RUTGERS COOPERATIVE EXTENSION AT THE NEW JERSEY AGRICULTURAL EXPERIMENT STATION

PLANT & PEST ADVISORY

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Zinc deficiency in New York

INSIDE

Zinc Nutrition Suggestions on Peaches

Jerome L. Frecon, Agricultural Agent

The following information has changed thinking on foliar zinc analysis and recommendations. It is based on the following resources: observations of zinc deficiency in many orchards and consistently high levels of phosphorous in soils; some unexplained disorders on peaches; the importance of zinc in calcium metabolism; conversations with Cornell Professor Emeritus Warren Stiles (Dr. Stiles will be your speaker at the South Jersey Tree Fruit Meeting on February 21, 2001); and *Orchard Nutrition Management*, Information Bulletin 219 – Cornell Cooperative Extension.

My analysis and recommendations may differ slightly than those listed in the Penn State foliar analysis report. According to Dr. Stiles' publication, many of the peach leaf samples evaluated in 2000 foliar sampling are either low or deficient in zinc. This also is not mentioned in our *2001 Tree Fruit Production Guide for New Jersey*.

According to Dr. Stiles and Dr. Reid's publication, interpretation of leaf zinc levels is complicated by zinc-containing materials in foliar applications and by interactions with phosphorous. If no foliar sprays containing zinc have been applied, 35-50 ppm indicate an adequate zinc status, 20-35 ppm a low zinc status; less than 20 ppm a zinc deficiency. Relying strictly on these levels may be misleading for two reasons: 1) growth is reduced as zinc becomes limiting. This limited growth results in an accumulation of zinc to higher concentrations than would occur with normal growth (probably not a problem in peach trees that are growing well); 2) high levels of phosphorous tend to reduce the availability of zinc within the tree as the result of the formation of inactive zinc precipitates. When zinc is limited, the reduced growth tends to result in higher concentrations of phosphorous within the leaf tissue, further accentuating the problem.

Dr Stiles and Reid suggest an evaluation of the ratio of phosphorous to zinc in the leaf tissue to provide a second means of determining relative zinc status. This ratio is calculated by dividing the ppm of phosphorous by the ppm zinc (since leaf phosphorous is represented by percentage, simply move the percentage point four places to the right to get ppm. For example, if your leaf P were 22 this would equate to 2200 ppm phosphorous). If your zinc level is 22 ppm then divide this into 2200 ppm. Your ratio would be 100 to 1 zinc. A ratio of 150 or more indicates zinc is deficient. A ratio of 100 or less indicates an adequate supply of zinc. Between 100 and 150,

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zinc is low. On your soil analysis report I will indicate the ratio by assigning an R or ratio number for zinc.

Zinc deficiency coupled with drought in New Jersey

These interpretations cannot be applied directly to samples that have been sprayed with zinc contaminated materials because of the presence of inactive zinc contaminants. Ziram is a zinc salt derivative of dithiocarbamic acid and labeled on all tree fruits. It will provide some zinc to the tree but can also be a leaf surface contaminant when taking leaf samples for analysis. The mancozeb fungicides also contain the zinc ion but in small quantities. They are not labeled for stone fruits.

Zinc Applications

According to Stiles and Reid, soil surface applications of zinc fertilizers have not been sufficiently effective to be recommended. Availability of zinc is reduced by high soil pH, high levels of soil phosphorous, and low soil temperature.

Foliar application is effective for supplying zinc to established fruit trees. One of the most critical periods when a zinc shortage may seriously impair tree performance is between bud break and fruit set. A zinc shortage at this time often results in poor growth of the leaves and new shoots, as well as abnormal development of pollen tubes, ultimately resulting in poor seed set in apples. Later in the season, the effects of limited zinc are small fruit and/or poor color development. Zinc is not readily mobile within the tree and applications must be thorough and timely for optimal response.

Various methods of applying zinc are available, the most common being late dormant sprays of zinc sulfate, summer applications of zinc chelates or other materials, and post harvest applications of zinc-containing products. Zinc-containing fungicides have been partially effective in established orchards, but have not met total requirements or completely corrected a zinc deficiency.

Application of zinc sulfate (20 or 36 percent zinc) at the late-dormant period for stone fruits, or dormant to silver-tip stage for apples and pears is effective in supplying part of the total zinc requirement (the most common tested in New Jersey). *These materials are applied at approximately 3.5-5 pounds of actual zinc per 100 gallons as dilute sprays, alone or with fresh hydrated lime as a safener.* These sprays should be diluted (not over a 2X tank-mix concentration) to obtain adequate coverage of the buds and shoot surfaces. *Oil sprays following zinc sulfate dormant sprays increase penetration of the zinc sulfate into buds and spur tissues and have resulted in extensive damage*. Likewise, freezing weather (frosts) occurring within 2-4 days before or after the dormant spray has increased the uptake of zinc sulfate and resulted in killing of spur systems on apple trees. Caution: Excess zinc and high rates of application can cause severe injury to shoots, buds, leaves and fruits. When using zinc sulfate crystals, be certain all crystals are dissolved before spraying, or injury can occur.

