Supporting Fruit Production

OHIO FRUIT NEWS

Research and Recommendations from Experts at The Ohio State University

July 2024

Impact of Heat and Drought on Apple Trees and Fruit

By Diane Miller, Associate Professor, Tree Fruit Extension Specialist, Department of Horticultural and Crop Science

Ohio is experiencing extended periods of hot temperatures combined with extended periods of little rainfall (heat and drought). This is a similar pattern to what occurred in summer 2023. The problem becomes that these 'annual' stressors take a toll on the vitality of apple trees. In their Central Asia center of origin, apple trees are tolerant of heat, and to some extent, to drought. But here in the Midwest we are interested in growing quality apples for satisfied customers, not just having trees survive. Please note the recurring theme below that in heat and drought conditions, a tree should not be overloaded with fruit.

What is the impact of heat and drought on rootstock function? The more dwarfing the rootstock (see rootstock article on page 4), the smaller the root system, and the less soil occupied for water uptake. B9, the most used rootstock in Ohio, is going to need trickle irrigation to continue to be a champion in a hotter, drier environment. More vigorous rootstocks are more resilient to drought, but bigger above ground trees require different management inputs. Supporting more dwarfing rootstocks with irrigation is the more efficient answer in most situations.

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Figure 1. Sweet Maia® planted on a B9 rootstock.

Inside This Issue:

What is the impact of heat and drought on apple fruit color? The quick answer is that heat and drought result in apples that are less red. The apple skin has three 'color' pigments: Chlorophyll (the green pigment), carotenoids (the yellow/orange/red pigments), and anthocyanins (the red/blue/purple pigments). Chlorophyll is present in the chloroplasts, carotenoids are in the chromoplasts, and anthocyanins in the vacuole in the cells. For red skinned apples, the normal process is for decreasing temperatures to degrade chlorophyll, and for chromoplasts and anthocyanins to increase dramatically resulting in green skin turning to shades of red skin. The hotter the temperature, the less this happens.

There is a genetic component to this which is why finding a redder coloring strain of a marginally red coloring variety (such as 'EverCrisp') is a big deal. And there are those few early varieties such as 'Sweet Maia' (Figure 2), which get red in the heat of the summer, and we wonder how they don't bake on the tree in the heat. Overall, what we rely on in Ohio for good color development is cool nights (to degrade chlorophyll) followed by warm sunny days on trees with a reasonable crop load. Overcropped trees often have fruit of poor color even in the best of environmental conditions.

Figure 2. Sweet Maia® is a summer apple that turns red in the summer. This image was taken in July and shows the beautiful carmine color of the fruit.

What is the impact of heat and drought on apple sweetness? Heat and drought can increase apple sweetness because trees are moving less water into fruit. Sweetness is dependent on tree photosynthates (the sweetness source) moving into the apple fruit (the sweetness sinks). Bright sunny hot days can result in lots of tree photosynthesis and fruits have a major draw on those sugars.

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Grower's Corner

What is causing my fruit to turn black before they ripen?

According to retired Extension Educator Brad Bergefurd, high temperatures (>90 F) can inhibit the development of flowers and fruit set, leading to poor quality fruit and reduced yields. High temperatures can also cause the flowers to dry out or become malformed, which subsequently affects pollination and fruit quality. Some of the symptoms on the fruit can be confused with insect damage, nutrient deficiency or early symptoms of Botrytis or anthracnose fruit rot. For more information on the causes of misshapen strawberry fruit see the May 2023 issue of Ohio Fruit News – link.

'Honeycrisp' is an interesting apple regarding photosynthate transport. It is well understood now (but took a few years to get figured out), that Honeycrisp is poor at translocating sugars out of the leaves to the sinks (fruit or roots). As a result, leaf chlorosis occurs because photosynthates packed so tightly into the leaves that the leaf structure integrity is lost (Figure 3). The chlorosis symptoms are worse on lightly cropped trees as there are fewer fruit for the photosynthates to sink. Therefore, in high heat, lightly cropped trees, leaf chlorosis in Honeycrisp will be much more severe than during low heat periods.

Figure 3. Leaf chlorosis on Honeycrisp is due to poor photosynthate transport and the build-up of photosynthates in the leaves. Symptoms are exaggerated during periods of high heat.

What is the impact of heat and drought on apple size? This one should be the most obvious to your experience. Even in 'normal' years a tree that is overloaded with apples results in undersized and under-quality fruits. Heat and drought combined with overcropping results in undersized fruit. And even a regular crop load can fail to size if water stress remains an issue prior to harvest.

