Journal of the American Pomological Society 60(4):164-168 2006

Introducing Haskap, Japanese Blue Honeysuckle

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Abstract

Haskap is a unique form of blue honeysuckle (*Lonicera caerulea* L. var. *emphyllocalyx* (Maxim.) Nakai) that has exceptionally fine edible berries. It is native to Hokkaido and northern Honshu in Japan, has only recently been domesticated, and is virtually unknown outside of this region. Research and development of this berry industry in Japan is summarized. Bush and berry characteristics are described. Haskap seeds were introduced to Oregon in 2000, and resultant seedlings have been evaluated in western Oregon and northern Idaho. Plants are environmentally adapted in both locations. With selection of superior cultivars in the current Oregon breeding program, there is excellent potential to develop a new berry crop for this region.

Introduction

Haskap, Japanese blue honeysuckle, (*Lonicera caerulea* L. var. *emphyllocalyx* (Maxim.) Nakai) is a high quality berry bush native to Hokkaido, Japan and little known outside of this region. I have been unable to find any reference to its being introduced into North America prior to 2000 when I visited Hokkaido to collect seeds and brought them to Oregon. I became acquainted with haskap through a gift of a single plant from Lon Rombough of Aurora, Oregon. He had received it from a Japanese contact and, knowing that I was interested in blue honeysuckle, he offered it to me. The following spring, I observed that this plant bloomed one month later than the Russian blue honeysuckle varieties under study (*L. caerulea* vars. *kamtschatica* (Sevast.) ex Pojark, *edulis* Turcz ex Freyn, *boczkarnikovae* Plekh. and *altaica* Pall. Because early blooming is a major limiting factor for successfully growing Russian blue honeysuckle plants in moderate, temperate climates, this source of late blooming appeared to offer promising genetic material for developing cultivars adapted to these conditions. Therefore, I planned a trip to Japan to obtain additional haskap germplasm. Dr. Keiko Kuroda at the Hokkaido Forestry and Forest Products Institute in Sapporo kindly agreed to arrange a program for me in Hokkaido, the center of haskap cultivation. The plan included visits with Dr. Mutsumi Takahashi and Dr. Shizuyuki Tanaka, both former haskap researchers, who were extremely helpful and who provided much of the information reported herein. Dr. Kuroda and Mr. Sanada also took us to the Yufutsu Plains, the region where wild populations are located.

The name “haskap’ (transliterated variously by the Japanese as hasukappu, hascup, haskappu,and hasakapu) is the name applied by the Ainu, the indigenous people of Hokkaido, and is currently used by the Japanese industry. It means “many fruits on branches”. This berry was an important part of the diet of these hunter-gatherer people, not only as one of the few fruits available but also they recognized the healthful benefits and treasured it as “the elixir of life”. Berries were used for both fresh consumption and preserved in salt or sugar and in alcoholic beverage for winter usage.

L. *caerulea* var. *emphyllocalyx* represents one component of a polymorphic, circumpolar species complex that belongs to the subsection Caeruleae of the genus *Lonicera* in the family Caprifoliaceae. Members of

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Acknowledgements: I gratefully acknowledge the assistance of my Japanese hosts, Dr. Keiko Kuroda, Dr. Mutsumi Takahashi, and Dr. Shizuyuki Tanaka, who were so generous with their time to share their experiences and knowledge and to assist me in haskap seed collection.

this subsection are called, collectively, blue honeysuckle because of their blue fruits, some of which are not only edible but exceptionally tasty. In the 1950's, Russian scientists began an extensive program to collect and evaluate outstanding plants of the widely distributed varieties *kamtschatica* in northeastern Russia and *edulis* that ranges from southeastern Russia to Central Siberia. Over the past several decades Russian scientists have released over 100 cultivars. These berries are much appreciated in Russia and plants are widely grown in northern regions of that country both in home gardens and in commercial plots. Hummer (1) described this domestication program and current industry. By contrast, the variety *emphyllocalyx* has a very limited distribution of wild plants. It has been domesticated quite recently, and only a very small area is currently under cultivation.

