

Supporting  Fruit Production

# OHIO FRUIT NEWS

Research and Recommendations from Experts at The Ohio State University

November 2022

## Plasticulture Strawberry Nutrient Management – Key to success

By Brad Bergefurd, OSU Assistant Professor Emeritus and Technical Agronomist, BRANDT Discovery and Innovation LLC.

We began researching the adoption of plasticulture strawberry production for Ohio and the midwestern United States over 20 years ago, a production method now adopted by farmers. Fine tuning nutrient management programs for this system have come a long way with research on prescription nutrient management continuing. This article will outline key prescription nutrient management techniques required for plasticulture strawberry success.

"A good nutrient management program ensures sufficient nutrients are available when the plants need them." ("Strawberry Nutrient Management Guide for Oregon and Washington") The basis of any crop nutrition program begins with a solid soil nutrient program that has been managed with pH, minor and major nutrient deficiencies corrected prior to planting. Nitrogen (N), phosphorus (P) and potassium (K) are the three major elements required in greatest quantity for optimal strawberry plasticulture production. A standard recommendation is to apply 60 lb./acre nitrogen (N) preplant and that phosphate and potash has been applied based on recent soil-test recommendations.

A high phosphorous starter fertilizer like a 8-27-2 used at planting will promote root system

initiation, early plant establishment and development.

Most strawberry flower buds, the buds that flower and set fruit in the spring, are initiated September through December. To promote flower bud initiation, late summer/fall fertigation treatments should begin within 2 weeks post-plant and continue through fall, early to end of November to early December, weather dependent. Fall fertigation of Nitrogen, the building block of proteins, growth and yield; Zinc, which is responsible for synthesis of auxins, apical meristem growth and enzymes activation; and Boron, responsible for the formation of plant cell walls and in the metabolism and transport of sugars, will promote plant development and flower bud initiation and can influence the quantity and quality of strawberry fruit.

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# Managing *Phyllosticta* Disease on PawPaw

By Melanie Lewis Ivey, Associate Professor, Extension Fruit Pathologist, Department of Plant Pathology

It is not uncommon to see brownish black spots on pawpaw leaves and fruit. *Phyllosticta* disease is a common fungal disease of pawpaw that affects the leaves and fruit (Figure 1). While some disease is tolerable too much disease can reduce tree vigor and render the fruit unsalable. Because pawpaw is a minor crop in the United States there are very few fungicides registered for use on pawpaw and none registered for *Phyllosticta* spp.

Captan is a fungicide that is used on many fruit crops to manage a broad range fungal diseases. Captan is not a systemic fungicide, which means it is not absorbed into the plant. Rather, it is a contact fungicide that creates a protective barrier on the surface of leaves and fruit. Captan is not toxic to bees and other insects but is toxic to aquatic organisms. Although captan is NOT registered for pawpaw it is very effective at managing fungal diseases on many tree fruit crops.

In 2021, in collaboration with an Ohio pawpaw grower a study was conducted to evaluate the effectiveness of captan in managing *Phyllosticta* disease on leaves and fruit. Pawpaw trees (cultivar KSU Chappel) were sprayed with captan



Figure 1. *Phyllosticta* spp. on pawpaw leaflet (top) and fruit (bottom).

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## Grower's Corner

### What can I do to control black root rot in my strawberry field?

In Ohio, black root rot is a common problem in established perennial, matted-row plantings. Black root rot is caused by multiple microbes including *Rhizoctonia*, *Pythium*, and root lesion nematode. Pre-plant chemical treatments to the soil or roots can prevent black root rot but it can be difficult to manage the disease once it shows up in a planting. Plant stress can increase disease severity so practices that promote a healthy plant are recommended. Adequate irrigation, mulching to prevent temperature stress and soil moisture, nitrogen application in late summer, and covering plants with straw to prevent winter injury will reduce plant stress. Post plant applications of fungicides aimed at the root system can also slow the decline of plants due to black root rot. Consult the Midwest Fruit Pest Management guide for fungicide recommendations.



## Managing Phyllosticta disease on pawpaw from page 2

beginning at flowering every 14 days until harvest. A total of six fungicides applications were made. We counted the number of leaves and fruit with disease (referred to as disease incidence) from trees that were treated with captan and from trees that were not treated with captan.