What is the impact of heat and drought on fruit maturity? Apples will mature earlier in a hot growing season. We experienced Lodi picked in end June in 2024. Apple bloom was almost 2 weeks earlier than historical average so there was an early start to the season, and the season is hastened along by the additional heat units. Keep a maturity watch on varieties tin order o pick when they are ready, and don't be surprised if an early or mid-season variety is ready sooner than expected.

What is a grower to do? The goal is to 'control the environmental aspects of apple quality that are possible to control' in the apple growing season. We can't control the heat. But we can control the amount of water the trees receive and that will alleviate lots of 'downstream' apple quality problems associated with heat. Apple trees need an inch of water per week during the growing season. Getting lots of rain in September does not make up for getting no rain in July.

Investing in a trickle irrigation system is a must for apple growing in Ohio in the 2020's. A trickle system can put water right into the area where the tree roots are located enabling small rooted trees such as those on B9 rootstock to continue to produce outstanding apple crops for us in Ohio in a hotter, drier environment.

Figure 4. Trickle irrigation allows for well timed applications of water.

Characteristics of Apple Rootstock

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

As Dr. Diane Miller emphasized in her article "Impact of Heat and Drought on Apple Trees and Fruit" that the rootstock can affect a trees ability to respond to heat and drought. From information available on-line I summarized the characteristics some of the available dwarf and semi-dwarf rootstock that are suitable for apple production in Ohio. All the rootstocks listed in the table are winter hardy. Resistance to Phytophthora crown, collar and root rot and fire blight (caused by *Erwinia amylovora*) varies depending on the rootstock but also the environmental conditions. For more information on horticultural characteristics of apple rootstock refer to the resources listed at the end of the article or contact Dr. Diane Miller. For more information of diseases contact Dr. Melanie Lewis Ivey.

Characteristics of Apple Rootstock

Classification	Rootstock	Size (percentage on seedling)	Anchorage	Soil Adaptability	Disease Resistance
Dwarf	Bud. 9 (B9)	35-40%	Needs support	Well drained soils required	Phytophthora: VR Fire blight: S
Dwarf	Geneva® 11 (G-11)	55-60%	Needs support	Well adapted to most soils	Phytophthora: MR Fire blight: MR
Dwarf	M.9 (337)	40-45%	Needs support	Well drained soils required	Phytophthora: MR Fire blight: VS
Dwarf	Geneva® 41 (G-41)	50-55%	Needs support	Well adapted to most soils	Phytophthora: R Fire blight: MR
Dwarf	Bud.10 (B.10)	35-40%	Needs support	Well adapted to most soils	Phytophthora: Fire blight: MS
Dwarf	NIC29®	30-40%	Needs support	Well adapted to most soils	Phytophthora: MR Fire blight: VS
Semi-dwarf	Geneva® 935 (G-935)	45-60%	Needs support	Well adapted to most soils	Phytophthora: R Fire blight: R
Semi-dwarf	M.26	55-60%	Needs support	Well drained soils required	Phytophthora: S Fire blight: VS
Semi-dwarf	Geneva® 969 (G-969)	70-75%	No support needed	Well adapted to most soils	Phytophthora: MR Fire blight: R
Semi-dwarf	Geneva® 30 (G-30)	60-65%	Needs support	Well adapted to most soils	Phytophthora: MR Fire blight: R
Semi-dwarf	M.7	60-70%	No support needed	Deep, well drained soils required	Phytophthora: S Fire blight: R
Semi-dwarf	MM.111	65-80%	No support needed	Well adapted to most soils	Phytophthora: MR Fire blight: MR
Semi-dwarf	Bud.118 (B118)	75-95%	No support needed	Well adapted to most soils	Phytophthora: MR Fire blight: S

