



Great Lakes Fruit, Vegetable & Farm Market EXPO Michigan Greenhouse Growers EXPO

December 4-6, 2018

DeVos Place Convention Center, Grand Rapids, MI



5 Berries I

Where: Grand Gallery Room E & F

MI re-certification credits: 2 (1C, COMM CORE, PRIV CORE)


CCA Credits: CM (1) PM (1)


Moderator: Douglas De Leo, MSHS Board, Bangor, MI

- 9:00 AM** **Pollinators for Berries**
- Rufus Isaacs, Michigan State University
- 9:30 AM** **Strawberry and Raspberry Varieties for Michigan**
- Eric Hanson, Michigan State University
- 10:05 AM** **Elderberry Production**
- Patrick Byers, University of Missouri Extension
- 10:45 AM** **Berry Disease Research - Program Directions**
- Tim Miles, Michigan State University
- 11:00 AM** **Session Ends**

Overview of Elderberry Culture


Patrick Byers
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Relevant, Reliable, Responsive... 

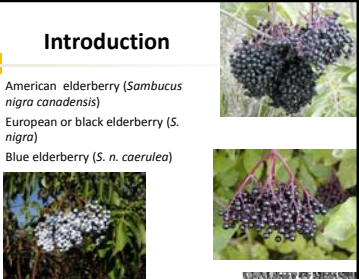
Outline


- Introduction
- Choosing a good site for elderberry production
- Choosing elderberry cultivars
- Propagation and planting establishment
- Elderberry cultural practices
- Harvest and postharvest handling

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Introduction


- American elderberry (*Sambucus nigra canadensis*)
- European or black elderberry (*S. nigra*)
- Blue elderberry (*S. n. caerulea*)




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Introduction

- American elderberry *Sambucus nigra* L. ssp. *canadensis* (L.) R. Bolli (or *Sambucus canadensis* L.)
- Native to much of North America
- Medium to large shrub to small tree



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Introduction




- Juice products
- Jelly, jam
- Wine, beer, spirits
- Health supplements
- Flower products
- Food colorant
- Other plant parts?

- Elderberry is of growing commercial interest

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Elderberry Culture


- Choosing a good site for elderberry
 - Marketing considerations
 - Availability of irrigation water
 - Elevated relative to surrounding land
 - Site specific issues
 - Previous uses of the site
 - Organic production considerations

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Elderberry Culture


- Cultivars with origins in New York
 - ‘Adams 1’, ‘Adams 2’ (1926)
 - Selected from the wild by William Adams
 - Fruit clusters and berries described as large
 - ‘Adams 1’ has greenish stems; ‘Adams 2’ has reddish stems
 - Cross pollination required
 - ‘York’ (1964)
 - Originated as a cross of ‘Adams 2’ x ‘Ezra’
 - Clusters heavy, berries large
 - Lower soluble solids than ‘Johns’, ‘Scotia’, or ‘Victoria’
 - Ripens after ‘Adams 1’ and ‘Adams 2’
 - Plant large, productive



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Elderberry Culture

- Cultivars with origins in Kentville, Nova Scotia
 - ‘Johns’ (1954) – parentage unknown
 - ‘Kent’ (1957) – seedling of ‘Adams 1’; earlier than ‘Adams 1’
 - ‘Nova’ (1959) – seedling of ‘Adams 2’; large fruit, ripens early, sweeter than ‘Kent’ and ‘Victoria’
 - ‘Scotia’ (1959) – seedling of ‘Adams 2’; large fruit, ripens early, sweeter than ‘Kent’ and ‘Victoria’
 - ‘Victoria’ (1957) – seedling of ‘Adams 2’; earlier than ‘Adams 2’

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Elderberry Culture


- Midwestern cultivars
 - ‘Bob Gordon’ (2011)
 - ‘Wyldewood’ (2010)
 - ‘Marge’ (2013)




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Elderberry Culture

- European Elderberry cultivars
 - ‘Haschburg’
 - ‘Marge’ (2013)
 - Danish cultivars






‘Haschburg’

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Elderberry Culture

- Propagation
 - Root cuttings
 - Sprouted hardwood cuttings
 - Softwood cuttings
 - Tissue culture
 - Seeds
 - Dormant hardwood cuttings
 - 1, 2, or 3 node cuttings
 - Rooting hormone?






