

PROJECT TO ESTABLISH A CANADIAN STRAWBERRY PROMOTION AND RESEARCH COUNCIL

Project summary update
September 2013

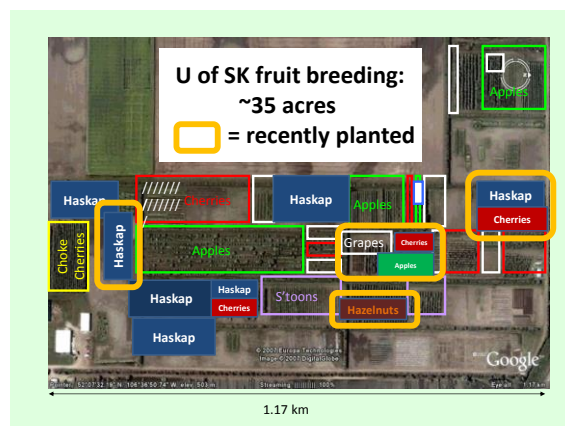
Presented by the
Quebec Strawberry and
Raspberry Growers' association

**WORKING TOGETHER;
CANADIAN STRAWBERRY
GROWERS & IMPORTERS**

WHY?
The Canadian strawberry industry will possess a

GENERAL PRINCIPALS OF THE PROJECT

- A budget of \$2,225,000 annually, powered by a system of levies (\$ 0.007/pound of fresh strawberries). The overall budget will be comprised of 14% domestic production and 86% imports; organizational governance and operational decisions will be mainly in keeping with this proportion.
- 79% of the operation budget will be allocated to general promotion and research activities, i.e. for all strawberry, regardless of its origin, and 21% of the budget will be allocated to domestic promotion and research activities.
- The Council shall be managed under a Canadian coordination within which the growers' associations in each province and the produce marketing associations



Research Projects in 2013



- “Breeding and selection haskap for nutritional and agronomic suitability” ADF funded
- “Breeding of Grapes and Apples with Emphasis on juice products and rootstocks” ADF funded.
- CAAP project on “Constituents of U of SK Cherries, nutraceuticals & antioxidants” CAAP funded



Funding Sources

- Royalties
- Sask Ag's ADF Fund
- Plant, book, workshop sales
- CAAP
- Grower Groups:
 - SFGA, CCPI, Haskap Canada
- Scholarship Givers:
 - NSERC, Knowles, Mongolian Government

PhD Graduate students in 2013

- James Dawson : Haskap Nutraceuticals
 - Cherry nutraceutical study
 - Eric Gerbrandt : Genetics and adaptation of Haskap hybrids
 - Bayartulga : Soil & growth of wild and greenhouse Haskap
-
- All have full scholarships
 - Research expenses funded by royalties



**Eric Gerbrandt: PhD Student
Haskap Genetics & adaptation in
British Columbia**

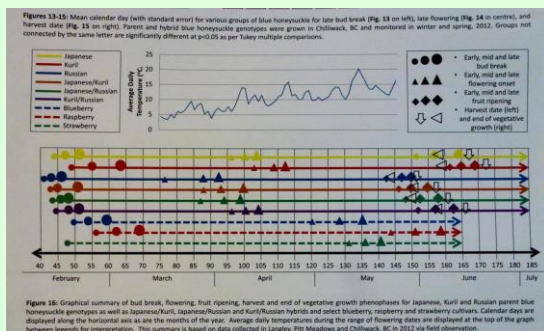
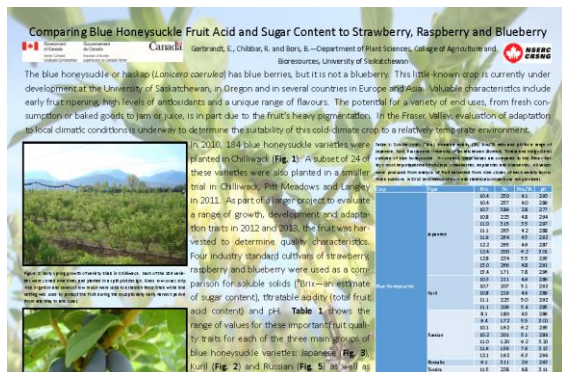
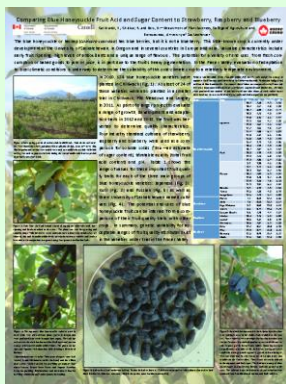


