

Blue Honeysuckle: A New Berry Crop for North America

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Abstract

Cultivars of blue honeysuckle, *Lonicera caerulea* L., have been recently introduced into North America from Russia. In addition, wild material has been collected from Russia, Japan and China and is now preserved at the United States Department of Agriculture, Agricultural Research Service, National Clonal Germplasm Repository (NCGR) in Corvallis, Oregon. Blue honeysuckle has potential as a commercial berry crop for northern latitudes. Russian cultivars were released in the 1980's and 1990's and are now available in North America. These cultivars bloom and ripen early in the season, and can yield between 2 and 3 kg/plant. The berry shape is similar to an elongated or cylindrical blueberry and the fruit flavor ranges from tart sugar/acid to bland. The fruit varies from about 1 to 2 g/berry, has high Vitamin C levels, and high antioxidant content. This crop could provide an additional opportunity for small fruit growers in high latitudes and colder climates to diversify their production for high-end specialty crop markets.

Introduction to Blue Honeysuckle

Lonicera caerulea L., the blue honeysuckle, a berry crop suited primarily for high latitudes and colder climates, has been recently introduced into North America. The genus *Lonicera*, family *Caprifoliaceae*, is widely known as an ornamental shrub (3) with small globose, usually yellow to red colored fruit. In contrast, *L. caerulea* has potential as a commercial, cultivated small fruit crop. Its fruits are edible, dark blue, and elongate with an irregularly cylindrical- or torpedo-shape. Many fruits have a waxy bloom on the skin. This fruit, when cultivated, can grow to more than 2 cm long and weigh more than 1.5 g/berry (6). Development of this crop first began in Russia in 1913 to 1915. The cultivation of blue honeysuckle in home gardens and commercial fruit plantings has increased across Northern and Central Russia since the 1950's (6), and is now recognized beyond Russia's borders in Europe and North America.

Fruits of this species were gathered from native stands by the Ainu People (who called it "haskap" or alternative transliterations of

"haskup", or the Japanese form "haskappu") on the Kamchatka Peninsula, the Kurile Islands and Yezo (the island now known as Hokkaido). Japanese scientists began breeding and improving cultivation of this crop for commercial production on Hokkaido (8) but have reduced their efforts due to funding issues. In Northeastern China, the fruits are gathered from the wild in Heilongjiang (6, 9). The Chinese extol the health benefits of the berry and process these wild-collected fruits into juice.

In the 1920's, some seed of *L. caerulea* var. *pallasi* (Ledeb.) Cionovskis were introduced to the Agriculture Research Station in Beaver Lodge, Alberta, Canada, from Russia (9). The cultivars, 'Georges Bugnet' and 'Julia Bugnet' were selected and introduced from this lot. Canadian nurseries have sold seedling plants from these cultivars. Unfortunately, the fruits of these Canadian cultivars are small, bitter, and the plants are low yielding. More recent blue honeysuckle cultivars selected from other subspecific taxa of *L. caerulea* are much improved and replace these early types (1, 9).

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During the past six years wild and cultivated genetic resources of this species have been introduced into North America from native localities and from research programs in Northeastern China, Northwestern and Siberian Russia, and Hokkaido, Japan (9).

Although blue honeysuckle was first reported as a horticultural plant in 1894 (6), and the first attempts for domestication in Northern and eastern Russia occurred in 1913 to 1915, more extensive breeding work only began in the 1950's at the N. I. Vavilov Research Institute of Plant Industry in St. Petersburg and the Siberian Horticultural Institute at Barnaul (6). The first three Russian cultivars resulting from this effort were introduced from St. Petersburg in 1980. In the mid-1980's, Professor Dr. Maria N. Plekhanova (now deceased), formerly Head of the Fruit Crops Department, Vavilov Research Institute of Plant Industry (VIR) in St. Petersburg, assumed the responsibility of breeding blue honeysuckle. During the past 25 years, the VIR stations in Russia have released more than 68 cultivars. At least 60 of those have been commercially produced. Russian nurseries produce and sell many plants for home gardens. Commercial plantations in western Siberia ranging from 10 to 25 hectares (25 to 62 acres) have now been planted (6).

