



# Move over Blueberries, here come Haskaps?

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# Haskaps and Honeyberries

- Honeysuckle Family - Caprifoliaceae
- Russian cultivars
  - *Lonicera caerulea* L. subspecies *kamtshatica*, *edulus*, *boczkarikovae*, and *altaica*
  - Native to Siberia, and Northern China
  - Plants bloom very early and are more subject to frost/freeze losses
  - Short dormancy period (May grow during winter warm spells)
  - Lose leaves early in fall
  - Fruit are small, very tart and sometimes bitter

# Haskaps and Honeyberries

- Haskap is an old Japanese name
  - *Lonicera caerulea* L. subspecies *emphylocalyx* (*edulis*)
  - Subspecies of blue honeysuckle
  - Native to northern regions of Eurasia and North America
  - Common names: Blue Honeysuckle, Honeyberry (Jim Gilbert of One Green Earth Nursery), Sweet Berry Honeysuckle, Swamp Fly Honeysuckle
  - Dr. Bob Bors, University of Saskatchewan has been breeding Russian cultivars and Haskaps from Japan and Canadian boreal forests.
    - In Canada they call them Haskaps
    - Initially developed for Japanese market

# Haskaps and Honeyberries

- Maxine Thompson, Professor Emeritus, Oregon State University and Dr. Danny Barney, University of Idaho
  - Developed varieties selected from plants from Hokkaido, Japan and the Kurile Islands
  - These varieties are better adapted to warmer climates than Russian types.
    - Slower to come out of dormancy, bloom 3 weeks later
    - Have larger fruit
    - Better flavor/sugar content
  - Flowers are often hardy to 18°F
- Nurseries Catalogues now call both the Russian cultivars, Haskaps, and hybrids Honeyberries



# Haskap Uses



- Popular fresh in Japan
- Baked goods
- Juices
- Vinaigrettes
- Ice Cream
- Candies
- Jelly
- Wine



# Haskaps

- Berries contain high concentrations of antioxidants and vitamin C
- Dark red pigments are stable in processed products



# Fruit Comparison Chart

Fruit	K (mg)	Ca (mg)	P (mg)	Fe (mg)	Vit. A (ug)	Vit. C (ug)	Vit. E (ug)	Energy (kcal)
Haskap	190	38	25	0.6	130	44	1.1	53
Pomegranate	236	10	36	0.6	0	10	0.6	n/a
Blueberry	70	8	9	0.2	55	9	1.7	49
Orange	130	17	12	0.1	60	35	0.4	39
Grape	130	6	13	0.2	15	4	0.3	56
Apple	110	3	8	0.1	11	3	0.2	50

Five revised standard tables of food comparison in Japan  
(Resources Council of Science and Technology Edition)

# Health Benefits

- High in anthocyanins
  - Cyanidin-3-O-glucoside
- United Kingdom 2018 study
  - European J. of Nutrition 58, 3325-3334 (2019)
- 20 adults aged 62-81
- Haskap berry extracts
  - 400 mg anthocyanin
  - Lowered diastolic blood pressure and heart rate
  - Significantly improved word recall and recognition

# Fruit Shape

- Wild fruit shape is diverse



Photo: Bob Bors, U. Saskatchewan



Rounded berries are preferred for machine harvest because they roll and are damaged less



# Berries

- Most varieties have fruitlets that are completely enclosed forming a single berry
- Some have the typical honeysuckle conjoined twin berries held together by a skin flap



# Plants

- Grow naturally in low and high pH soils
  - 3.9-7.7
  - 5.5-6.5 best
- Native plants found growing in swampy peat soils in low and in high areas, but they grow better on well drained soils
- Grow in heavy and sandy soils
- Winter hardy to  $-50^{\circ}\text{F}$  in Canada



# Plants

- Develop as a small bush
- Reach a height of 5-6'
- No suckering
- No thorns!
- Determined to be non-invasive
  - Have moved into the wild in a few areas





# Haskaps

- Fruit are soft
- Skin is thin
  - Has thin wax layer/bloom
  - Disappears when cooked
- Seeds are small and not noticeable
  - 20 seeds/fruit



# Harvest Timing

- Too early
  - Very tart, poor flavor
- Too late
  - Too soft, fruit are mushy, no storage life
- Purple fruit
  - Not a good index of ripeness
- When they shake easily from the plant
- Soluble solids
  - Canada- berries above 13% SS with average to good flavor
- Russian cultivars turn dark purple inside...Haskaps don't





# Haskap Trial

- Our Initial Interest in Crop
  - New fruit crop
  - Early ripening
    - Avoid spotted wing drosophila
    - Early fruit for on-farm and farmers' markets
  - High antioxidant levels
  - Sweeter fruit than that of Russian cultivars and Canadian native selections
  - Advertised as having few pest problems
    - Powdery mildew
  - Plant performance in a warmer area



