Propagation, Management and Adaptation of the Blue Honeysuckle©

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***Lonicera caerulea*, commonly known the blue honeysuckle, honeyberry, or haskap, is a novel fruit crop in North America, but interest as a backyard and commercial crop is rising. Since little agronomic research has been conducted to date, there are few scientifically validated recommendations on propagation, cultivar management, adaptation, and performance. Therefore, horticulturists rely on the experience of individuals as a starting point to propagate, grow, and manage blue honeysuckle taxa in disparate production regions. Four years of horticultural experience with 184 genotypes in British Columbia's Fraser Valley is described.**

INTRODUCTION

The blue honeysuckle (*Lonicera caerulea*) is an edible, blue fruit borne on a woody perennial shrub in the Caprifoliaceae family (Plekhanova and Sokoleva, 1992). In the wild, it is distributed across most of the arctic and boreal belt of the Northern hemisphere (Rudenberg and Green, 1969). Blue honeysuckle was first bred as a commercial crop in Russia in the 1950s and 60s and separately in Japan in the 1970s (Plekhanova, 2000). Currently, breeding efforts in North America are centered in Saskatchewan, Canada and Oregon, USA. In Saskatchewan, genetic material from Russia (var. *edulis* Turcz. and subsp. *kamtschatica* Sevast.) and the Kuril Islands (uncharacterized subspecies) have been used to produce hybrid commercial cultivars adapted to cold climates similar to the native ranges for these subspecies groups. More recently, genetic material from Canada (subsp. *villosa* Michx.) and Japan (subsp. *emphyllocalyx* Maxim.) has been integrated into these breeding efforts. In Oregon, Japanese genetic material is the primary focus of genetic improvement for more moderate climates when compared with the Russian material (Thompson, 2006b).

The small blue "berries" of the blue honeysuckle are actually multiple accessory fruit. Specifically, the ovaries of the two yellow flowers are enclosed in a copula by four bractlets to form a berry-like accessory fruit (Rehder, 1909). The skin of this fruit is heavily pigmented by anthocyanins; fruit shapes are highly variable, often being oblong, oval or jug-shaped; fruit weight ranges from 0.4 to 2.0 g in taxa from Russia and Japan; and fruit flavor ranges from sweet-sour to sour or even bitter (Plekhanova, 2000; Thompson, 2006b).

Foremost of its attractive features as a crop are: 1) the potential human health benefits of its abundant antioxidants, 2) early fruiting before even strawberries in most environments, 3) unique flavor profile and high acid, and 4) its range of end-uses as a fresh, frozen, or processed product due to its heavy pigmentation. Most genetic resources for this crop are adapted to cold, northern climates such as Siberia, but planting in North America now extends into relatively warmer climates. For example, interest is mounting in planting the blue honeysuckle in the Fraser Valley, British Columbia on the Pacific coast of Canada. Stemming from horticultural experience gained through evaluation of 184 taxa of blue honeysuckle in the Fraser Valley, the following are some general guidelines for propagation, management and crop adaptation that can be of applied to a range of production regions.

PROPAGATION

In general, the blue honeysuckle is a plant that wants to grow. This statement can be liberally applied to vegetative propagation, growing out in pots and field production. Therefore, conventional wisdom for rooting of cuttings is largely sufficient to propagate the crop and can be used to direct experiments.

As an easy-to-root species, vegetative propagation can be achieved using a broad range of stem types and sizes, with or without application of hormones or wounding. Soft, spring growth can be used to produce stem cuttings within a couple weeks of bud break as long as the tissues are firm enough to remain turgid on the mist bed. As stems begin to harden toward the end of vegetative growth, time to rooting tends to lengthen and rooting percentage begins to drop. Once stems are woody and apical buds have formed, rooting becomes considerably more difficult. As for other ornamental species with providence farther north than their target environment, growth over the longer, warmer summers of lower latitudes tends to result in sun-scalding of leaves and recalcitrance to vegetative propagation. Therefore, it is preferable to take vegetative cuttings before growth cessation and certainly before the cumulative effects of long summer days become noticeable.

Hardwood cuttings are mentioned in the literature as the standard Russian approach to propagating large quantities of blue honeysuckle (Dziedzic, 2008). This consists of harvesting stems from dormant plants, sticking them in sand or soil in an outdoor cold frame and waiting for them to root in the spring. As well, tissue culture is widely used to propagate large numbers of plants, with each nursery and researcher tailoring their protocols to specific cultivars. There are numerous accounts in the literature describing tissue culture experiments, but no comprehensive study or review to this author's knowledge.