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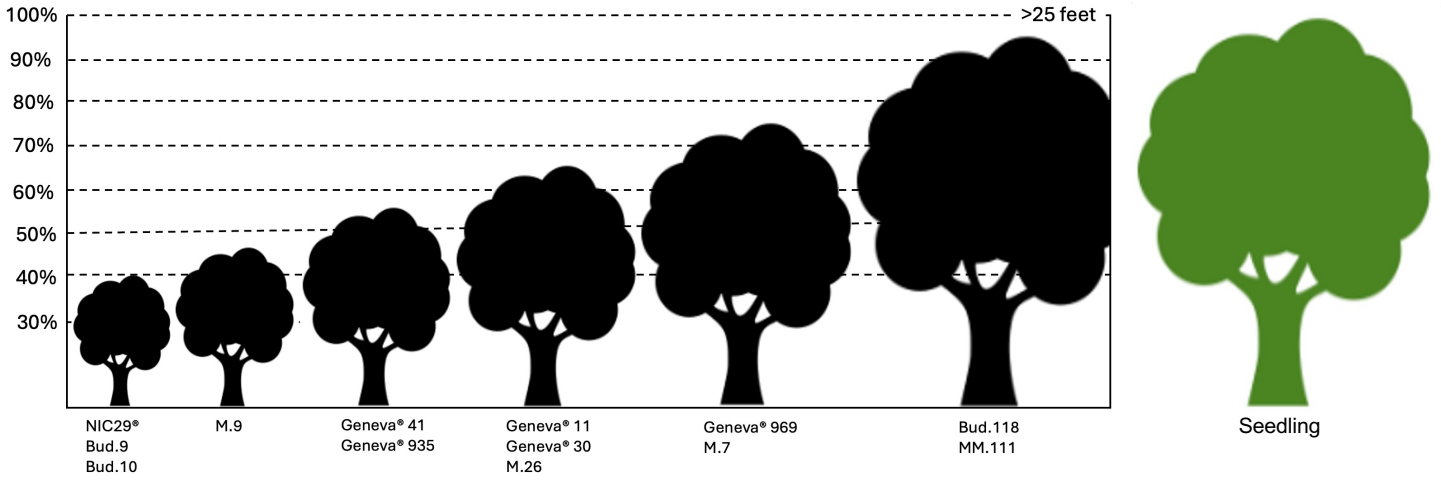
Apple rootstock continued from page 4

Tree Size – Percentage on Seedling



Apple Rootstock Resources

- eApples, Extension Foundation; apples.extension.org
- Geneva® Apple Rootstocks Comparison Chart v.4, Cornell University; ctl.cornell.edu/wp-content/uploads/plants/GENEVA-Apple-Rootstocks-Comparison-Chart.pdf
- Manual of Rootstocks by Lowell Cordas (on-line); www.rootstocks.info/
- USDA Plant Genetic Resources Unit; www.ars.usda.gov/northeast-area/geneva-ny/plant-genetic-resources-unit-pgru/docs/characteristics-of-apple-rootstock/
- Wafler Nursery, Wolcott, NY; waflernursery.com/varieties/apple-rootstock/; 877-397-0874

Dwarf and semi-dwarf apple planting at CFAES-Wooster, Wooster, OH. Image courtesy of D. Miller, The Ohio State University

Central State University Launches Climate-smart Commodities Program

* Article first published in Fruit Growers News, July 30, 2024

Central State University is recruiting 20 farmers from Ohio and southeastern Michigan to join the Partnership for Climate-Smart Commodities Program, funded by a $5 million USDA grant.

The Wilberforce, Ohio, university's initiative, running from fall 2024 through 2028, aims to promote climate-smart practices in agriculture.

"The goal of this partnership with the USDA-NRCS is to build markets for climate-smart commodities and invest in America's climate-smart producers to strengthen U.S. rural and agricultural communities," said Ibrahim Katampe, Ph.D., project director and assistant director of Innovation and Technology Incubation.

Farmers will use manure as natural fertilizer and implement climate-smart practices for growing vegetables. The program targets socially disadvantaged farmers and provides incentives such as seeds, manure-based fertilizer, and drip irrigation systems.

"Urban, as well as rural, farmers are encouraged to be part of the project," said Cindy Folck, Ph.D., project co-director and interim associate CSU Extension administrator. "The objective is to measure, quantify, and verify the carbon and greenhouse gas benefits associated with these practices." Farmers interested in participating can complete an interest form. For more information on the program, contact Cindy Folck, Interim Extension Associate Director and State Program Leader, Agriculture and Natural Resources, Central State University (937-376-6101; afolck@centralstate.edu.

Mancozeb Proposed Interim Registration Review Decision – Crop Cancellations and REI Changes

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

In June, the EPA completed the proposed interim registration review for mancozeb. Mancozeb is a broad-spectrum fungicide widely used by fruit, nut, and vegetable growers to control many fungal diseases. Mancozeb is a multisite fungicide, which means it targets several biochemical pathways in fungi. This mode of action makes it more difficult for fungi to develop resistance compared to fungicides that target a single site. However, the EPA has identified risks of concern to human health and non-target organisms from the use of mancozeb and thus proposed the following measures specific to fruit crops to "ensure mancozeb use does not present unreasonable adverse effects for human health or the environment."