# Variety/Selection Plot Hort Research Farm Lexington, KY

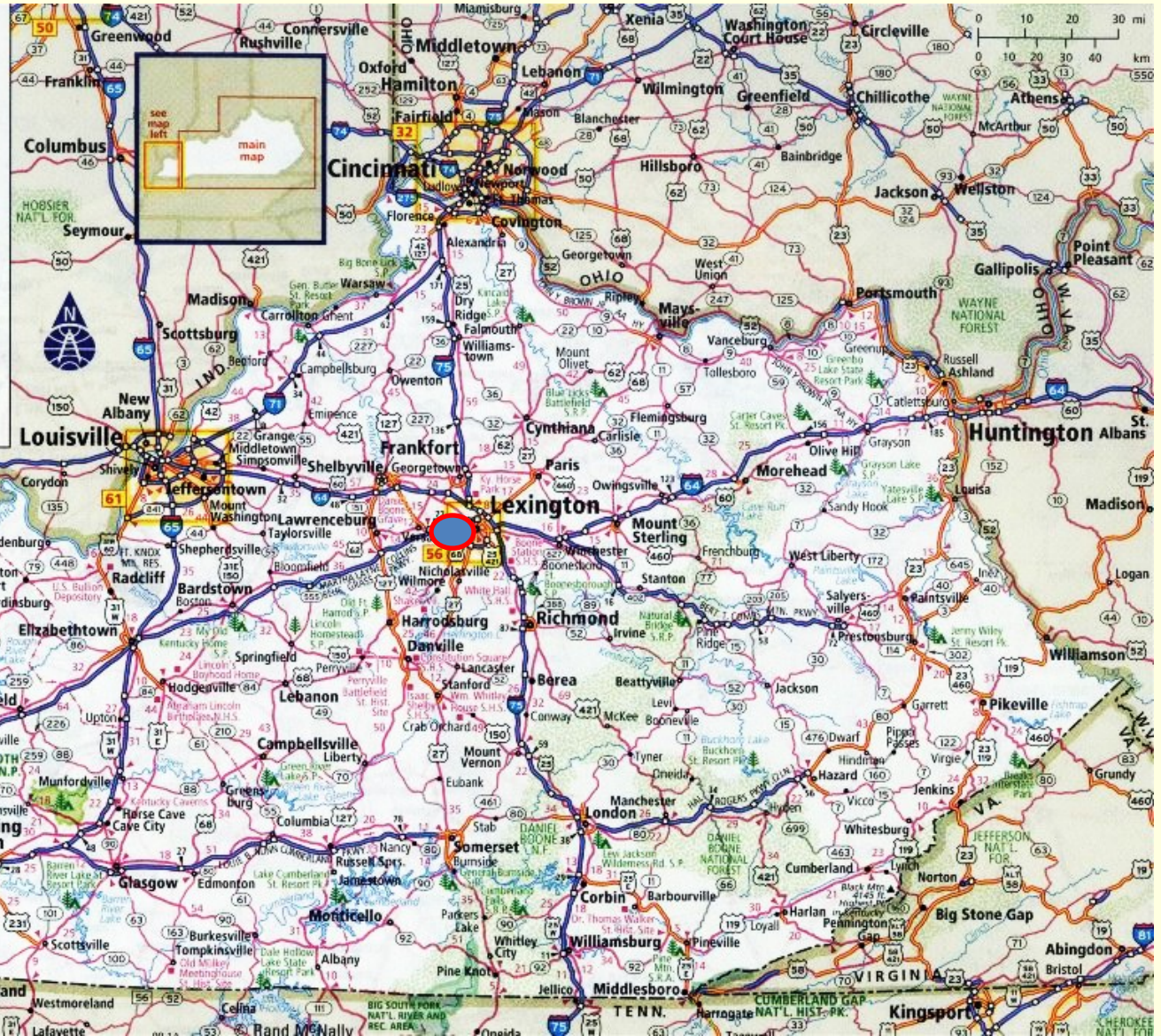


- Study with Gardens Alive! who supplied the plants
- How do they perform in a southern hot climate?



# UK Horticultural Research Farm

Elevation 1,044'





Funding for this project  
provided by:

A Kentucky Horticulture  
Council grant through the  
Agricultural Development  
Fund

# Haskap Variety/selections

- Borealis –
  - One of larger better tasting varieties in Canada
  - Russian/Kuril-Island hybrid



## Maxine Thompson selections

- 21-20
- 29-55 Sunrise
- 44-19
- 46-55
- 51-02 Early Blue
- 56-51
- 84-105
- 85-19
- 85-28
- 85-35



# Haskap Trial

- Greenhouse grown plants
- Six replications, RBD
- Planted June 2, 2014
- Spaced 6' X 12'
  - Kept plants separate
  - Canada recommends 3.3' between plants to produce a hedgerow.
- Maury Silt Loam



