Tree Fruit

Moderator: Scott Hassle, MSHS Board, Hartford, MI

9:00 am	Farming and Food Narrative Project: Toward an Informed Public Conversation about Farming and Farm Practices • Dr. Larry Gut, MSU Dept. of Entomology • Michael Rozyne, Red Tomato
9:25 am	Michigan Pollinator Initiative • Ana Heck, Michigan State University
9:30 am	Permitting Requirements for Managing Wildlife in Orchards • Timothy Wilson, USDA-APHIS Wildlife Services
10:00 am	Cold Hardiness and Winter Injury of Tree Fruits • Amy Irish-Brown, Michigan State University
10:30 am	MSU Samurai Wasp Dispersal Project: Rearing, Releasing and Recapturing a Parasitoid of BMSB (OH 2B, 0.5 hrs) • Marianna Szucs, Michigan State University, Department of Entomology

Cold Hardiness and Winter Injury of Tree Fruits
Tuesday, December 10, 2019, 10:00 AM - 10:30 AM
Amy Irish-Brown - Michigan State University
irisha@msu.edu

This presentation will highlight the process of cold hardiness and show you how to identify the signs and symptoms of winter injury.

The modern Michigan apple orchard is very different than the standard trees of three or more decades ago. For the past 20 years, the trend in orchard production in Michigan is towards systems that rely on dwarfing rootstocks and tighter tree and row spacing to achieve a quicker return on investment. There appears to be an "increase" in winter injury in tree fruits. In a changing climate, we are finding that these systems can be at risk of tree loss and injury. Over the past 10 or more years we have observed an increase in extreme weather events such as early cold snaps, early spring warming events followed by additional cold snaps, periods of excessive rain and periods of excessive drought during the growing season. All of these appear to be contributing to conditions conducive to tree stress and the opportunistic pathogens and insects that we see taking advantage of the situation.

PowerPoint Outline:
What we need to understand - Acclimation, dormancy, and freezing
What is dormancy?

- Growth inhibited by environmental factors, typically temperature but sometimes water and nutrient stress
- Growth inhibited by internal physiological factors outside of the plant organ, such as an apical bud suppressing growth of basal buds (apical dominance); ex., pinching basal to increase branching
- "True dormancy" where growth is inhibited by internal physiological factors within the organ, such as chilling requirement.

What is cold hardiness?

- The ability of plant tissues to withstand extremes in cold temperature.
- A complex physiological process that begins in early fall and progresses until bud break in the spring.

"Cold hardiness" depends on.....

- When low temperatures occur (early, mid or late winter)
- How fast the temperature drops
- Temperatures preceding cold temperatures
- Length of sustained cold temperature

How does it happen?

- Progressively cooler temperatures in the fall signal the plant tissue to move water from inside their cells into the spaces between cells.
- Some of this water is lost through transpiration, but what remains in the intercellular space eventually freezes into ice crystals.

- Crystals formed in this space do not damage the cell, but crystals forming inside the cell kills it by destroying the cell membranes.

How fast does it happen?

- Accumulation of cold hardiness is a slow process, and as temperatures get colder, tissues increase their cold hardiness.
- The maximum hardiness is reached in mid-January.

Winter injury most often occurs with…

- Extreme low temperatures
- Low temperatures following warm temperatures
- Fall, early hard cold before plants are acclimated
- Warm up during winter (loss of cold hardiness)
- Cold snap after spring warm--up, loss of dormancy and cold hardiness

What are some factors that affect cold hardiness?

- tree health – vigor, water stress, overcropping, excessive fertilizers, pruning to early
- temperatures – especially weather extremes

What are the symptoms of winter injury?

- Blackheart
- Cambium Injury
- Crotch injury
- Crown or collar injury
- Sunscald
- Trunk splitting (SW Injury)
- Killing back of shoots
- Injury to leaf/flower buds
- Killing of roots

Results in weakening of tree, secondary infection by fungi, canker

When do they appear?

- When temperatures rise above freezing and tissues thaw.
- Summer heat and water stress
- Can sometimes take 2 or even 3 years to present

What can we do? Find the balance of vigor, irrigation, crop load, and pruning