- Cancellation of mancozeb use on all types of grapes (including table, wine, juice, and raisin).
- For aerial applications to orchards that are adjacent to residential area a 25-foot buffer zone from the edge of the treated field will be required.
- Closed-cab equipment plus gloves will be required for the airblast applicator scenario for

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Mancozeb registration changes continued from page 6

the airblast applicator scenario for all formulations for orchards and vineyards.
- The use of an APF10 respirator and closed loading systems for aerial, chemigation, and ground-boom applications utilizing dry flowable, wettable powder, and water-soluble packet formulations.
- Increase in restricted entry intervals (REIs) for pome fruit from 24 hours to 4 days for all activities.
- Prohibition of hand-thinning pome fruit crops.
- Mandates on droplet size.
- Spray drift buffers for fields adjacent to aquatic habitats and conservation areas depending on the application method:
    - Aerial applications – 50 ft
    - Ground boom applications – 15 ft
    - Airblast applications – 15 ft

The proposed deadline to submit comments to the EPA is **September 16, 2024**. This leaves very little time for the fruit industry to put together a strong argument for the retention of the registration of mancozeb for grapes and the retention of a 24-hour REI for apple and pears. **The grape and tree fruit industries are strongly encouraged to write a letter of request to extend the public comment period so that the industries have adequate time to develop a strong public comment.** Requests can be emailed directly to Dr. Jean Overstreet (see contact information below). It is recommended that Mr. Ben Tweed be copied on the email.

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Comments must be submitted on-line. The link to submit a comment is www.regulations.gov/docket/EPA-HQ-OPP-2015-0291/document or you can use the QR code to access the comment section. In your comment reference the docket number: EPA-HQ-OPP-2015-0291. Comments can be typed directly into the text box or uploaded, and anyone can submit a comment.

Submit a Comment
EPA-HQ-OPP-2015-0291

A copy of the proposed interim registration review can be found at u.osu.edu/fruitpathology/fruit-news-2/.

Mesotrione injury on Vidal grapevines.

Mesotrione, the active ingredient in Callisto, is a selective herbicide used primarily in corn cultivation to control broadleaf weeds. However, it can cause injury to grapes when it drifts off target. Symptoms of mesotrione exposure in grapevines include whitening or bleaching of leaves and young shoots, potentially leading to reduced photosynthesis and stunted growth. Recovery from mesotrione injury depends on the extent of the exposure and the health of the vine prior to injury. On vines that are otherwise healthy and robust, new growth and clusters will be unaffected. However, severe cases with extensive damage might lead to significant stress or even mortality, especially if the grapevines were already compromised by other environmental or biological stresses.

Grower Resources:

- OSU Fruit Pathology website (u.osu.edu/fruitpathology)
- OSU Plant and Pest Diagnostic Clinic website (ppdc.osu.edu or 330-263-3650)
- OSU Extension Fruit, Vegetable & Specialty Crop News (https://u.osu.edu/vegnetnews/)
- OSU Fruit and Vegetable Safety website (https://producesafety.osu.edu)
- OSU Fruit and Vegetable Pest Management website (entomology.osu.edu)
- OSU Bramble: Production Management and Marketing Guide (Bulletin 782) (extensionpubs.osu.edu)

CFAES Upcoming Events-2024

OEFFA Organics 101 Series (virtual) – August 12 link here
Pawpaw Workshop – August 3 link here
OSU Extension Soil Health Field Day – August 15 link here
CFAES-AARS Summer Field Day – August 15 Contact Andy Kirk 440-224-0273 or kirk.197@osu.edu
Ohio Pawpaw Festival – September 13-15 link here
Great Lakes Fruit, Vegetable & Farm market EXPO – December 10-12 link here

*Contact your county Extension office to register for OSU events by phone or obtain registration forms.

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Ohio State University-Ashtabula Agricultural Research Station

2024 Summer Field Day: Horticultural Technology

Thursday, August 15th, 2024
1-3:30pm
Welcome from 12:30pm, No Pre-Registration Required

Location: Ashtabula Agricultural Research Station
2625 S Ridge Rd E Kingsville, OH 44048

From I-90, Take Route 11-North to S Ridge Rd (OH-84), Travel East for Appx. 3.5 Miles

Join OSU Staff and Vendor Partners to exhibit new horticultural technologies including a drone sprayer, robotic mowers, and numerous large vineyard implements.

LAKEVIEW VINEYARD EQUIPMENT INC.

DAVEY Resource Group

Private Applicator Credit TBD, Announcement forthcoming

1pm-Davey Resource Group, Drone Spraying Demonstration and Discussion
1:45pm-Lakeview Vineyard Equipment, Equipment Demonstration and Discussion
2:30pm-AARS, Robotic Mower Demonstration, Battery Powered Horticulture Discussion
Technology Demonstration
3pm, Pet Nat Wine Tasting (Vertical, 2021-2023)

For more information, contact the Ashtabula Agricultural Research Station
(440) 224 0273
Attn: Andrew Kirk (Kirk.197@osu.edu)