# Haskap Trial



- Six-foot wide Dewitt Sunbelt Weed Barrier
  - SSS8 8 gauge heavy duty staples
- Beds not raised
- Drip Irrigation
  - Placed on top of landscape fabric
  - $\frac{3}{4}$ " tubing
  - One Gal/hr. emitters 6" from plant base
  - Irrigated as needed

# Haskap Culture - Mosly Organic

- Fertilization
  - 1 C/plant Nature Safe 10-2-8 April 2016
  - No insecticides, fungicides used
  - Hand weeded
- Grass planted between landscape fabric strips



# Haskaps bud out early!



January 19, 2023

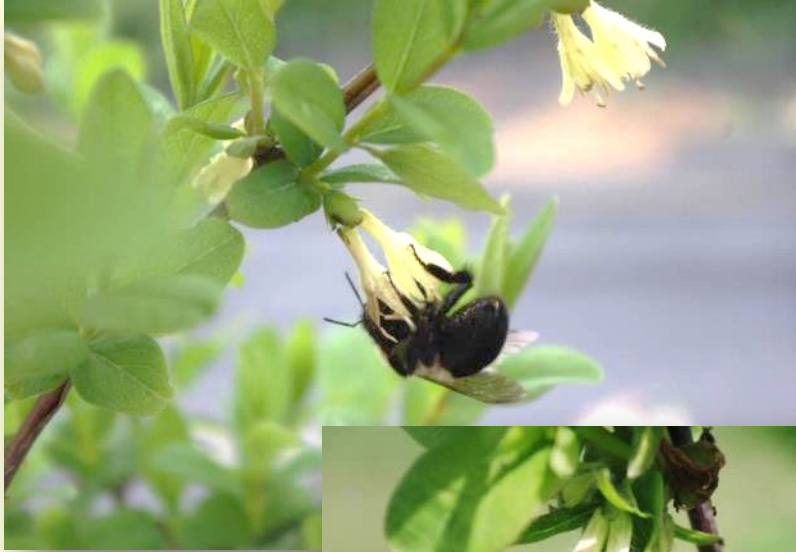


February 8, 2023

Early Blue



# Pollination



Insect pollinated

Require two compatible varieties, close proximity

Poorly pollinated berries are thin and spindly





April 21, 2016



March 25, 2017

# Foliar Frost Injury



- 29.8°F
- April 10, 2016
- Photo April 21, 2016
- Selection 56-51  
most injured in 2016  
not in 2017
  - First to begin growth  
in the spring



# Frost Injury



# Bird Control



- Birds cleaned out the few fruit in 2015
- Bird netting placed over rows prior to harvest in 2016, 2017 and 2018
- Cedar waxwings



# Fruit Quality Problems with Some Selections

- Adhering flower parts



- Adhering stems/leaves



# Minor Japanese Beetle Feeding



# Fruit Harvested by Hand

(Matted row strawberry season)

- 2016
  - May 13, 23,
  - June 1, 8
- 2017
  - May 8, 15, 27, 30
- 2018
  - May 16, 24, 31
  - June 4



Table 1. Haskap yields and fruit characteristics, 2018.

Selection/ variety	Yield/plt <sup>1</sup> (oz)	Wt 20 berries <sup>1,2</sup> (oz)	Attr. <sup>3</sup> (1-5)	Firm. <sup>4</sup> (1-5)	Sweet. <sup>5</sup> (1-5)	Flavor <sup>6</sup> (1-5)	Adhering flr. petals <sup>7</sup> (1-5)
85-19**	52.8 a*	0.46 e	3.8*	3.1*	3.0	3.3	1.1*
44-19*	33.4 a*	0.57 cde	3.6*	2.8	2.7	3.2	1.4
85-28	31.8 a	0.69 bcd	3.3	2.8	2.8	3.0	2.3
21-20	26.4 a	0.52 de	3.8*	2.1	3.1	3.5	1.6
85-35**	25.4 a	0.73 abc*	3.5	3.0*	3.0	3.8*	1.0*
84-105	24.0 a	0.57 cde	4.0*	2.5	3.0	3.8*	1.5
46-55*	20.0 a	0.88 a*	3.0	2.5	3.7*	4.2*	2.0
'Early Blue'*	18.1 a	0.66 bcd	3.3	2.3	3.7*	4.0*	1.0*
56-51	14.4 a	0.82 ab*	3.1	2.6	2.7	3.1	1.8
'Sunrise'*	13.6 a	0.54 de	3.2	2.6	4.3*	3.8	1.2*
'Borealis'	6.2 a	0.54 de	2.8	2.5	3.3	3.3	1.5

<sup>1</sup> Numbers followed by the same letter are not significantly different (Duncan Multiple Range Test LSD P≤0.05)

<sup>2</sup> Average weight based on 20 berries at first 3 harvests.