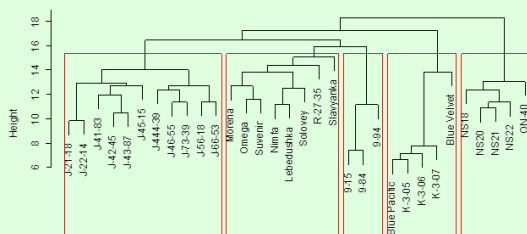
Figure 13-35: Graphical summary of bud break, flowering, fruit ripening, harvest and end of vegetative growth phenophases for Japanese, Kuril and Russian parent blue honeysuckle genotypes as well as Japanese/Kuril, Japanese/Russian and Kuril/Russian hybrids and select blueberry, raspberry and strawberry cultivars. Calendar dates are displayed along the horizontal axis as are the months of the year. Average daily temperatures during the range of flowering dates are displayed at the top of the graph between legends for interpretation. This summary is based on data collected in Langley, Pitt Meadows and Chilliwack, BC in 2012 via field observation.





Tree	Type	Area	Area	Area	Area
		104	2.90	4.1	2.99
		104	2.97	4.0	2.99
		107	3.89	2.8	2.97
		108	2.25	4.9	2.94
		110	3.15	3.5	2.97
		111	2.63	4.2	2.99
		115	2.64	4.5	2.92
		122	2.85	4.6	2.87
		124	2.90	4.2	3.03
		128	2.34	5.5	2.95
		130	2.69	4.8	2.91
		134	1.71	7.0	2.96
		103	2.11	4.9	2.89
		107	2.07	5.1	2.92
		108	2.19	4.9	2.89
		111	2.23	5.0	2.92
		113	2.96	5.4	2.86
		81	1.80	4.5	2.66
		94	1.72	6.5	3.08
		101	1.62	6.2	2.95
		102	2.01	5.1	2.84
		110	1.30	9.2	3.20
		119	1.96	7.6	3.13
		121	1.92	6.3	2.94
		95	3.11	2.9	2.96
		119	2.39	4.9	3.11
		135	2.48	5.4	3.06
		72	0.59	12.2	3.56
		76	0.59	13.2	3.57
		81	0.69	11.8	3.51
		85	0.74	11.5	4.21
		96	2.20	4.4	2.87
		103	1.76	5.8	3.09
		106	1.32	8.0	3.19
		106	2.07	6.1	2.86
		114	0.57	20.0	3.18
		119	0.47	25.0	3.25
		125	0.49	25.4	3.22
		145	1.02	14.3	2.96

Genetic Similarities of Haskap types (Part of Eric Gerbrandt's thesis)

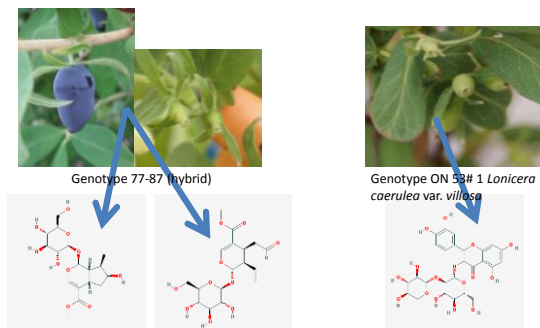


A genetic distance estimate for various blue honeysuckle (*Lonicera caerulea* L.) subspecies using ISSR
Gerbrandt, E.M., Tar'an, B. and Bors, R.H. – University of Saskatchewan, Saskatoon, SK, Canada

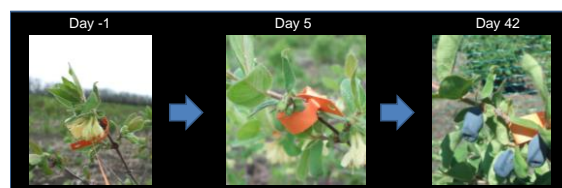
Major phytochemicals through the growth cycle of elite breeding lines of *Lonicera caerulea* L.



