners Robert and Gail Rudd, 875 Hensley Rd., East Bernstadt, KY phone (606)843-6858

Directions

Take I-75 to exit 41 and exit in the east direction on to 80. Travel 1/3 mile to the intersection of 80 and US 25. Take US 25 north about 2.5 miles and veer to the right on to HWY 490. (There will be a sign here directing you to the orchard.) Follow HWY 490 for 3.8 miles and turn left on to Hensley Rd. Robert Rudd's Apple Orchard is one mile on the left.

Program

10:00 A.M. EST	Apple Round Table Discussion led by John Schlei, President of the Kentucky State Horticultural Society.
11:30	Fresh Product Food Safety - Joe O'Leary
Noon	Lunch will be available at cost for those that preregister. The cost will be in the \$6.00 range. Preregister by calling Mary Ann Kelley at 502/365-7541 between 8:00 AM and 4:30 PM CST weekdays before March 14 and give her a count for the Apple IPM meeting at Rudd's Orchard.
1:00 P.M.	Spraying - Jerry Brown
1:30	Early Season Insect Management - Ric Bessin
1:50	Early Season Disease Management - John Hartman
2:10	Orchard Nutrition - John Strang
2:30-3:00	Setting Up Goodnature's Micro Flash Pasteurizer - Robert Rudd

Questions? Contact Jerry Brown 502/365-7541 Ext. 204 or John Strang 606/257-5685.

All UK Cooperative Extension Service Meetings are open to everyone.

Is the Devastating Plum Pox Virus a Threat to Kentucky?

Many of you are no doubt aware of recent reports of the discovery of Plum Pox Virus (PPV) in Adams County, Pennsylvania. This is a destructive disease of stone fruit and could be a threat to peach, plum, and cherry production in Kentucky. This virus has never been found in North America before, and now that it is here, we need to be aware of the findings surrounding this disease. In this article, basic information about PPV will be discussed. For more details visit the edifying web site on PPV, also called sharka disease, that is maintained by Pennsylvania State University (<http://sharka.cas.psu.edu>). This article is based on information obtained from the web site.

What was found? Plum pox virus (PPV) was positively identified in a relatively small region of

Commercial Apple IPM Meeting, March

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Pennsylvania in October, 1999.

Where has the disease occurred before? PPV was first found in Bulgaria in 1915, spreading gradually through Europe, reaching France in 1970, soon after, to England, and by 1984, to Spain. Throughout Europe, plum pox is considered the most devastating disease of stone fruits, and it has been estimated that over 100 million European trees are infected. Plum pox continues to spread eastward in Eurasia and southward along the Mediterranean coast of Africa. In the 1990's PPV was brought to Chile and within a few years, large numbers of trees in the stone fruit-growing regions were infected. In North America, the only identified occurrence of plum pox is localized in 18 stone fruit blocks of 4 orchards in two townships in Adams County, Pennsylvania. Due to the localized nature of this infection, it is hoped that eradication may be successful in eliminating this isolated focus of infection from North America.

Host range. PPV infects not only plums but also all economically important stone fruit (*Prunus*) species including peach, nectarine, apricot, almond, and cherry. PPV is also known to have the ability to infect some wild *Prunus* species, and a large number of weed species under laboratory conditions. In Europe, it is believed that spread within orchards occurs from infected to healthy fruit trees. The role of alternate weed hosts, if any, in disease spread is not known, but needs further study.

Symptoms on Stone Fruit. Symptoms of PPV may vary considerably with the plant species, the cultivar, tree age, nutrient status, and environmental conditions. In addition, different strains or variants of PPV may vary in virulence, and thus disease severity. Some infected plants show no clear symptoms at all. Diagnostic symptoms on leaves may consist of light green discoloration bordering the leaf veins (vein banding) or chlorotic light green or yellowed rings on the leaf blades. These symptoms may be obvious or barely visible to the eye, depending on factors described above. Symptoms frequently are restricted to only a few leaves per shoot. Infected trees are not stunted and are difficult to identify.