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Elderberry Culture


- Establishment - plants
 - Bare root or container plants
 - Berms
 - Spacing
 - 3-4 feet between plants
 - 10-12 feet between rows




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Elderberry Culture

- Establishment – hardwood cuttings
 - Stick directly in the soil
 - Success percentage can vary




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Elderberry Culture


- Growth habit
 - Fruits on old wood
 - Produces suckers, which also fruit in many cases



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Elderberry Culture

- Pruning
 - Annual removal of all shoots can improve harvest efficiency
 - Larger, fewer flower cymes
 - Concentrated ripening period
 - Implications for eriophyid mite and SWD management?



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Elderberry Culture


- Pruning
 - Selective removal of older shoots




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Elderberry Culture


- Fertilization
 - Nitrogen
 - 60-100 lb/acre (4x12 spacing)
 - Apply as growth begins
 - Other nutrients?
 - Foliar sampling to monitor nutrition?



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Elderberry Culture

- Irrigation
 - Elderberries are not drought tolerant plants
 - Drip or trickle irrigation systems work well – 18mm tube with emitters every 18-24"
 - Water needs: 1.5-2" per week



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Elderberry Culture

- Weed management
 - Control perennial weeds before planting
 - Plastic mulch for young plantings
 - Weed barrier fabric for older plantings?
 - Mulching
 - Hand removal
 - Herbicides
 - Labeled herbicides: Casoron, Surflan, Gallery, Snapshot, Aim, Roundup Max, Rely, Reglone, Gramoxone

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Elderberry Culture

- Pest management
 - Eriophyid mite



Eriophyid mite

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Elderberry Culture

- Pest management – eriophyid mites
 - Two species of mites discovered in MO
 - Overwinter in elderberry buds
 - Cultivar differences in susceptibility?
 - Control measures
 - Removal of woody plant parts?
 - Delayed dormant lime sulfur spray?
 - Oil spray?
 - Timing of sprays?

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Elderberry Culture

- Pest management
 - Japanese beetle



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Elderberry Culture

- Pest management – Japanese beetle
 - Insecticide applications
 - Mass trapping

1,120,745 beetles killed in 2012 in 4 traps!



Source: Dr. James Probst, Lincoln University

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Elderberry Culture

- Pest management
 - Spotted Wing Drosophila



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Elderberry Culture

- Pest management – Spotted Wing Drosophila
 - SWD is a new elderberry pest for Missouri
 - SWD numbers appear to build in May and June, and reach damaging levels in June-Sept in MO
 - SWD management in elderberry
 - Baited monitoring traps – place in advance of fruit ripening and monitor regularly
 - Use cultural methods (pruning) to concentrate ripening
 - Exclusion?
 - Spray program
 - beginning at first ripe fruit and repeat as necessary
 - at present pyrethroid, spinosyn, and pyrethrum class insecticides are labeled on elderberry for JB, but not for SWD (except for Deltageth)

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Elderberry Culture


- Pest management – Spotted Wing Drosophila

Class	Trade Name	Active Ingredient	PHI (days)	Days Residual
pyrethroid	Mustang Max (flu)	azela-cypermethrin	1	7
	Danitol (flu)	fenpropathrin	3	7
	Bingale (flu)	bifenthrin	3	7
spinosyn	Delegate (Zee)	spinetoram	1	7
	Entruat (organic)	spinosad	1	3-5
pyrethrum	Pyganic (organic)	pyrethrum	0	2