In this study, six applications of captan significantly reduced foliar and fruit disease incidence (Table 1). Disease was approximately 50% less when trees were treated with captan (Figure 2), and yield doubled. While captan was effective at reducing disease we observed some chemical damage (phytotoxicity) on the fruit (Figure 3). Additional trials to determine if fewer applications of captan or a lower rate could be used to reduce phytotoxicity without compromising disease control are needed.

This research was supported by an Ohio Department of Agriculture Specialty Crop Block Grant Award No. AWD-106542.



**Figure 2.** Pawpaw tree sprayed with captan (A) and tree that was not sprayed with captan (B).



**Figure 3.** Pawpaw fruit from trees sprayed with captan. The arrow points to chemical damage on the fruit.

**Table 1.** Foliar and fruit disease incidence and marketable yield

Treatment	Foliar Disease	Fruit Disease	Marketable Yield (Lb/A)*
Captan	18%	32%	2011
No fungicide	35%	64%	1322

\* Calculated based on 25 fruit per tree and 295 pawpaw trees per acre

**OPGMA**  
Ohio Produce Growers & Marketers Association

**SAVE THE DATE**  
**Ohio Produce Network**  
**January 16-17, 2023**  
**Columbus, OH**  
**614-475-7551**

## Plasticulture Strawberry Nutrient Management- Keys to Success from page 1

After removal of the winter freeze blankets a routine fertigation program then starts back up late winter/early spring (around April 1st) or about 45 days from the first planned date of harvest, continuing through harvest.

### **Spring Fertigation- Getting Started**

Nitrogen (N) is critical prior to and during early bloom. During this early spring vegetative growth begin applying N at a rate of 5–7 lb./acre/week. Where soils are sandy, the high rate (7 lb.) may be more appropriate; on heavy, clay soils, a lower rate (5 lb.). Apply N once weekly in a single application (5–7 lb./acre/week) or incrementally ( $\frac{3}{4}$ –1 lb./acre/day). **ALWAYS** inject N towards the end of the irrigation cycle for N moves on the wetting front and can be pushed down below the feeder roots. After fertigation, clean emitters by running water through them for 15–20 min. Continue this program until tissue testing or weather such as heavy rainfall indicates a reason to change.

### **Phosphorus Fertigation**

Even though soils may test high in phosphorus, cool early spring soil temperatures can induce phosphorus deficiency resulting in slower root growth and development, exacerbating the ability for plants to begin rapid spring growth. Roots generally absorb phosphorus in the form of orthophosphate. Fertigating a soluble P in the orthophosphate form will be readily available to plants under the cool soil conditions of spring.

### **Nitrogen-to-Potassium (N: K) Ratio**

Agronomists and Researchers have found that a 1:2 ratio of N to K usually improves fruit quality producing sweeter, firmer berries. One way is to use potassium nitrate (13-0-44). However, other fertilizer sources can be just as effective if they are water soluble and combined so a 1:2 ratio is maintained. Later in the season, a weekly monitoring program, using tissue testing and/or petiole sap analysis, may indicate the need for additional calcium and sulfur. If so, switch to 15.5-0-0 (calcium nitrate) with 0-0-50 (potassium sulfate, 18% S) to keep the 1:2 N-to-K ratio in balance.

This combination will supply sufficient calcium and sulfur. However, if 13-0-44 fertilizer is used and a recommendation for sulfur is made, add Epsom salt (13% S) at a rate of 10 lb./acre or other sulfur fertilizers to supply supplemental sulfur.