<sup>3</sup> Attractiveness: 1= poor, 5= sweet

<sup>4</sup> Firmness: 1= soft, 5= very firm

<sup>5</sup> Sweetness based on two evaluations: 1= tart, 5= sweet

<sup>6</sup> Flavor: 1= poor, 5= excellent

<sup>7</sup> Flower petals adhering to fruit: 1= none. 5= many



# Top Selections

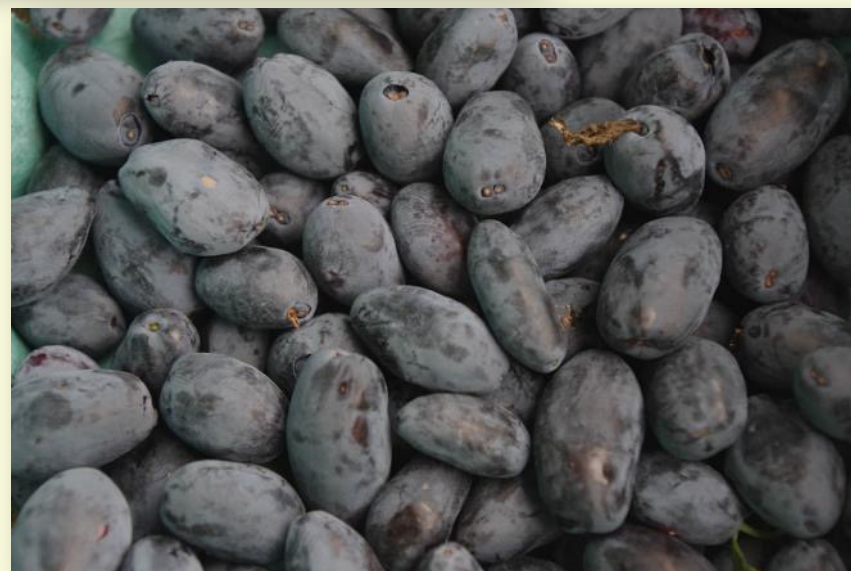


85-19



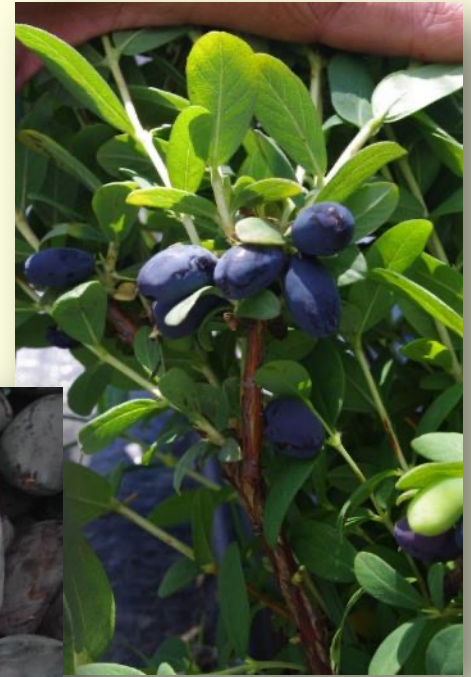
85-35

85-19





85-35





2016

51-02, 29-55



# Plant Death



Phytophthora  
(water molds)  
Confirmed by ELISA  
test



Flat beds vs.  
raised beds

# Phytophthora

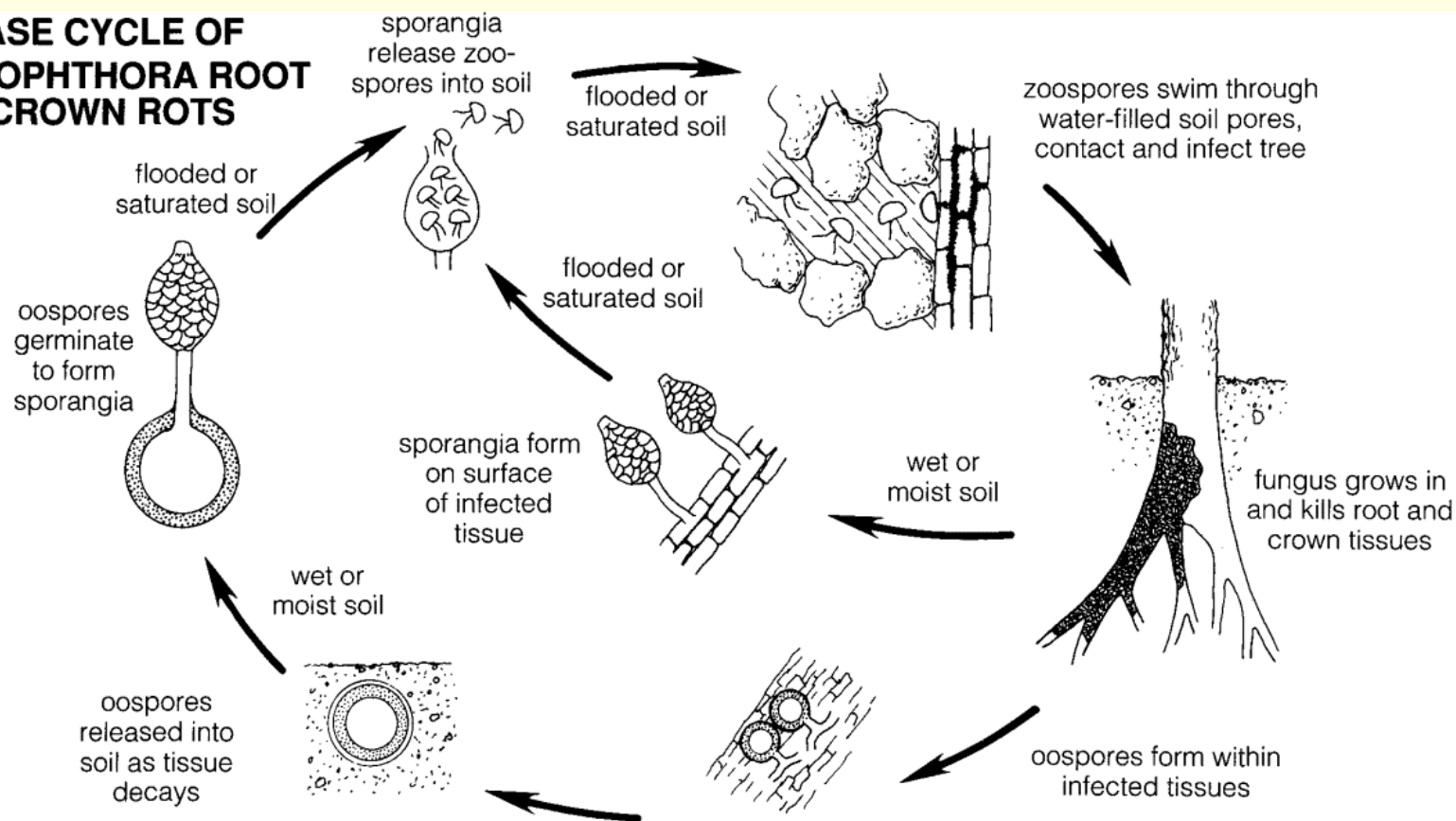
- Blackberries
- Blueberries
- Haskaps



Lost >51% of plants by 2018 in  
5 years



## DISEASE CYCLE OF PHYTOPHTHORA ROOT AND CROWN ROTS



Produced by Media Services at Cornell University for the New York State Integrated Pest Management Program, jointly sponsored by the New York State Department of Agriculture and Markets and Cornell University.

Cornell Cooperative Extension provides equal program and employment opportunities.

153GFSTF-D7 98/130 3/92 5M MP E10923G

Many species/strains



# Phomopsis Dieback, Tip Blight, Canker - Fungus



Control:  