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Elderberry Culture


- Pest management
 - Insect problems
 - Stem borer
 - Elder borer
 - Sawfly
 - Stink bug, including BMSB
 - Green June bug



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Elderberry Culture

- Pest management
 - Bacterial leaf spot (*Pseudomonas*)



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Elderberry Culture


- Pest management
 - Elderberry rust



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Elderberry Culture

- Other diseases
 - Phoma
 - Fungal leaf spot
 - Viruses




Fungal leaf spot

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Elderberry Culture


- Harvest - blossoms
 - June
 - Harvest when all florets are open
 - Florets may be removed by rubbing over a screen
 - Use immediately, freeze fresh blossoms, or dry for future use



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Elderberry Culture


- Harvest - fruit
 - July-August
 - Harvest cymes when all berries fully colored
 - Usually 2-3 pickings
 - Mechanization?



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Elderberry Culture

- Let's discuss the harvest decision process...



Harvest decision is based on:

- Berry color
- Condition of the crop
- Juice chemistry

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Elderberry Culture

- Yields
 - Year 1:
 - MO: 1226 lb/acre
 - IL: 1214 lb/acre
 - Year 2:
 - MO: 3338 lb/acre
 - IL: 8677 lb/acre
 - Year 3:
 - MO: 5621 lb/acre
 - IL: 8582 lb/acre
 - High yields
 - MO: 11352 lb/acre
 - IL: 13846 lb/acre



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Postharvest Handling

- Fruit is destemmed
 - 4-10% of fresh weight is stem
- Storage
 - Fresh destemmed – fruit held at 4°C
 - Frozen destemmed – fruit held at -20°C
 - Storage time – up to 2 years without loss of quality

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Elderberry Culture

- Stem removal
 - Can remove berries from stems by freezing



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Elderberry Culture

Terry Durham's Destemmer

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McCord Elderberry Farm Harvest

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Elderberry Culture

Means of juice characteristics from 2002 elderberry harvest at two locations:

Site	# Samples	Brix	pH	TA (ml)
Mt. Vernon	34	11.44	4.72	0.85
Mtn. Grove	26	12.59	4.56	0.92
Combined	60	11.94	4.65	0.88

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Elderberry Marketing

- Fresh or frozen fruit
 - On the stem
 - Destemmed
- Price:
 - On the stem - \$0.50 to \$1.95/lb
- Fresh, frozen or dried blossoms

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Development of Missouri's Elderberry Industry

- Snapshot – 1997
 - No known commercial elderberry production in Missouri
 - Elderberry products – strictly cottage industry based on wild harvested fruit or concentrate from elsewhere
- Snapshot – 2017
 - Estimated 300 acres of commercial elderberry in Missouri and surrounding states
 - Conservative estimated value of over \$900,000 annually for the raw fruit alone
 - Diverse products and markets, based on Missouri elderberries

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Industry Development

- Growth of the elderberry industry in Missouri is the result of a partnership among innovative farmers and researchers, with a common goal...to build an industry where none was before!

Terry Durham

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Challenges to Missouri's Elderberry Industry

- Additional research is urgently needed
 - Cultivar development
 - Cultural management, especially fertility
 - Weed control
 - Pest management, especially eriophyid mites, SWD, rust and BMSB
 - Mechanization
 - Flowers as a crop
 - Perception of cyanide issues
- Additional economic research is needed

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Riverhills Elderberry Workshop

Join us 13-15 June 2019!

Comments or Questions?