Zinc sulfate is highly corrosive. After use, thoroughly rinse spray tank, pump, lines and nozzles.

Sprays of EDTA-zinc chelates provide a greater degree of safety and can be applied during later stages of tree growth. Two or more sprays of the EDTA-zinc chelates applied at 10 to 14 day intervals beginning 1-2 weeks after petal fall are frequently required in a zinc maintenance program. Several formulations of chelated zinc are available and should be used at rates recommended by the manufacturers (*read the label because there are many zinc products with high percentage of zinc that may damage your fruit*). A prebloom application may also be needed to stimulate early bud, leaf, and shoot development if the zinc status of the orchard is marginal to deficient. In any case, foliar applications of zinc are necessary on an annual basis and not as a one-time curative treatment.

CAUTION: Several forms of chelated zinc are available, many of which have not been thoroughly evaluated for use on fruit crops. For example, NTA-zinc chelate is used safely in fertilizers applied to the soil for some crops and through trickle irrigation systems for tree fruits, but this material has caused severe defoliation when used as a foliar spray. Likewise not all EDTA zinc chelates are the same, for example, Zinche-10 has caused severe fruit injury to apples apparently because of the non-reacted zinc sulfate in the product.

Zinc oxide has been suggested for foliar application but has not improved tree performance. Leaf samples from trees sprayed with zinc oxide or similar materials may show high levels of zinc, but a high percentage of this zinc is apparently present as physiologically inactive contamination.

Postharvest tree sprays of zinc materials have shown variable results. In some cases, 3-6 pounds of 36 percent zinc sulfate in combination with 5 pounds of urea per 100 gallons as a dilute spray has been effective in mature apple orchards following harvest.

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Wanted: Peach Grower Input

Peter W. Shearer, Ph.D., Specialist in Tree Fruit Entomology

Peach production in the eastern US encompasses about 82,000 acres and 52% of the total national crop. In 1999, the eastern peach crop was valued at $191 million. Currently, Eastern peach growers are experiencing a potential pest management crisis with the loss and label changes of several key pesticides. In order to help deal with imminent peach pest management problems, growers, researchers, Extension personnel, and government agencies representing eastern US peach production areas met in Atlanta, GA, recently to initiate the development of a strategic plan titled "Pest Management Needs in Eastern Peach Culture".

The purpose of this document is to highlight peach pest management needs for the future. In light of the FQPA and the loss of current pest management tools and threatened changes in common production practices, it is important that adequate attention is given to developing and implementing new pest management tools and strategies to overcome and prevent economic loss caused by peach pests.

Participants at the Atlanta meeting developed the initial draft of the strategic plan. It emphasizes that eastern peach growers want reliable and economical IPM systems that are acceptable to society and the environment. The following is extracted from a draft of the Executive Summary of the "Pest Management Needs in Eastern Peach Culture Strategic Plan". The intent of this document is to highlight IPM needs for eastern peaches to help justify requests for funding research for peach IPM. Please review them and give me feedback so it can be included in the document. Indicate your IPM needs and let me know if it addresses your IPM needs or not.

Research Goals for Eastern Peach Pest Management

- Develop a better understanding of peach pests (insects, mites, diseases, nematodes, and weeds), and their natural enemies to form the foundation for developing biologically-refined monitoring and predictive tools for key peach pests.
- **Oriental fruit moth, Plum curculio, and scale** are the key peach insect pests. We anticipate that bugs (tarnished plant bug and various stinkbugs) and beetles (Japanese beetle and rose chafer) will become more important pests as OP use is reduced. Studies on their biology, behavior, monitoring, and new treatment methods are needed.
- **New insecticides** are needed to replace those at risk. New products must be researched in terms of efficacy and impacts on secondary pests and natural enemies.
- **Brown rot** is the key fruit rot of eastern peaches. A fuller understanding of this pathogen's biology and epidemiology is needed to improve spray timing and develop prudent resistance management strategies.
- **Bacterial spot** is a major pest of sensitive cultivars. While host-plant resistance is being utilized, all but the most resistant cultivars need supplemental chemical protection during high pest pressure. A better understanding of pest biology and lower-risk control options are essential.
- **Weeds** are major peach pests. Research is needed to determine optimal weed-free intervals for early-, mid-, and late season peaches. Drive-row cover crops need to be evaluated as a potential means of controlling weeds and reducing herbicide use. Replacements for simazine and 2,4-D are needed.
- **Plum pox virus (PPV)** and virus free certification is a priority to prevent the spread of PPV and other peach tree viruses.
- **Nematodes** are key peach pests and research must focus on best biology, resistant rootstocks, and cultural controls.