Reduce plant stress  
Prune out cankers



Powdery Mildew?





# Leaf Bronzing/Drop



Spring



Late summer  
Sunburn





# Nutritional Deficiency, Mg?



85-28  
Only on a few  
plants

Table 2. Haskap plant survival, size, percent bloom, foliar frost injury, and leaf bronzing.

Selection/ Variety	Plant mortality <sup>1</sup> (% dead)	Plant volume <sup>2</sup> (cu ft)	Bloom 2018 <sup>3,4</sup> (%)	Foliar frost injury 2018 <sup>4,5</sup> (%)	Leaf bronzing 2017 <sup>4</sup> (AUDPC) <sup>6</sup>	Leaf bronzing 2018 <sup>4</sup> (AUDPC) <sup>6</sup>
85-19**	33	43.8*	92 a*	5.6 bc	1459 c	1029 c*
44-19*	33	14.6	98 a*	19 b	3101 a	3163 ab*
85-28	66	32.2	88 ab	1 c*	1952 c	1853 bc
21-20	50	34.5*	70 a	7 bc	2853 bc	2918 ab
85-35**	83	23.6	100 a*	0 c*	1657 c*	2854 abc*
84-105	83	16.5	-	0 c*	931 c	931 c
46-55*	66	16.5	47 de	8 bc	3009 a	3778 a
'Early Blue'*	0*	27.0	58 cd	5 bc	2166 bc	1700 c*
56-51	50	23.8	37 e	47 a	3557 a	3848 a
'Sunrise'*	0*	8.7	68 c	6 bc	1586 c	1966 bc*
Borealis	66	3.8	35 e	0 e*	3654 ab	3196 ab

<sup>1</sup> Assessed on 30 September 2018.

<sup>2</sup> Calculated as volume of a cylinder based on plant height and width.

