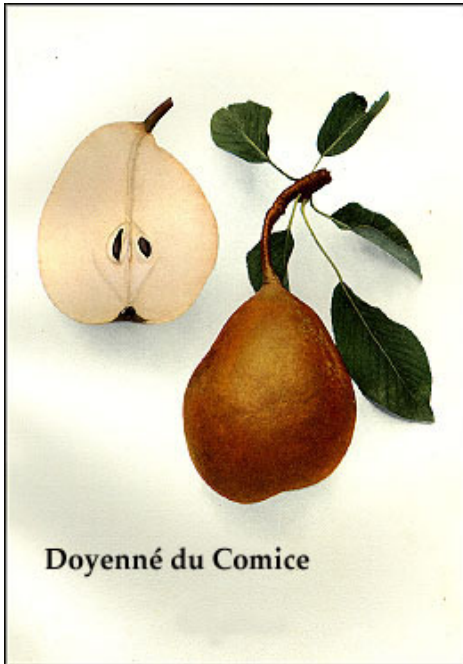


Arkansas Fruit and Nut Newsletter



M. Elena Garcia
Extension Fruit Specialist
University of Arkansas

Dec 1, 2005

Introduction

First, I would like to introduce myself. My name is Maria Elena Garcia and I am the new Fruit Extension Specialist at the University of Arkansas. I received my PhD from the U of A and for the past eight years, I worked at the University of Vermont as the state's fruit specialist.

My job responsibilities include helping fruit and nut growers and extension agents solve horticultural problems related to fruit and nut tree culture and management and to convey research information that might be applied to improve orchard practices. I see the publication of this newsletter as one way to communicate and disseminate pertinent and timely information on issues related to the fruit and nut industry. My plan is to publish this letter quarterly and to include guest writers to provide you with a wide range of topics to help you in your orchard management practices.

You are receiving this letter because I asked county extension agents to send me a list of the fruit growers in their counties. If you do not wish to receive this letter, please let me know and I will remove your name from our list. However, if you know of someone who is interested in receiving this newsletter, tell them to contact me and I will gladly put them on my mailing list. My contact information is as follows:

M. Elena Garcia
Extension Horticulture Specialist - Fruits
Department of Horticulture
University of Arkansas
316 Plant Science Bldg
Fayetteville, AR 72701
Phone: 479-575-2790
Email: megarcia@uark.edu

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Orchard Nutrition: Introduction

M. Elena Garcia

Optimal mineral nutrition is essential for high productivity and growers should become involved in the long-term management of the orchard nutritional needs in order to avoid problems of deficiencies and toxicities, maximize productivity, and reduce the application of unneeded fertilizers. When examining orchard nutrition problems, I have come up with the following conclusions as to the reason why nutrition problems occur in the orchard:

- * Most growers do not do a routine leaf analysis.
- * Most growers do not do a routine soil analysis.
- * Most growers use visual observations to determine the orchard nutrient requirements.
- * Most growers follow the same fertilizer application from year to year, especially if the tree or bush do not show any visual nutrition problems.

Practices growers should follow in order to have long term management of their orchard nutrition needs.

Soil analysis on a regular basis (at least every third year).

- * It makes no sense to design a fertilizer program without knowing the pH because nutrient availability is pH dependent.
- * Soil test can reveal a cause of a nutrient problem and is most useful when it supplements leaf analysis.
- * If the leaf analysis suggests a deficiency and the soil analysis suggests adequate levels, one might suspect that additional factors are involved
- * The most important soil test that could serve as a guide for the interpretation of foliar levels of Mn, Fe and Zn is soil pH.
- * Under common orchard practices, the soil tends to become more acidic over time, and a regular liming program is required to maintain the soil at the proper pH.

Leaf tissue analysis on a regular basis (at least every other year)

- * Regular sampling is more valuable than using leaf analysis only when nutritional problems are evident because a series of analyses over a period of years can indicate approaching nutritional problems.
- * Leaf analyses are a good indicator of the success of either fertilizer sprays or soil amendments.