Fruits of peach and apricot may develop lightly pigmented chlorotic rings or line patterns resulting from several rings coalescing together. Fruits may become deformed or irregular in shape, developing necrotic areas. The internal stone from an infected apricot fruit may show white to yellow or red colored rings on its surface when the flesh is removed. Plums are generally more severely affected and show more severe symptoms. For some plum cultivars, infected fruits drop prematurely from the tree. Infected plum fruits often develop darker rings or spots on the skin, are severely deformed, and develop a reddish discoloration of the flesh. Affected fruit can be low in sugars and tasteless.

PPV infection of fruit trees results not only in development of typical symptoms on leaves and fruits, but also eventually debilitates the tree, reducing its useful life. Unfortunately, many trees fail to show symptoms for the first few years following the initial

infection of the tree. In the survey done this fall in Pennsylvania orchards, only 2 of the 18 infected peach blocks had trees showing obvious symptoms. Therefore, symptoms are not a good indicator of infection and cannot be relied upon to determine the incidence or range of the disease. When symptoms do occur, however, they are frequently very diagnostic and easily recognized.

The Plum Pox Virus. PPV is a virus, an infectious agent much smaller than the disease-causing fungi or bacteria we often encounter. To visualize PPV, one needs to use an electron microscope which can magnify objects to 100,000 times natural size. Plum pox virus is a virus species in the genus Potyvirus. Potyviruses are one of the largest families of plant viruses and representatives are found in Kentucky as potato virus Y, bean common mosaic virus, maize dwarf mosaic virus, tobacco etch virus, and watermelon mosaic virus, for example. These viruses are transmitted by aphids. Once PPV is inoculated to a plant by a vector aphid, the replicating virus can spread throughout the plant infecting all tissues, including leaves, fruits, flower parts, buds, young bark, and roots. Plum pox virus is known to occur in several different forms or variants called strains. The strain introduced into North and South America has been the PPV-D strain which appears to be more slowly spread by aphids in Europe, compared to other strains.

How does PPV spread in the orchard? In orchards, PPV is spread only by aphids. Aphids are small insects that feed through modified piercing-sucking mouthparts on internal phloem tissues of plants. One of the most efficient vectors, the green peach aphid (*Myzus persicae*) colonizes other stone fruits in Kentucky. Therefore, the potential exists for aphid spread of PPV here. The aphids transmit PPV in a non-persistent manner which means that once the aphid probes into an infected plant and acquires the virus, the virus can only remain infectious and be transmitted by the aphid for a short time (usually some minutes or an hour).

How can the virus move internationally, and how did it get here? Long-distance spread of PPV by aphids is highly unlikely. Usually, long-distance movement of tree fruit virus diseases is done inadvertently through commercial shipping of nursery stock or budding material, but that has been pretty well ruled out in this case. A hobbyist propagator, a person who travels the world looking for new varieties from other countries, could bring a disease like this into the U.S. How PPV was introduced into the U.S. is not known.

Control through exclusion. Once PPV becomes established in a geographical region, it is very difficult or impossible to completely eradicate. Therefore, it is important to prevent the introduction of PPV into the country. Under the Plant Quarantine Act of 1912, in the United States, this is the responsibility of the Animal and Plant Health Inspection Service (APHIS) of the USDA. All fruit nursery stock for importation is tested for a range of known fruit tree pathogens and especially for

those that are not known to occur in the United States (exotic pathogens). Only pathogen-free material is released for commercial use. The occurrence of PPV in Pennsylvania serves to remind everyone of the importance and need of strict plant quarantine and testing procedures associated with imported nursery materials. In almost all cases, transoceanic dispersal of plant pathogenic agents is associated with human transfer of infected host materials. Therefore, careful regulation and inspection combined with education of importers and travelers could prevent reintroduction of exotic plant diseases threatening U.S. crops once they are eliminated.

Quarantine can be effective in preventing long-distance spread of PPV within a region, state, or country. If the disease is localized to a small area, it may be contained by local quarantines preventing movement of infected materials out of that area. Such a quarantine was implemented October 21, 1999, in Adams County, Pennsylvania, by the Pennsylvania Department of Agriculture (PDA). If implemented before movement of infected materials occurred, it will be effective in preventing spread of PPV. The objective of the quarantine is to exclude PPV from entering other fruit-growing areas. The inspection and testing of imported nursery material and plant breeding materials is the first line of defense against PPV. It is also essential for commercial growers and nursery propagators to purchase only certified virus-free planting stock that has been tested and verified to be free of PPV, as well as other fruit viruses.