This manuscript will focus on some Russian cultivars released by the VIR in St. Petersburg in the 1980's and early 1990's. These cultivars have been donated to the United States Department of Agriculture, Agricultural Research Service, National Clonal Germplasm Repository (NCGR) in Corvallis, Oregon, and are now available in North America.

Background and Genetics

Beginning in 1976, the St. Petersburg VIR Fruit Crop program began to examine the genetic diversity of several subtaxa in *Lonicera* L. subsection *Caeruleae* Rehd. More than 156 natural populations of blue honeysuckle were surveyed and collected

in the North and European part of Russia, Siberia, Transbaikalian Region, and the Far East (6). Species collected and examined included the diploid ($2n = 2x = 18$) *L. iliensis* Pojark., *L. caerulea* var. *edulis* Turcz. ex Herder, and *L. boczkarnikowae* Plekh., and the tetraploid ($2n = 2x = 36$) *L. caerulea* L. Of this germplasm, only specimens of the tetraploid *L. caerulea* have proven useful for domestication (6). In Russia, *L. caerulea* is endemic to the Kurile Islands (*L. c.* var. *edulis* Turcz. ex Herder), the Kamchatka (*L. c.* var. *kamtschatica* Sevest.) and Kola Peninsulas, Okhotiya, Yakutia, Sikhote-Alin, Sayany, and Altai Mountains (*L. c.* var. *altaica* Pall., along the lower Amur River, along the Ob River with its tributaries in the Urals, and in the Pechora and Severnaya Dvina Valleys (6). This species is also found on Hokkaido, Japan, in Heilongjiang Province, Northern China, and in Tajikistan, Kyrgyzstan, and Kazakhstan. In Europe, it occurs rarely in the Alps and Scandinavia. This species has been naturalized in North America (3).

In Dr. Plekhanova's breeding program, wild populations of *L. caerulea* from Kamchatka, the Kurile Islands, the Maritime Provinces, and the Altai Mountains were preferred in crosses (Table 1). Seedlings were selected according to the program priorities of high productivity, increased depth of dormancy, increased berry size, and high fruit content of ascorbate and other bioactive flavonoids. One genotype of *L. caerulea* var. *kamtschatica* Sevest. was the maternal parent for many named cultivars including: 'Sinyaya ptitsa' (translation: blue bird), 'Goluboye vereteno' (translation: light blue or sky blue), 'Fialka' (translation: violet, as in the flower), and 'Morena' (5).

Plant Description and Phenology

Native *L. caerulea* plants grow from 0.8 to 3.0 m tall and the branches are dense, with up-right growing to spreading habit. Under cultivation the plants grow 1.0 m wide to 1.8 m tall by 1.5 to 2.0 m within 10 years (6). Leaves are opposite, entire, dark green, lanceolate to

Table 1. Endemic location in Russia, and qualities of the blue honeysuckle seedlings².

Location	Seedling characteristics
Kamchatka Peninsula	Winter hardiness, large fruits, sour-sweet taste, high ascorbate.
Kurile Islands	Deep dormancy of buds, winter hardiness, large fruits, high ascorbate, late maturing
Sikhote Alin / Maritime	Early ripening, high yielding, high bioactive polyphenolics.
Altai and Sayan Mountains	High yield, non-shattering, drought resistance
Northern Europe	Deep dormancy, winter-hardiness, non-shattering.

²Information compiled from Plekhanova (5, 6) and Thompson and Chaovanalikit (9)

elliptical, and can be pubescent or glabrous. Flowers are about 2 cm, light yellow, and tubular to funnel-shaped.