<sup>3</sup> Visual estimate of percent bloom on 18 April 2018. Bloom was delayed on 84-105 and it was too early to rate.

<sup>4</sup> Means within same column followed by the same letter are not significantly different (DMRT LSD P<0.05)

<sup>5</sup> Visual estimate on 22 April of percent leaf injury following a freeze down to 20.7°F on 14 Mar. and 26 F° on 5 Apr. 2018.

<sup>6</sup> The area under the disease progress curve (AUDPC) is a quantitative summary of disease intensity over time, calculated from leaf bronzing and drop ratings taken on 23 August, 11 and 22 September and 7 October 2017; and 1, 16, and 31 August, 16 and 30 September 2018. Higher numbers in the columns indicate greater cumulative leaf bronzing and leaf drop.

Table 3. Haskap selection/variety fruit observations, 2017.

Selection/ variety	Fruit observations
85-19**	Long, slender, uniform berry size and shape; attractive wax bloom; easy to pick since fruit is on bush exterior; fruit shakes off easily; some adhering leaves and stems
44-19*	Uniform berry size and shape; heavy wax bloom; tart when ripe; many adhering leaves and stems; a few conjoined berries; fruit shake off easily sometimes
85-28	Variable fruit size and shape; fruit darker in color than other selections; adhering petals and stems
21-20	Uniform fruit size and almond shape; heavy wax bloom; only selection with a fruity taste; persistent stems; fruit does not shake off or release from bush easily; fruit skin may slip off during harvest when pulled
85-35**	Uniform fruit size and shape; attractive firm skin that holds up well; no conjoined <sup>1</sup> fruit; fruit shake from plant easily
84-105	Uniform fruit size and shape; heavy waxy bloom; very soft, tender fruit that damage easily; no conjoined fruit; few to many with persistent flower parts; fruit easy to pull off plant
46-55*	Uniform berry shape, darker fruit color; soft when ripe, great flavor; a number of conjoined fruit; adhering stems; easy to pick; fruit don't shake off easily

<sup>1</sup> Conjoined berries are open on one side exposing the two fruitlets, as opposed to most berries where the two fruitlets are completely enclosed in a blue sack forming a single berry.



Table 3. Haskap selection/variety fruit observations.

Selection/ variety	Fruit observations
Early Blue* 51-02	Irregular fruit size and shape; lumpy fruit; heavy wax bloom; no conjoined fruit; close to blueberry in taste; easy to pick and fruit shake from plant easily
56-51	Variable size and chickpea shape; heavy wax bloom; a few conjoined berries; easy to pick, but fruit do not shake from bush easily
Sunrise* 29-55	Attractive, medium-to large fruit, uniform shape; excellent mild sweet flavor, very few conjoined fruit, fruit shake from plant easily
Borealis	Variable fruit shape and size, fair number of adhering leaves and conjoined fruit

Table 4. Haskap selection/variety juice characteristics<sup>1</sup>

Selection/ variety	°Brix	Juice pH	T.A. (g/L) <sup>2</sup>	Sweetness (1-5) <sup>3</sup>
85-19*	10.7	2.81	27.09	3.0
85-35*	10.7	2.97	28.83	2.9
44-19*	11.5	2.79	38.11	2.6
84-105	10.8	2.95	30.57	2.8
51-02* Early Blue	10.9	2.99	27.47	3.2
46-55*	12.7*	3.00	20.70*	3.7*
21-20	10.3	2.68	37.34	2.7
85-28	10.8	3.09*	21.09	3.1
Borealis	9.6	3.08*	22.44	3.2
56-51	10.1	2.76	39.86	2.9
29-55* Sunrise	13.3*	3.24*	18.30*	3.9*

<sup>1</sup> Based on one composite sample from the second harvest, 15 May 2017.

<sup>2</sup> T.A. = Titratable acidity measured as grams of tartaric acid per liter of juice.

<sup>3</sup> Sweetness based on two evaluations: 1 = tart; 5 = sweet

**Table 1:** Total Soluble Solids (TSS) as determined by a hand held refractometer on juice extracted from 5 blue honeysuckle (haskap) cultivars over two dates grown at Simcoe, Ontario.

<b>Blue Honeysuckle Cultivar</b>	<b>June 26, 2013</b>	<b>June 18, 2014</b>
<b>Tundra</b>	13.5	13.5
<b>Borealis</b>	12.0	9.0
<b>Indigo Treat</b>	14.5	13.5
<b>Indigo Gem</b>	14.0	8.0
<b>P. 17 (polliniser)</b>	13.0	13.0

For reference, **Table 2** shows comparative Brix values and corresponding indices for common small fruit species. It should be noted that each fruit species has its own range and comparisons between species cannot be made.