- * Leaf analysis can confirm visual symptoms that suggest deficiencies or toxicities.
- * Using leaf analyses enable growers to better manage their orchards. When specific deficiencies are identified, large responses are possible.

Factors to consider when determining the orchard fertilizer program:

Crop load

- * The first prerequisite to understand the effect of crop load on leaf nutrient levels is to recognize the differences in elemental content of the fruit compared to foliage.
- * In both stone and pome fruits, concentration in the fruit of mobile elements, e.g. K may be similar to that in the foliage while an immobile element such as Ca may be <5% of the levels in the foliage.
- * Increasing crop load decreased the total N requirement of the trees.
- * Crop load can reduce K in the leaves.

Plant vigor

- * There is a concept of nutrient balance that states that if any element is deficient to the extent of limiting growth, when corrected, may result in deficiency of other elements because of the increased growth demands on the marginal supplies.
- * Often when little or no growth happens, nutrients are often concentrated and deficiencies may not be apparent.
- * Excessively vigorous trees may show deficiencies due to a dilution effect rather than an actual deficiency.

Pruning

- * Pruning results in a dwarfing effect on the tree, but induces vigorous growth near the pruned area. A general concentration of all nutrients can result from pruning.
- * Orchard floor management
- * Cover crops change water relations, alter root distribution, change root temperatures, and compete for plant nutrients.
- * If moisture constrains restrict root activity to less-fertile subsoil, large differences in K and other surface concentrated nutrients may appear.

Nutritional interactions

- * The optimal value of one mineral element may depend on the levels of another and

Modifying one nutrient will likely alter another

- * For example, adequate Zn levels may differ depending on the P status
- * The sum of cations, (i.e., K, Ca, and Mg) in milliequivalents, usually is not changed. As one element is added, the other two usually decrease.
- * Increasing the application of K or Mg is reflected not only in a decrease in the foliar concentration of the element not applied, but foliar levels of Ca are often decreased
- * High K levels could result in lowering of Ca and Mg by 40 and 50%, respectively.
- * In the interpretation of leaf analyses, levels of K in the mid to upper portions of the sufficiency range, coupled with low foliar Ca would warrant restriction in future use of K fertilizers.
- * Evidence shows that increasing the soil P levels lowers foliar levels of Zn
- * In the interpretation of Zn foliar level concentrations, it appears that the soil Zn levels are the utmost importance, but that the uptake, translocation, or utilization of Zn can be altered with an increase in the P levels.
- * Increasing the N supply usually results in decreases in leaf levels of several elements

Season differences:

- * Concentration of mineral within any given tissue is a reflection of the nutrient uptake, growth, transport, and remobilization of the nutrient within the plant. Climatic factors affect all these processes and may explain some differences in mineral concentration that occur within the same tissue in different years.
- * Transpiration and uptake can have profound effect on the elemental composition of the plant tissues. Temperature and soil moisture, coupled with relative humidity, determine the amount of transpiration from plant leaves.
- * Nutrient availability for root uptake is a summation of those nutrients that are intercepted by plant roots, nutrients in the soil reaching the plant root by **mass flow** (nutrient and dissolved substances are transported in the flow of water to the root that results from transpirational water uptake), and those reaching the root by **diffusion** (the movement of nutrient and dissolved substances from a high concentration to a low concentration).

(Information from: Righetti, T. L., K. L. Wilder, and G. C. Cummins. In: Soil testing and plant analysis 1990 Soil Science of America. Plant analysis as an aid in fertilizing orchards. 3rd. ed. SSSA Book Series, no 3).

A reminder... Soil Testing Time

You can begin the long-term management of your orchard's nutritional needs today by collecting your soil samples for testing. It is important to do this test in the fall to determine the soil's pH and the fertilizer needs of your orchard to make the necessary corrections for next year's growing season.

Soil testing is available through the University of Arkansas and it is free. Contact your **county extension agent** for instructions on how to collect the samples and where to send them.

Primocane Fruiting Blackberries –Exactly What are These??