MANAGEMENT

Plant growth habits range from a low-growing dome to an upright, narrow vase, depending on the genetic heritage. No matter the plant shape, planting in perennial rows is the most efficient means of establishment. Spacing at 3-4 ft between plants is recommended, depending on the growth habit of the cultivar. Nine to ten ft between rows is likely as dense a planting as can be achieved while permitting tractor movement within the field. Greater spacing may be required to permit movement of bulky harvesting equipment.

Management of a blue honeysuckle planting can easily be modeled after that of a high-bush blueberry, but is easier to achieve since the crop grows well over a broader soil pH range and has even more vigorous vegetative growth. Generally, fertile soils with adequate drainage are better than mineral and/or poorly drained soils. A raised bed can be used to keep the majority of the roots out of standing water and drip-line irrigation can be used to maintain adequate soil moisture throughout the growing season. A sawdust mulch or weed-mat can be used to effectively limit weed growth around plants within the row. The use of a perennial grass row cover is likely the most efficient means of controlling weeds between the rows, limiting mud and dust and providing a level surface for tractor and foot traffic.

Some accounts indicate that fertilizer application should be limited, but no scientific evidence has been found to support this recommendation. To the contrary, the plants respond well to a generous spring dose of slow-release nitrogen as part of a complete macronutrient and micronutrient fertilizer. Application of comparable amounts of fertilizer to what is recommended for high-bush blueberries of the same size has resulted in no signs of deficiency or excess.

Pruning should be conducted during the dormant season with renewal pruning as the general strategy. Younger wood tends to bear the most fruit, so removal of old branches on a regular basis permits growth from dormant buds at the base or on lower branches. Twiggy growth with short internodes indicate under-pruning and is likely associated with lower fruit production in a mature planting.

Though a small degree of fruit set is observed in the absence of cross-pollinating cultivars, the crop is largely an out-crosser, requiring compatible pollinizers (Plekhanova, 2000; Thompson, 2006a). Appropriate pollinizer cultivars must be determined based on cross-compatibility studies, but also depends on overlapping bloom periods in the target environment. To minimize the risk of poor fruit set, interplanting of multiple cultivars is recommended. Planting more than one cultivar in a single row poses challenges for management of plant growth habit as well as harvesting. There is no scientific evidence to indicate that different cultivars should be planted in the same row to affect cross-pollination, so these management problems can be avoided.

Several accounts indicate that suitability for low-input or organic production are advantages of the blue honeysuckle. There is no scientific evidence behind this claim and abundant experiential evidence to the contrary. First, it usually takes just a few years for pest and disease issues to arise in an area planted with a novel crop. In the Fraser Valley, pests such as aphids, mites, leaf rollers and voles have been observed to cause considerable damage to blue honeysuckle plants. Likewise, diseases such as powdery mildew and botrytis fruit rot are prevalent. The degree to which these issues are of agronomic importance varies based on the cultivar and production region. Second, it has been observed that low levels of fertilization result in reduced vegetative growth as well as reduced fruit yields. Therefore, management of the blue honeysuckle under a low-input or organic approach should not be assumed as an advantage over other crops.

In the future, experimental validation of each aspect of these horticultural management guidelines should be tailored to key cultivars over a range of production regions. This is because management practices are highly dependent on the interaction between genetics and the environment.

ADAPTATION

Crop phenological response to a target environment depends largely on how the climate of that environment differs from that of the crop's provenance. The genetic lineage of a particular cultivar is the primary determinant of its adaptation. Across a range of production environments, the Russian cultivars are known to break bud, bloom, and fruit the earliest; the Kuril cultivars have the latest phenology; and the Japanese types are somewhat intermediate. Most types fruit earlier than even strawberries.

Cold hardiness is generally not an issue in temperate climates since most blue honeysuckle types can withstand temperatures of -40°C or lower (Sabitov et al., 2007). On the other hand, when grown in warmer climates than that of their origin, it is the more northern adapted cultivars that tend to sustain winter damage. This is due to active growth during the winter months in response to temperatures that alternate above and below zero.

Similarly, the productivity of blue honeysuckle in warmer climates depends on whether pollinators are active during the bloom period. This is a particular problem for cultivars that are adapted to the coldest environments and, therefore, have the earliest spring phenology. In these cultivars, some fruit will set with little pollinator activity, but optimal yields are dependent on adequate cross-pollination via insects.

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QUESTIONS AND ANSWERS

David Cain: Do you know what kind of compatibility there is among the various groups? What about self-incompatibility?

Eric Gerbrandt: It is a gametophytically self-incompatible crop. Beyond that there has been no work on compatibility groups. It is recommended to plant 2-5 cultivars in proximity to one another to obtain adequate fruit set.

Katreen Gradowski: We tried growing just one plant and it did produce fruit.

Eric Gerbrandt: Yes, you will get some fruit set from an individual plant, but to get optimum yields outcrossing will be necessary.