**Table 2:** Adapted from International Ag Labs Inc. (Minnesota, USA), Index of crop juices calibrated in Brix.

<b>Fruit Species</b>	<b>Poor</b>	<b>Average</b>	<b>Good</b>	<b>Excellent</b>
<b>Blueberry</b>	10	14	16	20
<b>Strawberry</b>	6	10	14	16
<b>Raspberry</b>	6	8	12	14



# Selections Showing Promise



44-19



46-55



51-02 Early Blue



29-55 Sunrise

# Named Varieties



Early Blue (51-02)



Sunrise (29-55)



# Borealis did not perform well

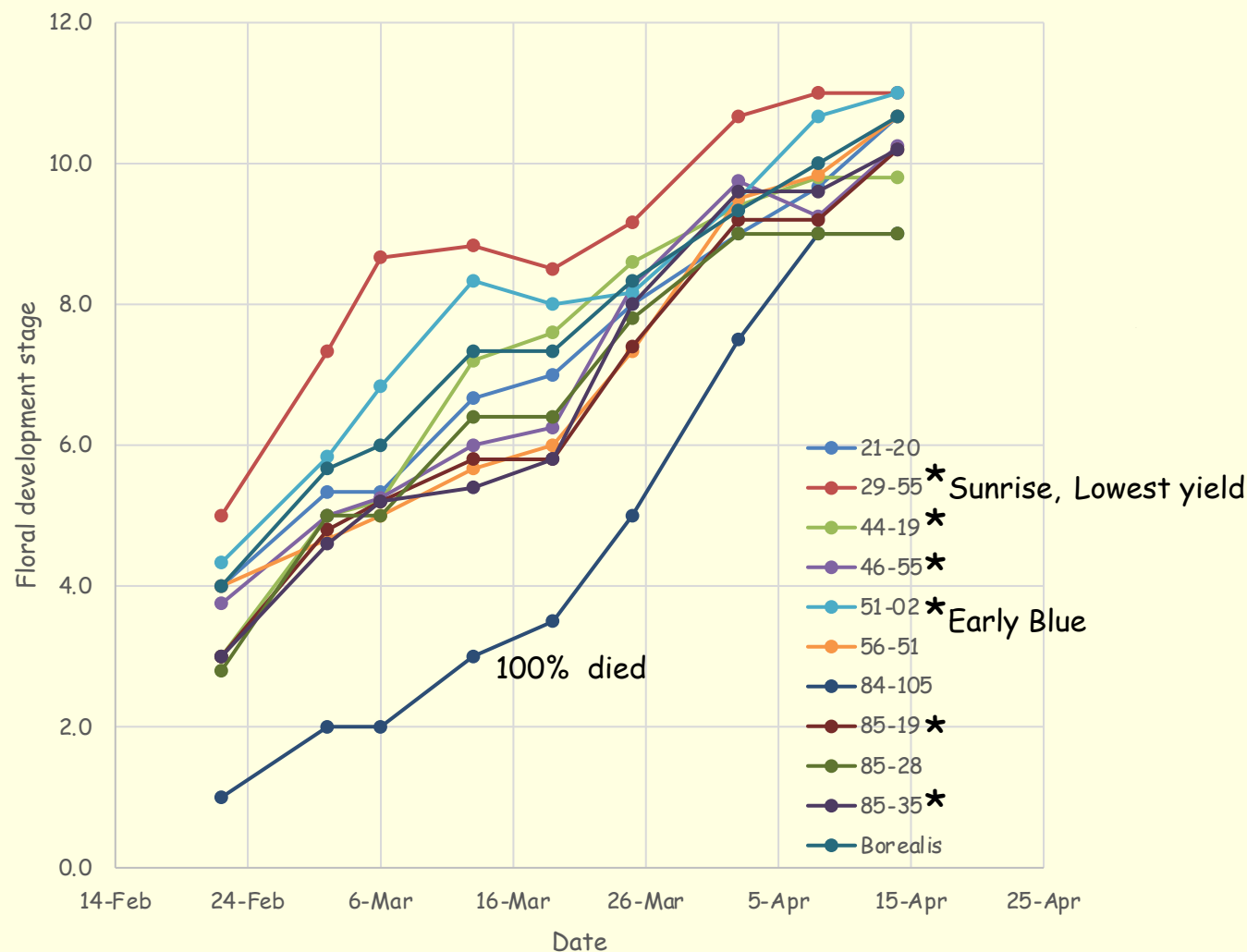




# Floral Developmental Stages



# Selection/Variety Floral Development Stage by Date, 2017



Floral developmental stages: 1 = buds dormant; 2 = buds showing green; 3 =  $\frac{1}{4}$  inch green; 4 = flower buds visible; 5 = first bloom; 6 = 25% bloom; 7 = 50% bloom; 8 = 75% bloom; 9 = 100% bloom; 10 = petal fall; 11 = small fruit