EXPERIMENT 1 – Phytochemicals in *Lonicera caerulea*



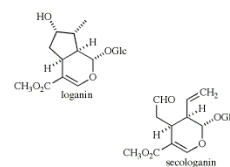
EXPERIMENT 2 - Phytochemical concentration in fruit of *Lonicera caerulea* throughout fruit development



Phytochemicals Quantified

Phytochemical	Human effect	Role within plant
Chlorogenic acid (Hydroxycinnamic acid)	<ul style="list-style-type: none"> Neurotrophic Antihyperlipidemic Anti-preadipocyte 	<ul style="list-style-type: none"> Generalized stress response Inhibition of IAA oxidase
Quercetin 3 sambubioside Quercetin 3 rutinoside Quercetin 3 glucoside (Flavonol)	<ul style="list-style-type: none"> Muscle mitochondria biogenesis Sirtuin activator 	<ul style="list-style-type: none"> Stimulator/repressor of mitochondria metabolism UV protectant
Loganin Secologanin (Iridoids, monoterpenoids)	<ul style="list-style-type: none"> Protects against diabetes induced liver disorder Inhibition of β-Secretase (Alzheimer's disease) Anti-inflammatory Antibacterial Antiviral 	<ul style="list-style-type: none"> Protein cross linker Herbivore deterrent
Cyanidin (Anthocyanin)	<ul style="list-style-type: none"> Chemopreventive Chemotherapeutic Anti-inflammatory 	<ul style="list-style-type: none"> UV protectant response to oxidative stress visible pigment

EXPERIMENT 3 - Phytochemical concentration in leaves of *Lonicera caerulea* throughout the growing season



EXPERIMENT 4 - Phytochemical concentration of diverse gerplasm of *Lonicera caerulea*

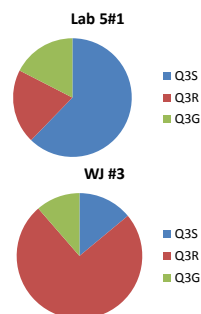


Lonicera caerulea var. *villosa* Lab 5#1

Phytochemical profile of *Lonicera caerulea*

Compound	Lab 5#1 (villosa)	WJ #3
Chlorogenic acid	8.091	6.279
Q3S	2.189	0.757
Q3R	0.713	4.042
Q3G	0.614	0.616
Loganin	11.892	1.858
Secologanin	2.312	1.583

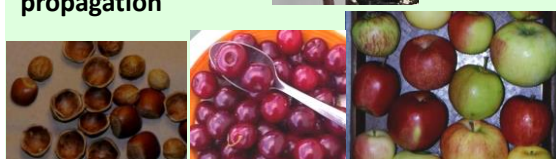
Values in mg/g



Bayartulga Lkhagvasuren

- Funded by Mongolian Government
- Has MSc in Soil Science from U of SK
- Thesis:
 - Study wild haskap: soils, ecology
 - Use wild info in greenhouse production
 - Propagation
 - Plant growth
 - Fruiting

Rick Sawatzky: Head Technician. Works on all areas. Lately, has strong interest in eating apples, root stock breeding, cherry breeding, hazelnuts, cutting propagation

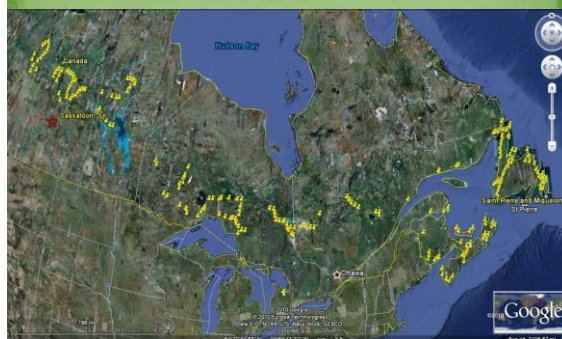




Ellen Sawchuk: Fruit quality evaluations of Haskap and cherries, tissue culture propagation, coleus