### **Monitoring with Plant Tissue Analysis**

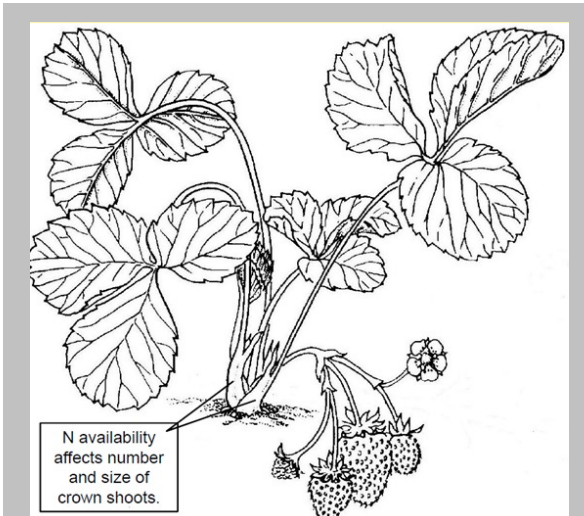
Tissue testing on a routine basis will indicate any plant nutrient imbalances before plant symptoms begin to show. Begin collecting tissue samples in the fall after plants have established and again after spring fertilization is initiated and continue at one to two-week intervals throughout the growing season. Tissue analysis will take place over a 10- to 12-week period. When collecting tissue samples, randomly select 20 to 25 most recently mature leaves (3 leaflets per leaf) and the associated petioles. Immediately detach petioles from leaflets. If foliar fertilizer or fungicide applications have been applied wash leaves and petioles to remove residue which can alter results. Place leaf blades in a paper bag and the associated petioles in an envelope inside that bag and send along with the labs form to the lab of choice, see the OSU Extension fact sheet *Choosing a Laboratory for Nutrient and Soil Health Testing* <https://ohioline.osu.edu/factsheet/anr-0107> , for more information and list of labs. Results are available or posted online three working days or less after samples are received.

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### Possible Fertilizer Problem Areas

- Lack of fertilizer uniformity
- Bulky, hard to handle or store
- Unstable after mixing or in storage
- Inconsistency from batch to batch
- Some fertilizers have higher cost and variability
- Water soluble and remain in suspension



Nitrogen availability throughout the strawberry crop life impacts yield and quality



Prescription Nutrient Management is Critical for Plasticulture Strawberry Success

### Key Points to Success

- Nutrient management tools include soil-applied fertilizer, fertigation, foliar feeding, and maintaining soil organic matter. (“Strawberry nutrient management | UMN Extension”)
- Nitrogen availability is critical for strawberry yield and fruit quality.
- Synchrony of N supply to strawberries during early development is critical to competitive yields and fruit size.
- Preplant applied compost or synthetic fertilizer may not release appreciable Nitrogen beyond 6-8 weeks.
- Regular and frequent Nitrogen fertilization throughout the crop cycle – liquid N fertigation– is critical to strawberry production.
- Liquid and/or water-soluble fertilizers are valuable and necessary tools.
- If material not finely ground Nitrogen is lost behind filter or drip emitter.
- Continuous mixing/agitation required for most fertilizers.
- Be aware of the mineralization characteristics of different fertilizer types/brands.

#### Contact Information:

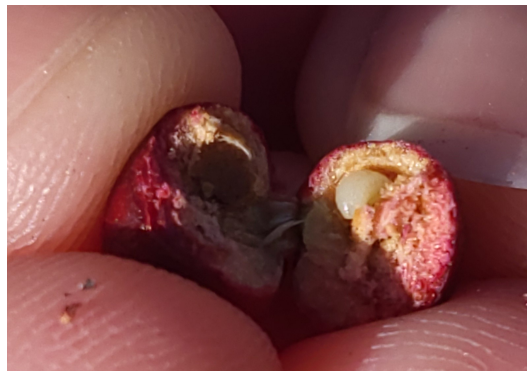
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# 2022 Great Lakes Fruit Workers Conference

By Melanie Lewis Ivey, Associate Professor, Extension Fruit Pathologist, Department of Plant Pathology

The Great Lakes Fruit Workers (GLFW) is a regional working group of researchers, extension specialists, and consultants from public or private institutions, who have met annually since 1998 to share preliminary research and extension programming, and to discuss challenges common to fruit production in the Great Lakes Region. This year the annual meeting was hosted by Michigan State University in East Lansing, MI. Eighty-two members attended the meeting in-person or virtual and the conference included oral and poster presentations. There were sessions on plant, water, and nutrient management, postharvest management, pest and beneficial insect management, extension tools and techniques, new fruit production systems, plant breeding and new cultivar trials and last, but certainly not least, disease management.