Blue honeysuckle plants can survive a mid-winter minimum temperature of -46 °C without damage (5) allowing cultivation of the crop even north of the Arctic Circle where open ground is accessible. Notwithstanding this cold hardiness, the buds have a very short chilling, i.e., rest, requirement. In St. Petersburg, rest is satisfied by late October or early November (6). Because of this, in climates where fluctuating temperatures occur in the fall, secondary flowering may occur after leaf drop (9). After rest is broken the buds are ready to begin flowering as soon as the air temperature increases. In St. Petersburg and other northern latitudes, cold temperatures keep the plants dormant until spring. In climates such as Oregon where temperatures fluctuate, the mixed and vegetative buds of the Russian blue honeysuckle cultivars are subject to loss of their cold hardiness after rest has been satisfied, even though the plants remain dormant prior to bud break. These buds can be injured or killed at this stage (9). The dead buds do not break in the spring. Flowering period tends to be early relative to other fruit crops but is variable depending on spring air temperatures. Year to year differences can be as much as 1 month at a given site. In Corvallis, blooms occur about one month before those

on plants in Sandpoint, Idaho (Thompson, per. comm.) Blooming flowers are cold hardy and have survived -7 °C in Canada (1), -8 °C in Russia (5), or -10 °C in Hokkaido (9) without damage. Growing vegetative buds and young stems, however, are less hardy at this stage than are the blooming flowers.

Blue honeysuckle fruit ripen very early, usually two weeks prior to strawberry ripening in St. Petersburg (6) and in Saskatoon, Canada (1) or with the earliest of strawberries in Oregon.

Plants can begin fruiting within one year after planting and 300 to 500 g of fruit per plant can be obtained within three years. Maximum yield between 2 to 5 kg per plant (Table 2) are obtained at maturity. Blue honeysuckle plants are long-lived and can survive 25 to 30 years (5).

Fruit Quality and Characteristics

Blue honeysuckle fruit shapes are variable within the species. Fruit of the cultivars of continental origin tend to be cylindrical with irregularities toward the apex. Others are jug-shaped, sickle-shaped or pyriform. Some island types tend to be tapered at both ends like a torpedo. Fruits of other genotypes are more ovoid than elongate. This shape is a priority goal for recent blue honeysuckle breeders.

The fruit flavor in different genotypes ranges from bitter, very sour, slightly sour, mild or

Table 2. Selected blue honeysuckle cultivar releases from St. Petersburg available in North America².

Cultivar name	Release year	Ripening date	Yield kg/plant	Fruit size g/berry	Ascorbate mg/100g frt
Amfora	1997	22 June	2.2	1.25	59
Desertnaya	1987	28 June	2.5	0.94	83
Fialka	1992	26 June	2.0	1.16	45
Morena	1992	18 June	2.3	1.07	54
Nymfa	1993	21 June	2.8	1.04	52
Pavlovskay	1987	22 June	2.5	1.32	68
Viola	1995	19 June	2.8	0.97	61

²Information from Plekhanova (6)

neutral to tart-sweet (9). Some describe the flavor as blueberry-like; others describe it as having a “hint of black currants” (1). Early cultivars were frequently bitter. Breeders are now selecting for tart-sweet types as a priority. The seeds are of inconsequential size and are not noticeable during eating.

Dr. Plekhanova bred fruit for high ascorbate and bioactive flavonoid content (Table 2). The Russian cultivars ranged from 45 to 93 mg of ascorbic acid/100g fresh fruit in her analysis and have high antioxidant capacity (Table 2). Thompson and Chaovanalikit (9) reported comparable or higher total anthocyanins, total phenolics, oxygen radical absorbing capacity (ORAC) and ferric reducing antioxidant power (FRAP) in Sinyaya Pititsin (Blue Bird), Zarnitsa and Magadan than were observed by Moyer et al. (4) in the highbush blueberries *Vaccinium corymbosum* L. ‘Blue Crop’ or ‘Duke’ (Table 3).

Cultural Requirements

Blue honeysuckle cultivars are self-incompatible and require other pollinizer genotypes for cross-pollination (5). Bumblebees and honeybees are the pollinators. Blue honeysuckle has sweet nectar with April or May flowers and can draw the pollinators

providing that that weather allows the insect flight.

Blue honeysuckle does not require specific soil types. Soil pH may vary from 5 to 7. Organic content should be high; mulches and organic fertilizers can assist in mineral soils. These plants thrive on moist soils but not in standing water or swamps. Open, sunny fields produce the highest yielding plants. Fall is the best season for planting in higher latitudes. Spring planting can be done in milder climates.