Regulatory Needs for Eastern Peach Pest Management

- Region-wide virus and phytoplasma tree-health programs are needed to prevent the spread of PPV and reduce the threat of other viruses.
- American growers need assurances that foreign producers are held to the same U.S. standards for pesticide labels and use.
- Resistance management programs could benefit if the Regulatory decision process made more products with different modes-of-action available for use.

Your input and feedback is requested and most welcome. You can send your letters with feedback to:

Dr. Peter W. Shearer
Department of Extension Specialists
Cook College; Rutgers University
Martin Hall
88 Lipman Drive
New Brunswick, NJ 08903

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In other cases, this and other materials applied in this manner have not justified recommendation.

Some special considerations when spraying foliar applications of zinc according to Stiles and Reid are:

1) Generally urea, Solubor, EDTA – zinc chelates and Epsom salts are compatible. They have been used safely together in pre-bloom sprays on apples and pears. Many orchardists prefer not to add all in one tank mix but rather to spread them over three sprays;

2) Unless the compatibility of the pesticide with the zinc compound is known, it is better to spray it alone.

Applications of liquid chelated zinc through a trickle irrigation system will effectively supply this element. Research trials suggest that 8-10 weekly applications of EDTA-zinc (6 percent ZN) at rates sufficient to supply 10 to 15 pounds or more of zinc per acre per season may be necessary.

The following web site has some excellent information on nutrient sprays on fruit trees: http://www.tfrec.wsu.edu/Horticulture/nutspray.html.

Literature Cited:

Stiles, W.C and W. S. Reid. 1991 Orchard Nutrition Management, Cornell Cooperative Extension Information Bulletin 219, 22 pages. ❑

Workshop of Internal Fruit Worms

March 8, 2001
9:00 AM – 4:30 PM
Penn State Cooperative Extension
Adams County Agricultural and Natural Resources Center
670 Old Harrisburg Road
Gettysburg, PA 17325

Organized by Penn State University Fruit Research and Extension Center and Penn State Cooperative Extension.

Workshop Speakers:

Dr. Henry W. Hogmire, West Virginia University

Dr. Larry A. Hull, Penn State University

Dr. Peter W. Shearer, Rutgers Agricultural Research and Extension Center

Dr. Greg Krawczyk, Penn State University

The Penn State University Fruit Entomologists together with guest speakers from Rutgers University and West Virginia University will provide participants with the most current information on understanding, monitoring, and managing the Oriental fruit moth and other internal fruit worms.

The meeting is designed for growers, consultants, scouts, chemical company field reps, and others that may benefit from in-depth information about the management of the internal worm complex.

Participants will have the opportunity for hands-on experience in pest monitoring and identification.

- Biology and behavior of Oriental fruit moth, codling moth, and lesser appleworm
- Pest identification including hands-on experience with larval and adult specimens
- Insect monitoring with pheromone traps, trap maintenance, and interpretation
- Utilization of egg hatch models, degree-days and biofix for proper timing of control activities
- Oriental fruit moth resistance to commonly used insecticides
- New and current options for managing internal fruit worm complex
- Practical use of pheromone mating disruption

Cost: $30.00 per person

Registration deadline, February 28, 2001

For registration, contact: Karen S. Weaver, Penn State FREC, 290 University Drive, Biglerville, PA 17307, (717) 334-6271 or (717) 677-6116

Calendar of Events

February 21, 2001 - South Jersey Fruit Meeting and Trade Show, Masso's Crystal Manor, Glassboro, NJ. Contact Dave Schmitt at RCE of Gloucester County at 856-307-6450.

February 22 - 24, 2001 - The Mid-Atlantic Direct Marketing Association Annual Meeting at the Cavalier Hotel in Virginia Beach, VA., preceded by a Franklin/Covey Management Seminar, February19 - 21. Contact Catherine T. Belcher, Virginia Department of Agriculture and Consumer Services, 1100 Bank Street, Room 1021, Richmond, VA 23219.

March 8, 2001 - Workshop of Internal Fruit Worms, Adams County Agricultural and Natural Resources Center, Gettysburg, PA. Contact: Karen S. Weaver, Penn State FREC, 290 University Drive, Biglerville, PA 17307, (717) 334-6271 or (717) 677-6116.

March 10, 2001 - A Viticultural and Enological Symposium. Forsgate Country Club, Jamesburg, NJ. Contact Dr. Joseph A. Fiola, Cream Ridge Research Center at 609-758-7311, X10, fax 609-758-7085 or e-mail: creamridge@aesop.rutgers.edu.

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