Control through eradication. Now that the virus is in the U.S., and since diseased trees cannot be cured, the next control strategy is to eliminate the virus-infected materials as quickly as possible before the virus spreads. Intensive surveys are planned to identify the extent of PPV spread. Because of quarantine concerns, the USDA has stepped in to work with the PDA and together, with advice from European scientists, they will develop a plan of action to eradicate the problem. Although details of the eradication program are not available yet, preliminary discussions suggest that hundreds of acres of stone fruits including peaches, nectarines, plums and apricots will need to be destroyed. Scouting and surveys to detect PPV will probably continue for several years to verify the effectiveness of the eradication program. This will involve use of laboratory assays such as serological tests (ELISA), or nucleic acid probes for specific viral RNA sequences. Once infected trees are identified, the cure is simple and administered with a bulldozer, chain saw, or other equipment to completely remove the tree, including roots. The role of weeds or nearby wild prunus species in harboring the virus is not known. If weeds and wild hosts are found to be important refuges for the virus, then eradication may be nearly impossible.

Control through protection of trees from aphid vectors. Creating an insecticide barrier around healthy trees is not a practical means of preventing aphid

transmission of PPV. Control of this type of transmission is difficult because the aphids are so mobile and need to probe for only a few seconds to acquire or transmit the virus, leaving little time for insecticide effects. Because aphids tend to lose the ability to transmit potyviruses if they land and test probe on a non-host plant before landing on the crop plant, decreased infection might result from surrounding Prunus with several rows of a non-host species such as apple.

Control through host plant resistance. If PPV becomes established in the U.S., then plant breeding and genetic engineering may become important. Unfortunately, little resistant germplasm has been identified in Prunus species. This means that few naturally occurring resistance genes are available for plant breeders to use in developing highly resistant fruit varieties. Genetic engineering of resistant Prunus species may be possible by insertion of specific genes from PPV into the plant, but this approach has only been demonstrated experimentally thus far.

Now that the disease is in Pennsylvania, can they get rid of it? At the moment there are many unanswered questions regarding how the virus arrived in Pennsylvania and exactly how far it has spread. To date, PPV has not been found outside of two townships in Adams county. These townships are under quarantine making it illegal to move Prunus trees or bud wood from this area. The USDA Animal and Plant Health Inspection Service (APHIS) and the PDA Bureau of Plant Industry (BPI) are working to prevent this disease from spreading to other parts of the country if at all possible. The USDA has been successful in keeping PPV out of the country up until now since this is just the first report of PPV in North America, but with increased international travel and trade, this job becomes more difficult. Officials are hopeful that because the strain of PPV found here tends to spread slowly in nature total eradication of PPV from Pennsylvania is feasible. Presently, wild cherry, a common Prunus species growing in Eastern forests and fence rows, is also being tested to see if it is susceptible to PPV. If wild cherry proves to be a host, PPV may be difficult to stop. Within the quarantine area, home orchards and ornamental Prunus plantings are not excluded from PPV surveys and eradication, if found to be infected.

What are the implications of PPV for Kentucky? Assuming the disease is eradicated from Pennsylvania, there would be little economic impact here. Growers will probably not be able to obtain Prunus trees from nurseries located in the quarantine area. If PPV is not stopped, then ultimately production of peaches and other stone fruits would not be profitable here until resistant trees are developed. Use and maintenance of ornamental Prunus species in the landscape would also be compromised. We should hope that the disease will be eradicated and that it will not appear here. (Hartman)

Bramble Production Management and Marketing Publication

Ohio State University Extension has just published an excellent new Bramble Production Management and Marketing Publication (Bulletin 782). The bulletin is a complete source of information with many color pictures. It is 92 pages long may be purchased for \$10, which includes shipping and handling from Media Distribution, Ohio State University Extension, 2021 Coffey Rd., Columbus, OH 43210, or call 614/292-1607. Make check payable to The Ohio State University and include your street address. UPS shipping.