L. c. var. *emphyllocalyx* is quite distinct from the Russian forms not only in morphology but also in ecological characteristics. Its range is limited to a few locations along the southern coastal region of Hokkaido and northern Honshu. The climate there is relatively cool in summer due to fog from the sea and rather cold in winter, but with little snow. Formerly, the area called the Yufutsu Plains in the moist, lowland region near Tomakomai City on Hokkaido was famous for its abundant haskap bushes with high quality fruits. Annually, many people came from miles around to harvest these wild berries. However, in the 1960's to 1970's, much of this region was drained by the Eastern Tomakomai Development Project and the population of haskap bushes has greatly diminished (6). This decline in wild plants stimulated the first efforts by two different organizations to domesticate haskap. In 1967, the Hokkaido Prefectural Agriculture Experiment Station transplanted 60 selected wild bushes from the Yufutsu Plains to the Station, evaluated them for several years, selected the best few for regional trials, and in l992 released the first cultivar 'Yufutsu' (9). This selection and breeding program at the Agriculture Station was discontinued in 1993 due to low priority in a period of economic decline. In l975, a local farmers' cooperative and the city of Chitose also began a program to select outstanding bushes from the wild and propagate these for distribution to farmers (6). Their goal was not only to save the haskap plants but also to develop an alternate, high value crop for abandoned rice paddy fields. Currently, Hokkaido University has an active program for evaluation of haskap selections from wild populations. The goal is to identify elite forms to use in breeding for superior cultivars that will be profitable for the industry (8). Commercial production of haskap, using both 'Yufutsu' and several numbered selections, began in 1973 and gradually increased to 169 ha in 1991 (7). Major regions of cultivation are near Chitose, Bibai and Atsuma cities. During this period, the Chitose Cooperative and some private businesses were very creative in developing and successfully marketing an array of high-value processed products. Unfortunately, although the berry is much appreciated by consumers, haskap production has steadily declined since 1991 because of the high labor cost for hand-harvesting. The few shake and catch methods tried have been unsuccessful. Therefore, many of the remaining farmers have U-pick operations. Currently, because of successful promotion and great appreciation of the tasty haskap processed products, there appears to be more demand than product in Japan. In the Chitose airport there is a Haskap Shop that sells a wide array of products. Food items include several kinds of candies, some mixed with chocolate, baked products such as fruit cake, tarts and berry bars, jam, jelly, gelatin, juice, juice concentrate, soda pop, several types of wine, ice cream, yogurt, noodles, chewing gum, canned fruit,

syrup, toppings, and tea. Flavors imparted to these items are pronounced and pleasant. Also, non-food items picturing haskap berries, including printed table cloths, cups, doilies, T-shirts, etc., are available at this shop.

Characteristics of plants

Plants are long-lived, deciduous shrubs that may reach more than 2m in height and width. Growth habit varies from very upright to very spreading, or drooping. Bushes can be kept in good production for many years with renewal pruning where old shoots are thinned annually to stimulate new replacements. In their native region, the usual winter minimum temperature is -25° C so dormant bushes are cold-hardy. The Japanese claim that flowers can withstand temperatures of -10° C at full bloom, so spring frosts are not a hazard.

Leaves are opposite, simple, elongate or lanceolate. In each leaf axil, usually 3 buds form in a series, one above the other. When growth begins in spring, the lowest bud normally develops into a leafy shoot or (if a mixed bud) a shoot with pairs of flowers at the basal one to four nodes. Sometimes the middle bud also develops, giving rise to two shoots, both of which may have flowers. The highest buds remain dormant until subsequent years when they may give rise to vigorous shoots from lower down on older stems.

Flowers are pale yellow or cream-colored and relatively small compared to ornamental *Lonicera* species. Corollas are tubular, about 2 cm long with 5 lobes. Each flower appears to consist of a pair of corollas with a single ovary at their base. Actually, two adjacent ovaries are surrounded by fused bracts that form the outer part of the fleshy wall of a single fruit. Sometimes there is incomplete closure of these fused bracts at the apex so that the pair of ovaries is visible within the mature fruit, or sometimes bulge out causing a deformed fruit. Plants are mostly self-incompatible although some cultivars, for example, 'Yufutsu', have some self-fertility (9). When grown in isolation, this cultivar produces a relatively light crop of smaller-than-normal berries due to their having very few seeds. Well-pollinated flowers form larger fruits with up to 22 seeds. Seeds are small and soft and not objectionable when fruits are eaten. Plants bloom very early, (during March in western Oregon), often when temperatures are still quite cool. Therefore, because bumble bees (*Bombus* sp.) and mason, or blue orchard, bees (*Osmia* sp.) are active at lower temperatures, they are more effective pollinators than honey bees. The fruit development period is rather short, about six to eight weeks from blooming to mature fruits.