John R. Clark

Many of you have heard of the new UA primocane-fruited blackberry releases, the world's first of this type. These new developments, named Prime-Jim™ and Prime-Jan™, were released in 2004. How exactly do these plants grow?

First, these plants break buds, flower and fruit on second-year canes, known as floricanes, just as all other blackberries. These two varieties ripen quite early, late May to early June at Clarksville and near Choctaw season. Near the end of their floricanefruiting season, the primocanes will show flower buds at the tips of the canes, and primocane flowering will occur usually beginning in July. Here is the tricky part of the fruiting cycle in Arkansas; the high heat in July and August (and September in some years such as 2005) hinder fruit set and development, resulting in small, often poorly shaped berries. This seems to be worst when 6-10 or more consecutive days are above 85°. This of course is common in Arkansas. However, in some years very nice primocane fruit has been produced in Clarksville and even better in Fayetteville where the temperatures tend to be cooler. These varieties have performed quite poorly in south Arkansas however, in the test plots at Hope.

General recommendations for Prime-Jim™ and Prime-Jan™ are:

- These are recommended only for home garden use for late summer and fall berries.
- Fruit are not firm of the varieties, and will not handle well after harvest for commercial marketing.
- Primocanes should be tipped when they reach 3-4 ft. in height, even if flower buds are present. This will keep the canes within a reasonable height and increase lateral branching and fruiting.
- Winter pruning consists of cutting the primocanes back to where they flowered in the fall; this tissue will be dead by the winter. The remaining live buds on the lower areas of the primocanes will fruit the next year (these will be floricanes in the second year).

Of course one of the challenges in the breeding program is to select heat-tolerant primocane blackberries. I am encouraged by what I saw in 2005. Some of the new selections performed much better than Prime-Jim™ and Prime-Jan™, and I think progress can be made in improving this plant type so that we can more reliably have fall fruit. Rest assured this issue is getting substantial emphasis in breeding.

I want to mention one last item on the primocane-fruiting plants. These perform much better in a moderate climate, such as the Willamette Valley of Oregon. Therefore you may hear that these do much better in such climates and that is true. The primocane-fruiting along with floricanes-fruiting releases are becoming increasingly popular in other regions of the U.S. (and world), and our work in Arkansas is helping spread the production of blackberries to many more people.

Biology and Management of Raspberry Crown Borer in Caneberries

Donn Johnson and Jackie McKern

The raspberry crown borer, *Pennisetia marginata* (Harris) (Family: Sesiidae; clearwing moths), is a pest of blackberries and other cane fruits.

Distribution

This pest is native to North America. The distribution has been recorded as: New England west to Nebraska and south to Georgia and an additional distribution in Washington, Oregon, California, New Mexico and British Columbia Canada.

Damage

If preventative control is not maintained, within a few years the accumulated damage by larval feeding within the crown and canes can result in a significant reduction in yield and plant death which is estimated to reach up to 30% per season. Due to the damage by larval feeding, nutrient flow is often reduced to the canes of plants and causes a shepherd's crook to form at the tops of infested canes. Infested canes in non-trellised plantings are less vigorous than uninjured canes and are easily broken off at the base by the wind. Larval tunneling also provides entry for pathogens and moisture that cause the crown to decay and die.

Description of Life Stages (Fig. 1)

Eggs are reddish brown, oval in shape, 1/16" long and appear slightly rough under magnification. In Arkansas, eggs can be found on the undersides of leaves in October and November.

Larva after hatching is 1/10" long with a brown head and a white body covered

with a few colorless hairs. A full-grown larva may be 1.1" long with a smooth reddish brown head and a dull white body. Along the ventral surface, the body is constricted and has three pairs of short prolegs. A distinguishing characteristic is the crochets on the prolegs that resemble small setose spines rather than hooks. In Arkansas, larvae can be found in crowns and canes of plants from May until pupation in August. Before May, the larvae are very difficult to find because they are small.