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- <http://extension.missouri.edu/greene/ElderberryDevelopmentProject.aspx>



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Raspberry and Strawberry Varieties for Michigan

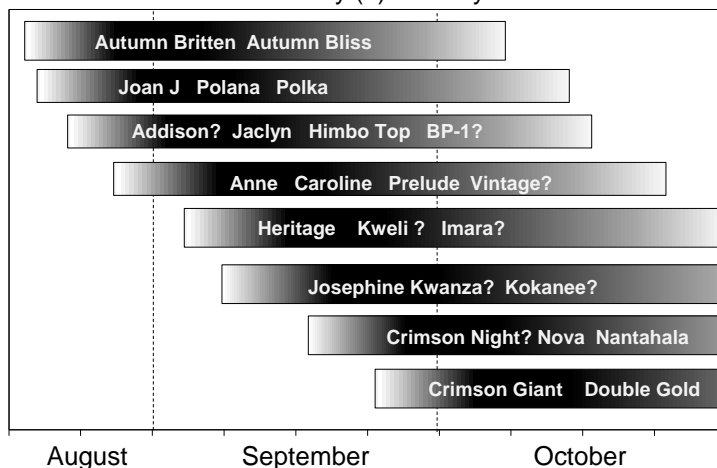
Eric Hanson, Department of Horticulture,
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RASPBERRIES

In choosing raspberry varieties, first decide when you want fruit. Primocane fruiting types bear on the current year canes in the fall, and floricanes fruiting types bear on two year-old canes in the summer. Floricanes can be retained on some of the primocane fruiting types so that they bear a second crop during the following summer (double cropping). Double cropping costs more but provides fresh fruit for longer periods and yields can be higher. Primocane harvest can occur over two months, whereas floricanes harvest occurs in 2-4 weeks. We have been able to assess these types in southern Michigan with funding through the NIFA Specialty Crop Research Initiative project (www.tunnelberries.org).

For primocane fruiting, choose varieties that ripen early enough to harvest high yields for your region. Earlier maturing types are best for short growing season locals, and early and later maturing types are good in longer growing season areas or under high tunnels that lengthen seasons. The chart below provides general harvest times for primocane fruit in southern Michigan. Move the bars to the right in more northern locations.

General harvest times for primocane raspberries in high tunnels in southern Michigan. Relative harvest volumes increase with bar darkness. Varieties followed by (?) are only estimated.



EARLY PRIMOCANE TYPES

Joan J and **Polka** are good choices for early season. Both mature about the same time. Both have excellent flavor and are firm. **Joan J** berries are dark red whereas **Polka** fruit are a glossy medium red. Both varieties are high yielding and produce abundant canes of medium height. **Joan J** canes are thornless. Their primary limitations are dark fruit (**Joan J**) and susceptibility to damage from potato leafhoppers (**Polka**).

Himbo Top matures a few days after **Joan J** and **Polka**. Berries are large and lighter red, but have an average flavor and are less firm, so they may not pack and ship well. Canes are very vigorous and taller than the other types, and **Himbo Top** fruit are easy to see and pick.

MID-SEASON PRIMOCANE TYPES

Caroline been a popular variety because it is extremely productive and has an outstanding flavor. Berries are somewhat less susceptible to gray mold, but firmness is only average. Plants produce abundant canes that are medium in height. **Anne** is the best yellow-fruited variety we have tested, producing large berries with a unique pleasant flavor. Berry yields and firmness are average. **Heritage** is an old variety that fruits later than **Caroline** or **Anne**. It is a consistent producer but has mostly been replaced by larger fruited varieties.

Two new varieties that have high potential are **Imara** and **Kweli**. Both produce very high quality fruit that are very firm, medium red and glossy, large and flavorful. Fall harvest appears to be in the late mid-season, similar to Heritage or later. **Imara** is a little earlier than **Kweli**. Though these are relatively new, they both appear to be good choices for double cropping since the primocane and floricanes yields and quality are excellent. **Addison** is a very new variety developed in Maryland that appears to be productive with large, firm, flavorful fruit. Berries are a very dark red color. Fruiting season is not entirely clear, but appears to be similar to Heritage or perhaps earlier.