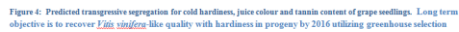


1200 wild Haskap plants gathered from 270 locations since 2007



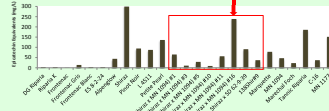
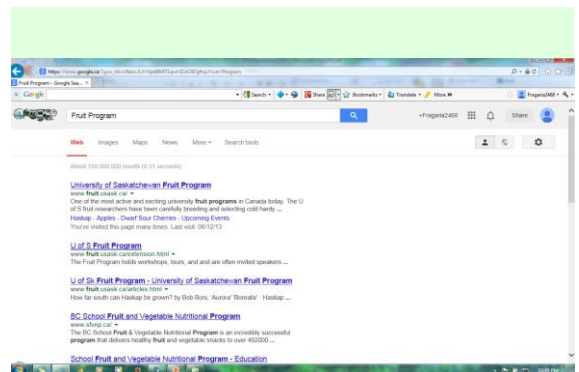
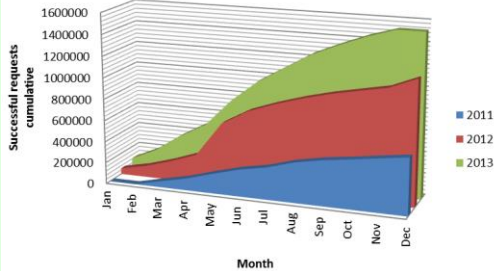
Advanced Selections 2013 Notes			
Early Bloomers		Late Bloomers	
22.6.33.0	Low Prod 2013	22.02.56.0	this looked better than 56.5
22.08.31.5	tall sturdy Kurile Prob not Productive	22.02.56.5	hardly any production, birds? Next to
22.10.18.75	Fruit holds on in Early Aug, prod in 2012 & 2013, flat bullet	22.03.37.75***	med-lg size but v firm fruit late in season
22.11.30.2	flat rectangle, no fruit left	22.04.12.0***	v large fruit
22.11.34.4	v lg bullet, no fruit left	22.04.14.0	
20.03.21.5	Elephant, nice but sister plant tastes much better, about 8 plants east	22.06.25.5	**** were both successful crossed to 25.5
		22.08.16.5	
Mid Bloomers		Very Late Bloomers	
14.16.9.25	great aroma	14.17.2.6	lg tasty, kurile like, med low prod?
14.16.10.25	smooth arow	14.17.5.5	Bullet Heart, kurile type, breeding?
22.04.78.5	lg bullet	14.19.2.75	special flavour, v tall, big fruit, good
22.08.18.66	boxy flat	14.19.3.75	tangy tall, low prod
22.10.29	flat rectangle	14.16.0.5	megawimp
Aurora		14.19.43.5	tall, prod, firm late in season, med-lg size, some hold on flowers? Wow!!





- ~50 varieties obtained, evaluated, some used
- 40 combinations of parent used in crosses
- Field of 3000+ evaluated with most discarded
- 4500 seedlings planted
- 4000+ seeds being germinated

[illegible]

[illegible][illegible]

Potted rootstocks before inoculation with fire blight bacteria.
These trees are 1 – 3ft tall with multi-year wood. Actively growing tissue is inoculated with a mixture of fire blight strains from across North America.



Strains of *Erwinia amylovora* used in the inoculant. Long term cryogenic storage is used to maintain the virulence of these cultures.



Rootstocks showing symptoms of Fireblight infection. The “shepherds crook” branch tips and whitish yellow ooze are typical indicators.



Fire blight resistance in dwarfing rootstocks.

Cultivar or seedling	Performance	Fire Blight Susceptibility (1=Low Susceptibility 5=Highly Susceptible)
V3	Resistant check cultivar. Demonstrated significant resistance to infection.	1
O3	Check cultivar. Common hardy rootstock in Saskatchewan	4
Bud 491	Check cultivar. Common commercial rootstock	4
7-1-5.7	Less susceptible than check cultivars Bud491 and O3	3
7-2-30.7	Low susceptibility to infection	1
7-1-16.0	Less susceptible than check cultivars Bud491 and O3.	3
7-2-36.5	High susceptibility to infection	5
7-1-6.5	High susceptibility to infection	5
7-1-7.9	Moderate susceptibility to infection	4
7-3-12.2	Low to moderate susceptibility to infection	2
7-3-29.0	Moderate susceptibility to infection	3
7-3-24.3	Moderate susceptibility to infection	3
7-2-7.8	Highly susceptible to infection	5



Methyl Cellulose Precipitable (MCP) tannin assay.
measures tannins, important for juice and cider quality.