Pupae are reddish brown, vary in length from $\frac{3}{4}$ " to 1", obtect (legs held closely to the body and are unable to move) and have a transverse row of spines located dorsally on each abdominal segment. The male pupa is smaller than the female and has two rows of spines on the sixth abdominal segment, whereas the female has one row. The cephalic end of the pupa terminates in a four-angled, sharply pointed process.

Moths mimic yellow jacket wasps. They vary in both size and color between sexes. Males vary from $\frac{3}{4}$ " to 1" in wingspan and the females from 1" to 1.5". The head is black with yellow rings around each eye with black antennae; the thorax is brownish black with three yellow spots on each side between the eye and the forewing; each segment of the abdomen, except the last, is encircled by two contrasting bands, the anterior black and the posterior yellow. The forewings are transparent with a brown discal cell and bordered by brown. The bands of yellow on the female are usually more pronounced and wider when compared to the male. The female has smooth antennae, an enlarged abdomen and the last abdominal segment is solid yellow with a very slight anal tuft. The male has comb-like (pectinate) antennae and the last abdominal segment is black mixed with yellow with a large anal tuft.

Biology (Fig. 1)

Knowing the biology of a pest is important for the implementation of efficient control tactics. Recent evidence indicates the raspberry crown borer in Arkansas completes its life cycle in one year, instead of 2-years required in cooler more northern latitudes. Adult flight and egg laying can occur from mid September through mid October. Flight varies from year to year, for example in Conway, AR the flight began on 16 September in 2004 and was delayed until 5 October in 2005. Mating occurs in the late morning on the upper side of a shaded blackberry leaf. A virgin female raises her abdomen and begins calling males by everting her ovipositor, beating her wings and releasing a sex pheromone. Males in range follow the pheromone odor (plume) toward the "calling" female. As the male lands near the female, she stops wing fanning and the male begins wing fanning. The couple circles each other for about 20 minutes then mate for about 90 minutes. During the day, mated females fly from plant to plant within a row depositing one egg on the underside of a leaf. A single moth may lay up to 150 eggs. The young larva chews its way through the egg nearest to the margin of the leaf. The shape of the chorion is retained after egg hatch and the only evidence of hatching is a small exit hole at the anterior end. Hatching is very irregular, taking from 4 to 8 wk after oviposition. Egg development requires from 40 to 60 days with hatch occurring from early October to early November. Upon hatching, larvae follow the leaf veins to the petiole and began crawling down the cane on the shaded side toward the ground. The descent of the larva averages 15 cm within 5 min. Within 30 minutes it

reaches the bottom of the cane, wedges itself in a small bark crevice, bores into the bark leaving only a small pinpoint of frass and silk at the entry point. It forms a round cavity in the bark (hibernaculum) where it curls up and is inactive over the winter. The following spring the larva tunnels into the cambium. In late spring, the larva begins to tunnel deeper within the crown of the plant and feed. From late May to early August, larvae occur in the crown beneath the soil making it difficult for insecticide material to reach and control them. By the end of July or early August the larva is fully developed. The mature larva bores from the crown upwards into a cane to a few inches above soil level. The larva bores a small escape tunnel through the side of the cane leaving a thin intact covering of bark for protection against weather and predators. Pupation occurs from mid August through mid to late September. In mid September to early October, the chisel-like head of the pupa breaks through the thin layer of bark covering the escape tunnel. The pupa wriggles part way out of the cane by flexing its spined abdominal segments. The pupal case splits lengthwise and the adult crawls out of the pupal case, leaving the pupal case protruding from the cane. At this point, males fly off in search of females. Virgin female moths walk up the cane to a leaf in the upper canopy.