# Fall Blooming

10/7/17



Borealis



# Harvest

Excessive heat speeds maturity



Hand harvested



Harvested by beating bush  
Harvests the ripest fruit

Children's swimming pools work well  
to catch fruit

# Haskap Harvesters

- Joanna harvester from Poland
  - Used on Haskap, gooseberries, currants and saskatoon berries



- <https://research-groups.usask.ca/fruit/documents/haskap/20080042.pdf>
- Jagoda Kamczcka Zbior Video
- <http://www.lovehoneyberry.com/honeyberry-harvesting/>



# Propagation

- Root easily from dormant stem cuttings
  - May use a rooting hormone
- Softwood cuttings of new spring growth placed in a mist bed
- Layering
  - Mound soil over plant bases for a season and then cut off rooted shoots





# Weed Control



# Herbicides for Weed Control

## Berry & Small Fruit Crops, Honeysuckle (edible)

- Preemergence

- Chateau EZ

- 6 fl oz/A
    - REI 12 hrs
    - PHI 14 days
    - Avoid foliage contact
      - If less than 2 years old protect with nonporous wrap

- Postemergence

- Arrow (clethodim)  
Not Select Max

- 4-8 fl oz/A +  
1% v/v crop oil
    - REI 12 hrs
    - PHI 14 days

- Roundup WeatherMax  
(glyphosate)

- 11 fl oz-3.3 qt/A in  
10-40 gal
    - REI 12 hrs
    - PHI 14 days
    - Don't contact desirable foliage
    - Also listed for Honeysuckle control



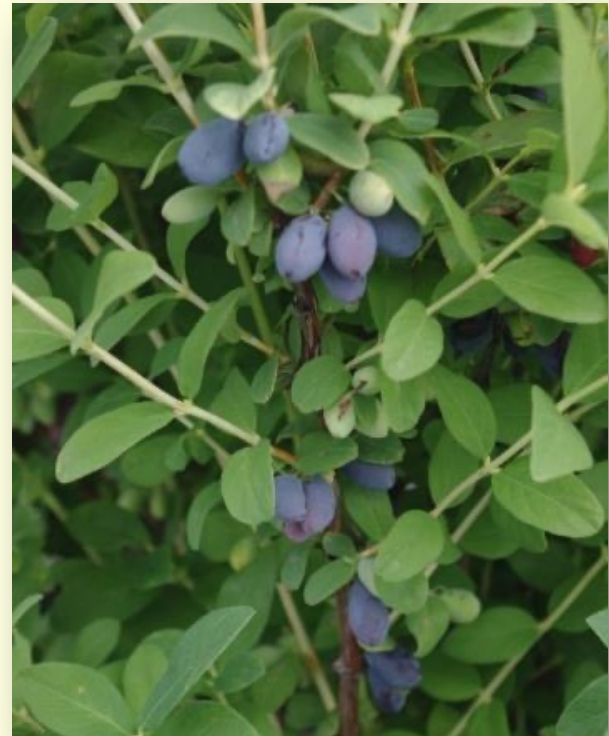
# Honeyberry Nurseries

- Indiana Plant & Berry
  - \$14.95-\$15.50
- Honeyberry USA (MN)
  - \$11-\$20, 1-2' tall plants
- Stark Bros (MO)
  - \$21.99-\$38.99
- Raintree Nursery (OR)
  - \$39.99
- One Green World (OR)
  - \$22.95
- Gardens Alive (OH)
  - \$39.99
- Gurneys Seed & Nursery Co. (IN)
  - \$39.99



# What We Learned

- Two selections (85-19 & 85-35) looked very good.
- Hand harvest not suitable for commercial production
  - Too time consuming
  - Fruit are soft
- Haskaps look to be very good for home production
- Plant Haskap varieties - These bloom later in southern areas
- Fruit not all that sweet for fresh consumption
- Fruit are tender and won't store too long
- Some selection fruit had excessive flower part retention
- Leaf bronzing was a major problem
- Fall blooming on some selections
- No problems with spotted wing drosophila



# What We Learned



- Noted some Japanese beetle leaf feeding
- Phytophthora root rot was a severe problem leading to plant losses
  - Suggests that planting on raised beds is critical
- Landscape fabric?
- Phomopsis dieback became a problem in 2018
- Powdery mildew was not a problem

# Suggested (Haskap/Honeyberry) Varieties [Japanese genetics, zones 6-8]

- Gurneys
  - Maxine's Opus and Kawai
  - Aurora
  - Early Blue™
  - Sunrise™
- Raintree Nursery
  - Blue Hokkaido™
    - Good variable spring weather
  - Blue Pagoda™
  - Blue Mist™



# Suggested (Haskap/Honeyberry) Varieties [Japanese genetics, zones 6-8]

- One Green World
  - Blue Sea™
  - Blue Hokkaido™
  - Blue Pagoda™
  - Blue Mist™
  - Keiko
  - Aurora
  - Tana





QUESTIONS?