Plants are precocious: if grown vigorously in a greenhouse the first year, most plants will bear a few to several fruits the next year in the field. Mature fruit shapes are distinctly broader than Russian types (that tend to be long and thin); they are oblong, football-shaped, ovoid, cylindrical, jug-shaped, pyriform, and, less commonly, round. Fruit size ranges from 0.5g to over 2.0g. Fruit color ranges from deep purple to dark blue and berries are covered by a slight to heavy white, waxy bloom. Although basically soft, fruit firmness varies considerably, from so soft that fruits break down shortly after harvest to sufficiently firm to maintain their integrity for more than two weeks in cold storage. Pedicels may be so short that the closely attached fruits are difficult to harvest, or they may be longer than one cm. Berries may be so tightly attached to the pedicel that fruit is ruptured when harvested, or so loose that fruit falls prematurely. Optimum attachment is strong enough so many fruits remain on the bush until full maturity, and yet loose enough so fruits are easily harvested. Fruit flavor varies from mild, almost sweet, to slightly tart, tart/sweet, very tart, and a few are bitter. Overall haskap berries have a unique, pleasant flavor, especially pronounced and relished in processed products. One study of the chemical composition of berries indicates that haskap berries have high nutritional values (10).

Among six selections, vitamin C ranged from 34 to 64 mg/100 g, ºBrix values ranged from 12.5 to 17.2, pH from 2.67 to 2.88, calcium varied from 30 to 45 mg/100g, iron 0.38 to 0.78 mg/100g, potassium 170 to 233 mg/100g, and magnesium 8 to 15 mg/100g (10). Fruits mature very early, with or before the earliest strawberries (May to early June in W. Oregon). On a given bush, fruits mature over varying periods of time, from very short (a few days) to rather extended (up to 3 weeks), thereby requiring multiple harvests. Yield is influenced by the vigor of annual shoots, the number of mixed buds per shoot, the number of double shoots, the number of nodes with flowers on current year shoots, and the size of individual fruits.

Plants are relatively easy to propagate vegetatively, both by softwood and hardwood cuttings, or by micropropagation (4). Seeds usually germinate at a high percentage and no stratification is required.

In Japan, the two major insect pests are the celery aphid (*Semiaphis heraclei* Takahashi) whose sucking causes tight curling of young leaves and a scale (*Leucanium* sp.) that, when infestations are heavy, can greatly reduce the vigor and kill the plants unless control measures are initiated.(5). Other insects that occasionally cause some damage are several species of Tortricid leaf rollers (*Hemaris fusiformis affinis* Bremer, *Orgyia recens* Hubner, and *Apha aequalis* Felder) and the yellowish elongate chafer (*Heptophylla picea* Motschulsky), a weevil whose larvae feed on roots (2, 3).

In Japan, the only disease that is sometimes a problem is *Botrytis* sp. that affects both plants and fruit.

Conclusions

Most likely this tasty berry has not been introduced previously to North America for several reasons: its minor horticultural significance, its recent domestication, and its occurrence in a peripheral region to the main Japanese Horticultural Research Stations and fruit production areas where foreigners are more apt to visit. Haskap seedlings grown from seeds introduced to United States in 2000 are currently being evaluated in both the moderate climate of western Oregon and the colder region of northwestern Idaho. In both locations, plants are proving to be well-adapted; bushes grow vigorously and are productive. A breeding program is underway to develop cultivars that are high yielding and have high quality fruits that will form the basis for a new berry industry. Selection of bush forms suitable for blueberry mechanical harvesters will obviate the problem that limits the Japanese industry; that is, the high cost of hand-harvesting. With the unique new flavors, haskap berries will fill a niche market for high-value, specialty processed products. The progress of the breeding program will be described in a separate publication.

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