Clones can be propagated by softwood cuttings, hardwood cuttings, crown division, and tissue culture (5). Seed propagation is used for breeding. Germination of fresh seed was comparable to that stratified for 6 weeks to 3 months (9).

Trial plantings of blue honeysuckle in the mid-western United States were extremely susceptible to leaf blight, caused by *Insolibasidium deformans* C. J. Gould Oberwinkler and Bandoni formerly known as *Herpobasidium deformans* C. J. Gould (2). The host range of this disease is limited to members of the Caprifoliaceae, the honeysuckle family. This disease is widespread in 14 North Central and Northeastern States (7). Some Native American and Asian *Lonicera* are resistant to

Table 3. Average total anthocyanin mg/100g (ACY), average total phenolics mg/100g (TPH), oxygen radical absorbing capacity (ORAC) umols TE/g, and ferric reducing antioxidant power (FRAP) umol/g In some blue honeysuckle (*Lonicera caerulea* L.^z) and blueberry (*Vaccinium corymbosum* L.^y) cultivars.

Plant name	ACY	TPH	ORAC	FRAP
<i>L. caerulea</i> cv.				
Zarnitsa ^x	338.3	967.5	51.7	80.5
Sinyaya ptitsa ^x	172.5	465.8	32.0	44.5
Magadan ^x	122.2	440.3	18.4	38.4
<i>V. corymbosum</i> cv.				
Bluecrop	84.0	304.0	50.0	34.4
Duke	173.0	274.0	32.6	42.3

^z Information from Thompson and Chaovanalikit (9)

^y Information from Moyer et al. (4)

^x 'Zarnitsa' is marketed in the US as 'Blue Lightning'®

'Sinyaya ptitsa' is marketed in the US as 'Blue Bird'®

'Magadan' is marketed in the US as 'Blue Forest'®

this disease, but most species of honeysuckle are susceptible.

Plant Availability and Future Possibilities

More than 8 North American woody plant nurseries now sell blue honeysuckle plants (10). While "blue honeysuckle" is the preferred common name for the species, the plants are also referred to as "fly honeysuckle," "blue-fly honeysuckle," and recently marketed as "honeyberry." The NCGR in Corvallis, Oregon, preserves the genetic resource collection of edible fruited *L. caerulea*. Plant material (Table 2) is available for research on request from the curator.

Cultivars selected in continental Russia may be adapted in northern latitudes, however, they do not perform as well in Oregon as do selections from the Kurile Islands or Hokkaido (9). Blue honeysuckle breeding programs in Oregon and Idaho are now testing advanced selections for these milder climates. Their breeding priorities are to produce plants

that avoid winter or spring injury, are high yielding, have upright growth habits that would support machine harvestable fruit, have more simultaneous ripening, and have fruit with a uniform shape with high levels of health-promoting compounds. New American releases should be available within the near future (Thompson, per. comm.).

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CALL FOR WILDER SILVER MEDAL NOMINATIONS

The Wilder Committee of the American Pomological Society (APS) invites nominations for the 2006 Wilder Silver Medal Award. All active members of APS are eligible to submit nominations. The award was established in 1873 in honor of Marshall P. Wilder, the founder and first president of APS. The award consists of a beautifully engraved medal which is presented to the recipient at the annual meeting of APS, held during the ASHS annual meeting.

The Wilder Medal is presented to individuals or organizations that have rendered outstanding service to horticulture in the area of pomology. Special consideration is given to work relating to the origination and introduction of meritorious fruit cultivars. Individuals associated with either commercial concerns or professional organizations will be considered if their introductions are truly superior and have been widely planted. Significant contributions to the science and practice of pomology other than through fruit breeding will also be considered. Such contributions may relate to any important area of fruit production such as rootstock development and evaluation, anatomical and morphological studies, or noteworthy publications in any of the above subjects. Information about the award, past recipients, etc. can be found on the APS website at <http://americanpomoloical.org/wilder1.html>

To obtain nomination guidelines, please contact committee chairperson, Dr. Douglas Archbold, Department of Horticulture, University of Kentucky; phone: 859-257-3352; fax: 859-257-2589; e-mail: darchbol@uky.edu

Nominations must be submitted by May 1, 2006