Control

Better borer management could result in more sustained, healthy caneberry plantings that could yield fruit for a longer period of time. Currently, blackberry plantings are removed every 6-8 years. Timing of applications could make a significant difference in the efficacy of treatments due to the different locations of the larvae within the plant throughout the season. Insecticide applied as a spray directed at the base of blackberry plants using 50 gal of spray solution per acre in late October and early November resulted in excellent control of the overwintering larvae. Similar control was achieved by a treatment applied in early April. No control of larvae was achieved by sprays applied from early May to mid July. In October 2005, the pyrethroid Bifenthrin (Capture 2EC) received an EPA registration for caneberries against raspberry Crown Borer at a rate of 6.4 oz product/acre (0.1 lbs a.i./acre). Directions for use are: apply 6.4 oz product/acre, post-harvest (fall) or pre-bloom (spring), as a drench application directed at the crown of plants in a minimum of 200 gallons water / acre. Research in Arkansas has noted Capture 2EC to be effective against raspberry crown borer by applications at 50 gallons water / acre. Greater efficacy is observed in an application prior to a significant rainfall event. Do not make pre-bloom foliar and pre-bloom drench applications. Restrictions: do not apply more than 0.20 lbs. a.i. per acre per season and do not apply within 3 days of harvest.

Natural Enemies

There are a few natural enemies of the raspberry crown borer but all produce < 67% reduction in the local borer population comparable to several insecticides (including Capture) that cause nearly 100% mortality. Two entomopathogenic nematodes, *Steinernema feltiae*, and *Heterorhabditis bacteriophora*, applied as a soil drench to the base of blackberry plants in early April caused 50 to 67% raspberry crown borer larval mortality. On 11 and 14 October, several raspberry crown borer egg parasitoids in the family Eulophidae emerged from several hundred eggs collected from a black-

Figure 1. Life cycle of the raspberry crown borer in Arkansas



Up-Coming Events... Mark them on your calendar

The 25th Annual Ark-OK Horticulture Industries Show

"Improve Your Growing Climate at H.I.S." is the theme for the Silver Anniversary of the Oklahoma/Arkansas Horticulture Industries Show.

The meeting will be held from 9 a.m. until 5 p.m., Friday and Saturday, January 6 and 7, 2006 at Tulsa Community College Northeast Campus, 3727 East Apache St., Tulsa, OK.

On Friday, the six different grower organizations of H.I.S. will host concurrent educational programming on the following topic areas: Christmas Trees, Vegetables, Fruit, Herbs, Farmers' Market Growing/Sustainable Agriculture, and Public Gardens/Master Gardeners.

To celebrate our anniversary, HIS has planned a special one-day hoophouse workshop on Saturday, January 7 in lieu of individual grower group programming. Hoop houses, high tunnels or walk-in growing frames, are becoming a vital part of horticultural enterprises. The season can be extended and climate controlled in spring and fall as tender crops are protected from frost, hail, and high winds. Specialists from Kansas State University and the Noble Foundation of Ardmore will present practical ideas for getting into hoop house production. Commercial growers will speak about the crops they raise: vegetables, cut flowers, and small fruit crops.

Attached is a pdf of the program or one can visit the following website:

<http://www.okstate.edu/ag/asnr/hortla/events/his.html>

Acrobat Reader is needed to open the pdf attachment. If you currently do not have Acrobat Reader, it can be downloaded for free at the following location.

http://www.adobe.com/products/acrobat/readstep2_allversions.html

If you would prefer a hardcopy mailed to you, please contact Donna Dollins:

e-mail: donna.dollins@okstate.edu or 405-744-6460

Pruning Workshop

There will be a pruning demonstration workshop scheduled for Tue, Feb 14th (or Tue, Feb 21st in case we have to cancel due to inclement weather) at the U of A Fruit Research Substation in Clarksville. In this workshop, you will learn about the principles of grafting along with a hands-on demonstration for pruning apples, blueberries, brambles, grapes, and peaches. Registration will begin at 12:30 p.m. and the workshop will begin at 1:00 p.m.

Please call 479-754-2406 to pre-register or to get further information

A Commitment to Excellence and Service:

We are committed to excellence and service to you. If you have any questions, problems or want to arrange for an orchard visit regarding your concerns, please contact your county extension agent or call or write me.

For questions concerning this letter contact:

M. Elena Garcia
Extension Horticulture Specialist -Fruits
Department of Horticulture
University of Arkansas
316 Plant Science Bldg
Fayetteville, AR 72701
Phone: 479-575-2790
Fax: 479-575-8619

Email: megarcia@uark.edu



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