During the conference we toured the MSU Plant Pathology Farm where we learned about some of the research being conducted on apple, hop and chestnut diseases, saw a demonstration of a smart sprayer used for weed management (Figure 1) in vineyards, and learned about the blueberry stem gall wasp (Figure 2).



**Figure 2.** Blueberry gall wasp damage on highbush blueberry plants (top) and maturing gall wasp larva inside a gall (Bottom).



**Figure 1.** Dr. Sushila Chaudhari (MSU, East Lansing) is conducting studies to test the efficacy and efficiency of smart sprayer technology for weed control in vineyards. The sprayer recognizes the green color of plants and only sprays when it “sees” green.

After touring the farm, we visited the MSU Food Safety Department where we had the chance to taste new apple cultivars, juice prepared from red flesh apples (Figure 3) and conducted a taste test to determine if we could distinguish between fruit flavor compounds. We then headed to the Entomology Department and got to see a collection of blueberry pollinators in the lab of Dr. Rufus Isaacs. I had no idea that there are over 4,000 native bee species in the United States!

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# 2022 Great Lakes Fruit Workers Conference

By Melanie Lewis Ivey, Associate Professor, Extension Fruit Pathologist, Department of Plant Pathology

We also visited the greenhouses and learned about techniques being used to manipulate fruit tree architecture and learned about advances in irrigation sensors. I'm looking forward to the 2023 conference in New York state!



**Figure 3.** Three red flesh apple cultivars (Otterson, Cranberry, and Roberts Crab) being evaluated at Michigan State University for juice and cider production.

## 2022 Great Lakes Fruit Workers Conference Sponsors

- Michigan State University, College of Agriculture and Natural Resources
- Michigan State University Extension
- AgBioResearch, Michigan State University
- Michigan State University Horticultural Society
- Welch's
- Michigan Blueberry Commission
- Montmorency Tart Cherries
- Michigan Apples
- Michigan Peach Sponsors
- RedHaven
- Michigan Tree Fruit Commission



A group photo of the in-person attendees at the 2022 Great lakes Fruit Workers Group Conference, East Lansing, MI. November 8 – 10.

To learn more about the GLFW visit their [website https://greatlakesfruitworkers.weebly.com/](https://greatlakesfruitworkers.weebly.com/).



Bitter pit is a physiological disorder associated with mineral nutrient imbalances and low fruit calcium content. mostly due to a calcium deficiency. Symptoms may develop in the orchard or storage. Varieties that are most susceptible to bitter pit include Honeycrisp (shown here), Courtland, Crispin, Empire, Fuji, Idared, and Northern Spy. An excess or lack of soil moisture and suboptimal soil pH will affect the accumulation of Ca within plants. For in season recommendations growers can consult the Midwest Fruit Pest Management Guide starting on page 49.

## Grower Resources:

- OSU Fruit Pathology website ([u.osu.edu/fruitpathology](http://u.osu.edu/fruitpathology))
- OSU Fruit and Vegetable Safety website (<https://producesafety.osu.edu>)
- OSU Fruit and Vegetable Pest Management website ([entomology.osu.edu](http://entomology.osu.edu))
- OSU Fruit and Vegetable Diagnostic Laboratory ([u.osu.edu/vegetablediseasefacts/](http://u.osu.edu/vegetablediseasefacts/))
- OSU Bramble: Production Management and Marketing Guide (Bulletin 782) ([extensionpubs.osu.edu](http://extensionpubs.osu.edu))

## OSU Upcoming Events-2023

2023 Ohio Produce Network – January 16-17 [link here](#)

Ohio Grape and Wine Conference – February 20-21

Ohio Commercial Pesticide Applicator Recertification Conference – [Akron January 12](#); [Cincinnati January 25](#); [Columbus February 21](#)

New Pesticide Applicator Training Webinar – February 8 [link here](#)

Agricultural and Horticultural Field Crop Recertification – February 14 [link here](#)

Agricultural and Horticultural Field Crop Recertification Webinar – February 28 [link here](#)

\*Contact your county Extension office to register for events by phone.

For a list of CFAES events and schedule changes go to the [CFAE Events Page](#)



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