Table 1. Juice quality traits of SK grown apples. Fruit grown on the U of SK orchards in Saskatchewan Saskatchewan. Fruit from 2011, 2012 and 2013 crop years was tested

	Cultivar	Juice Yield kg/ha	%Tannin(Lowenthal Permanganate)	MCP Tannin	pH	Titrateable Acidity (mM)	Soluble Solids (Brix)
Recent U of S Introductions	Anna Gold	55.1	0.95	45.91	3.42	0.50	12.8
	Autumn Delight	78.9	1.15	27.97	3.31	0.47	12.8
	Festive Treat	53.6	1.73	25.805	3.25	0.70	12.5
	Granny Annie	80.1	1.36	75.67	3.285	0.72	12.8
	Misty Rose	62.0	0.84	37.085	3.38	0.63	14.6
	Patience	77.5	1.41	35.21	3.235	0.66	13.0
	Prairie Sensation	65.5	0.81	26.11	3.405	0.66	13.2
	Trail	65.6	1.34	44.805	3.715	0.59	16.5
	Red Sparkle	65.0	1.31	45.595	3.5	0.37	12.8
	Prairie Rose	71.1	0.83	11.5	3.13	0.79	13.6
	Conventional Norkent	66.0	1.13	37.23	3.765	0.45	14.1
	Hardy Apple	78.4	0.65	12.11	3.27	0.63	13.5
	Cultivars Kerr	75.4	1.39	9.53	3.21	0.95	16.5
	Goodland Carlos	53.8	0.95	28.68	3.4	0.62	14.1
	Queen	58.5	0.83	19.55	3.34	0.68	13.6
Unreleased apple Selections	Brightness	77.3	1.28	35.77	3.3	0.89	16.9
	Profilic	75.2	1.80	73.49	3.595	0.68	15.5
	R52722	76.8	1.00	16.8	3.61	0.41	13.8
	R64711	58.2	0.77	29.49	3.5	0.46	14.2
	R76731	59.7	1.19	45.935	3.37	0.56	13.2
	SK08-15	-	1.17	15.22	4.22	<0.21	16.4
	SK08-16	-	1.03	-	3.48	0.57	15.8
	SK81-48	66.4	0.70	18.19	3.72	0.46	16.6
	SK81-69	62.1	0.65	45.065	3.4	0.76	17.9

Table 1. Cultivars scored and ranked based on their suitability for hard cider in Saskatchewan. Tannin score is determined according to the Methyl Cellulose Precipitable (MCP) tannin assay. MCP tannin values of all cultivars are determined according to their values on a scale of 1-5 (1 being the lowest tannin content, and 5 being the highest). Tannin score is given according to where the MCP tannin content falls on that scale. Acid score is determined according to the cultivars titrateable acidity (TA). TAs of all cultivars are distributed according to their values on a scale of 1 to 5 (1 being the lowest acid content and 5 being the highest). Acid score is given based on where the cultivar's TA falls on that scale.