LATE-SEASON PRIMOCANE TYPES

A number of varieties mature later than Heritage so they have limited use for primocane production in Michigan except perhaps in the extreme south or in high tunnels. Further north, fall fruiting will begin too late for good yields. **Josephine** is a productive variety with excellent flavor and fruit size. The dark red color has limited Josephine acceptance. **Kwanza** is a new type that produces very large light red berries with excellent flavor. **Kwanza** has very high primocane yield potential in long season areas, but may perform best in Michigan as a floricaner, because our season is too short for high primocane yields. **Crimson Night** and **Double Gold** are interesting new late types from Cornell University. They are likely too late to grow in most of Michigan (unless under tunnels). Both produce firm, flavorful fruit. **Crimson night** is a very dark red and **Double Gold** is yellow-pink.

FLORICANE FRUITING TYPES

Recommended floricaner fruiting types have not changed much because few cultivars have been released lately. **Prelude** and **Nova** are good early season types. **Prelude** berries are a little smaller but have a slightly better flavor. **Nova** canes may be a little more cold hardy than **Prelude** canes. Both varieties produce some primocane fruit. **Encore** is an excellent late season variety. Berries are large, firm and flavorful. Canes are hardy enough for most sites designated USDA Hardiness zones 5 and 6. **Tulamagic** is a mid-season variety that show promise, but has not been adequately tested to recommend widely.

STRAWBERRIES

Michigan strawberry acreage has been declining but this crop is still important because returns can be good and strawberries can spread farm risk over different crops. Most recommended short-day varieties (June-bearing) have been available for many years. However, new varieties are released regularly that may have potential for use in Michigan. We compared several new and old types in a 2017 planted trial in East Lansing. The planting was on a loam soil and managed in a matted row system, and harvested in 2018. Below are descriptions of some standard recommended cultivars as well as initial observations of some newer types.

Recommended varieties for Michigan in the early season include **Honeoye** and **Earliglow**. **Honeoye** is more productive and larger fruited than **Earliglow**, but **Earliglow** has superior flavor. **Galletta** and **Wendy** are two other early season types that had high quality fruit and were productive. **Galletta** in particular maintained berry size through the late pickings. **Yambu** is a newer early season type that begins maturing with **Honeoye**, but **Yambu** has better flavor.

Jewel and **Allstar** have been Michigan standards in the mid season for some time. **Jewel** is still one of the highest quality varieties in this season, with excellent flavored large berries. **Allstar** is also productive and flavorful but has a lighter red color. **Archer**, **Clancy**, **Flavorfest** and **Mayflower** were four newer mid-season types tested. All had modest yields in this trial. **Archer** and **Flavorfest** produced the largest berries.

Cavandish is a common late season variety in Michigan. Newer late season types tested in 2018 include **Record**, **Valley Sunset** and **Malwina**. **Record** was productive while yields were disappointing from **Valley Sunset** and **Malwina**. All three produced very large berries. **Malwina** was the latest variety in the trial.

Redstart and **Wasatch** are two day-neutral types included in the trial for observation. Neither were outstanding and **Redstart** in particular did not behave as a day-neutral. We only harvested fruit from these in June, so productivity later in the season was not quantified.

Yield and average berry weights of strawberry varieties in a 2017 matted row planting, East Lansing, MI, 2018.				
Variety	Season	Yield (kg/plot)		g/berry
		Total	Marketable	
Archer	mid	4.9	4.8	14.3
Clancy	mid	6.7	6.6	11.6
Flavorfest	mid	7.1	7.0	14.0
Galletta	early	6.5	6.4	12.1
Honeoye	early	8.7	8.6	9.4
Jewel	mid	10.0	9.8	10.6
Malwina	v late	4.1	4.1	16.4
Mayflower	mid	6.7	6.6	11.3
Record	late	11.1	10.9	16.1
Redstart	early	7.0	6.9	10.7
Valley Sunset	late	6.3	6.2	14.0
Wasatch	early	6.3	6.2	8.9
Wendy	early	7.8	7.7	10.9
Yambu	early	8.8	8.6	11.9

1 kg is equivalent to about 2400 lbs/acre.