Strawberry Winter Mulch Removal and Application

Awinter straw mulch is an integral part of growing strawberries successfully in the Midwest. Without the protection of the straw, many plants will be injured or killed by the cold temperatures and drying winds during most Illinois winters. Mulch also keeps plants from heaving during periods of fluctuating temperatures that will first heat the soil and then freeze the solid below the depth of the strawberry roots. In spring, the mulch conserves soil moisture and reduces weed populations. One of the most important uses for straw mulch is to keep the fruit dry and clean in the spring. As the berries grow in size and weight, the clusters will droop near to the soil level. If no mulch covers the ground, the berries will rest on the soil and become muddy and inedible. Fruits on the ground can also become infected with soil borne fungi and then rot.

Knowing that a mulch is necessary for best production two questions that are asked are: "When should mulch be applied in the fall?" and "When should mulch be removed in the spring?" In past years the first question was answered by "Oh, about Thanksgiving or the end of November when the plants aren't growing" and the second answer was "When growth is seen under the mulch and some of the new leaves become yellow, usually in March or April". Some growers apply or remove mulch on or near a particular date regardless of temperatures or plant growth.

To help answer these questions, we decided to investigate the possibility of correlating soil temperatures with the application and removal of the mulch for maximum crop production. From past experiments we already knew that strawberries grow very slowly at 40°F. Using this knowledge as a starting point, we began by measuring soil temperatures at the 4" to 5" depth in the late winter-early spring. This depth is roughly one-half the depth of the majority of the root systems of straw berry plants. It is also the depth reported on local television weather reports for soil temperatures - the soil temperatures at the 4" and 8" depths. The second question "When should the mulch be removed?" was the first to be answered. The test cultivars ('Earliglow', 'Allstar' and 'Guardian') were part

of an established planting. The temperatures used when the mulch was removed were 38°F, 43°F, 48°F and 54°F. Before the mulch was removed, the temperature had to remain fairly constant at the specified temperature. This was at least three days with little fluctuation. Mulch removal recommendations were followed with approximately one-half of the straw being pulled off the plant row and left in the aisles. The new leaves and flowers then grew through the straw remaining over the crowns.

The earliest removal was in mid-March and the latest was at the end of April. Although there was a five-week time span from the 38°F to 54°F soil temperatures, the time of early bloom between treatments was only 11 days. Their first picking dates were only several days apart so there is little advantage to early mulch removal for an earlier harvest. However, a difference was seen in the crop production at the different temperatures (Fig. 1). By removing the mulch early in the season, a larger crop was produced. If the mulch was removed late (54°F). For the strawberry grower then, the best time to remove winter mulch is when the soil temperature reaches near 40°F. This allows the plants time to begin growing early with no danger of having sunburned leaves.

Now that the mulch removal temperature was established, we asked the other question of "What temperature is best for straw application?" Again we wanted to determine an accurate and reproducible measurement to know when to mulch strawberries to maximize the fruit crop the following spring. The same plants were used as in the mulch removal experiment and soil temperatures were measured as before. The temperatures used for the straw applications were 45°F, 40°F, 35°F and 30°F. The earliest application date was late October and the latest was in early December (Urbana, IL location). The mulch was applied to the 4"

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to 6" depth. The following spring, when the soil temperature reached 40°F (in April), the mulch was removed. The plants were rated for vigor in May and all plants were considered comparable by visual observation. There was a difference that was measured when comparing the crops produced by the different treatments (Fig. 2). Although 'Allstar' produced nearly equal crops regardless of the soil temperature, 'Guardian' and 'Earliglow' plants produced larger crops when mulching was done at lower temperatures but before freezing.

By taking advantage of the strawberry plant's ability to grow at 40°F, mulch application and removal should be done when the soil is near this temperature. If the time of mulch application is coupled with the time of mulch removal in the spring, yields for the strawberry grower may be increased by several thousand pounds per acre with no increase in expenditures. The temperatures recorded in our experimental plots were very close to the official soil temperatures reported on local television weather reports. Therefore many growers can have access to soil temperatures by watching a local weather report.

A.G. Otterbacher and R.M. Skrivin, University of Illinois, Urbana-Champaign
Source: Proceeding 1998 Illinois Small Fruit and Strawberry Schools

Receiving Fruit Facts Electronically on the Internet

Fruit Facts is available on the web in the pdf format. To get notification of the monthly Fruit Facts posting automatically and approximately two weeks earlier than it would normally be received via mail, you can subscribe to the UK College of Agriculture's Majordomo list processor.

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John Strang, Extension Horticulturist