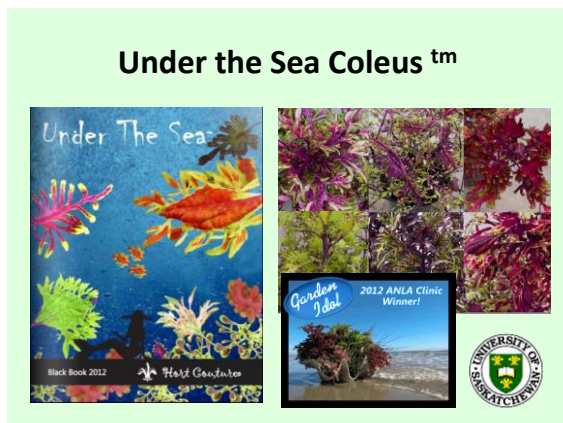
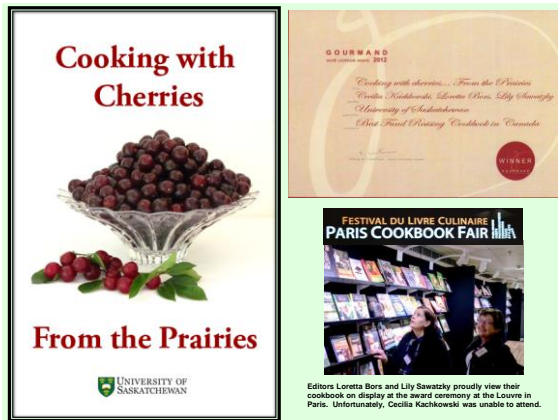
Cultivar	Score (out of 5) Tannin	Score Acid	Desert Quality
SK08-15	3	5	Fair.
Norkent	3	4	Good
R52722	1	4	Poor. Small fruit
Red Sparkle	2	4	Unique flavor
SK81-48	2	4	Poor. Sweet. Hard texture
Anna Gold	3	3	Good.
Autumn Delight	2	5	Good. Nice texture
Goodland	1	3	Good quality
Minn 447	3	3	Good. Unique flavor
Misty Rose	3	3	Fair. Tart.
R64711	4	3	Poor. Small fruit
R76731	1	3	Fair. Juicy, crisp.
Trail	2	3	Good. Sweet
Carlos Queen	2	4	Poor. Small fruit
Festive Treat	4	2	Good. Balanced acid
SK08-16	1	3	Fair. Tart
Granny Annie	3	2	Fair. Tart
Prairie Sensation	3	2	Good
Profilic	4	2	Poor. Small fruit
SK81-69	5	2	Poor. Small fruit. Unique flavor
Brightness	3	1	Poor. Fresh astringent flavor. Small fruit
Kerr	4	1	Poor. Small fruit. Unique flavor
Patience	2	1	Fair. Tart
Prairie Rose	3	1	Very tart

Table 1. Acid, Sugar, and Tannin contents of apples grown in BC in 2011 for use in fermented cider

Cultivar	Collection Location	Juice Yld % w/w	% Tannin (Lowenthal- Permanganate)	MCP Tannin (mg/L)	pH	TA (%Malic acid)	Soluble Solids (Brix)
Blauchner	Keremeos	37.2	1.1	32.3	3.1	0.68	14.7
Brown's Apple	Summerland	65.4	2.0	33.8	3.12	0.69	15.1
Dabinett	Summerland	75.1	0.8	21.1	3.26	0.47	15.3
Dabinett	Keremeos	71.2	1.4	47.2	3.45	0.35	13.1
Kerrmerian	Summerland	73.4	0.9	58.9	3.15	0.64	14.8
Kingston Black	Summerland	-	0.8	75.7	3.29	0.49	15.5
Michelin	Summerland	41.7	1.3	150.2	3.71	<0.21	13.2
Michelin	Keremeos	38.9	0.9	60.63	3.69	0.25	13.4
Saurgrau	Keremeos	54.0	1.4	83.8	3.33	0.5	13.3
Yarlington Mill	Summerland	43.3	2.0	271.7	3.7	<0.21	12.9
Average		55.7	1.3	84.5	3.38	0.45	14.1

Other activities

2



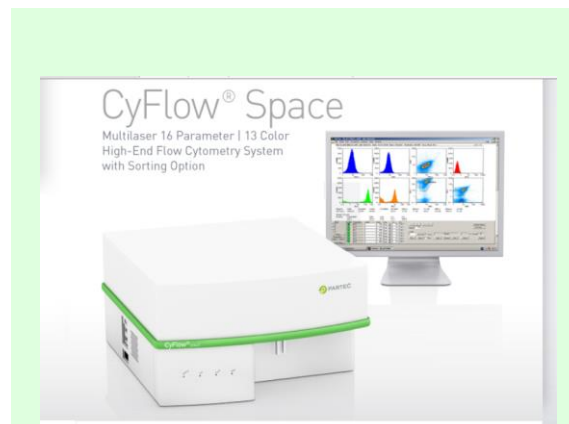


New Freeze drier

Fast prep of fruits
 for nutraceutical
 testing



Hazelnut Breeding



Flow Cytometer Uses

- Seedless grapes
- Haskap Breeding
 - Using wild relatives
 - Larger and later ripening fruit
- Larger Saskatoons?
- Sterile ornamental trees
- Coleus Breeding



www.fruit.usask.ca

