Haskap: An Introduction to the Fruit, Its Health Benefits, and Marketing Possibilities

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Contents

Hypothesis

The new fruit variety, haskap, will succeed because of the many health benefits that it possesses, such as: antioxidants, ascorbic acid, phenols, and minerals.

Purpose and Scope

The purpose of this project is to research haskap for the health benefits and marketing capabilities that it possesses.

Abstract

Haskap, Lonicera Caerulea, is a new fruit variety with many health benefits. In my research I found high levels of antioxidants that are equal to and higher than many medicinal plants in use today. It has also been found to be high in phenol content but there is relatively low ascorbic acid and mineral content. This fruit, being unknown on the market, is a new commodity that many people have been awaiting. Haskap will truly be the new fruit of the future.

Background

1. Metabolism

A. Metabolism

Metabolism refers to the breakdown of the food we ingest. Once these food particles are sufficiently broken down, they can be absorbed across the membranes of our cells and used for cell maintenance and energy production.

The metabolic process also produces a variety of molecules that share the characteristic of having a single, unpaired, negative electron at their outer-most layer. This group of molecules has been named, free radicals.

B. Free Radicals

Free Radical Theory was first proposed by Denhan Harmon in the 1950's. However, even today it is not fully understood and remains an area of intense research. It is hypothesized that most free radicals do damage to normal cell components by trying to bond with them because of their negative charge. It is thought that this degradation leads to aging and being overly-prone to various diseases, including certain cancers.

C. Oxidation

One of the reducing agents used in the metabolism of our food is oxygen. (It is foundational in cellular respiration, glycolysis, the citric acid cycle, and the Kreb's cycle.) The presence of oxygen also joins with elements in our bodies to produce unwanted free-radical molecules. This process is called oxidation and is typified by rust on metal.

D. Antioxidants

Our bodies use other molecules to contain this unwanted oxidation. Vitamins C and E are both compounds that regulate unwanted oxidation. These are known as antioxidants. Antioxidants are capable of slowing or preventing the oxidation of other molecules. By doing this it is hypothesized that resistance to disease can be increased.

E. Phenols

Phenols are a group of compounds that have an affinity for binding to molecules that have negatively charged ions. Once they do this, then the molecule is neutralized and no longer causes cell damage. Free radicals are one such molecule that phenols may affect.

Technically speaking, antioxidants both prevent unwanted oxidation, as well as correct it once it has occurred. Therefore, phenols are antioxidants. But because phenols work to bind already oxidized free-radical molecules once they are formed, they deserve their own special category.

Some sources of phenols are: berries, tea, beer, red grapes, red wine, olive oil, chocolate, cocoa, coffee, walnuts, peanuts, borojo, pomegranates, yerba mate, and other fruits and vegetables. But the most abundant source that also has the most beneficial phenols is edible blue honeysuckle.

2. Lonicera Caerulea edulus – Edible Russian Blue Honeysuckle

Edible blue honeysuckle has five times the amount of phenols as does the previous food/fruit champion, blueberries. What this actually means is uncertain. Of the new variety of Russian blue honeysuckle that is recently released, there are so few berries that adequate research is yet to be done. And there is nothing more uncertain than the effect of ingesting phenols in additional quantities as to whether this will promote any added health benefit?

A. Fruit History

Lonicera Caerulea edulus is circumpolar in its distribution. Lonicera Canadensis is an edible blue honeysuckle that is native to the Canadian boreal forest. However, its fruit is unpalatable. Other attempts at breeding edible blue honeysuckles at Beaver Lodge, Alberta back in the 1960's focused on the ornamental value of the plant and also produced inedible fruit.

Some cultures, however, have cultivated edible blue honeysuckle for millennia. In the late 1990's Dr. Bob Bors of the University of Saskatchewan obtained plants from colleagues in the United States who had gathered some of these plants from Japan, Russia, and the Kuril Islands. Since then he has collected and produced the largest gene bank of Lonicera caerulea in the world. The first commercial varieties of these were released last year and were categorically named Haskap, the Japanese name for cultivated Lonicera caerulea edulus. This was done primarily in order to distinguish in the public's mind this truly good tasting fruit from its bitter forerunners.

B. Health Benefits

Haskap is not only a genuinely good tasting fruit(like a sweet blueberry x red raspberry), but it is also easily grown and harvested, has exceptional shelf life, and best of all **it has five times the amount of phenols that blueberries contain.**

Phenolic content is directly associated with color and flavour. The phenolic content of red wine, for example, comes during the winemaking process. Most varieties of red grapes have white meat. The redness and subsequent phenol content is produced when wine is allowed to ferment in the presence of its skin. The color is leeched into the juice. And with the color comes the phenols. Haskap, on the hand has a deep burgundy-colored meat. Phenol content with and without skins has not yet been analyzed.

C. Berry Uniqueness

The berries that are produced are special and unique with nothing else to compare with it. Also they produce early in the spring so it will give you the added berry when other plants are still not in season. Haskap is an extremely hardy plant. Being circumpolar it is found in northern countries were climate is extremely harsh at certain times throughout the year. There has been no winter damage recorded to date and leaving plants uncovered throughout the winter with temperatures down to -50 has proved to be no problem, they come back thriving in the spring. Haskap hardiness is not only the ability to withstand cold temperatures but it is also the ability to lie dormant until spring even when there is warm weather in the winter. There are two main groupings of Haskap, Russian and Japanese. These two types differ in taste, and how fast they come out of dormancy. Throughout the years these two categories have been crossed with each other to produce a better tasting, bigger, and overall better berry and plant.

D. Growing Haskap

Growing haskap is divided into three areas: plants, pests, and harvesting.

i. Planting

There are a few things to be aware of when planting haskap. Plants grow into a small bush. If a hedge is desired then plant 1 meter apart but it may prove harder to harvest. If planted a bit farther apart around 1.3 meters they should remain as individual bushes with some pruning in later years. When planting a haskap plant you should plant them 1-2+ inches deeper than what it had originally been. This helps to establish a deeper, stronger root system. Haskap can withstand a -7C freeze to an open flower without any damage. Many prarie and great plains soils will sustain Haskap but the best possible soil type is not yet known. However they are closely related to potatoes and tomatoes so possibly the same soil type will support haskap well. Finally have a clear area around the plant do not have grass or weeds growing right beside it. The plant will not get the needed moisture and will stunt the growth and berry production of the plant.

ii. Pests

There are relatively few pests when compared to other fruits but they can still greatly damage your crop for the year. Birds are the number one pest for Haskap. They love the berries and will eat the whole crop. It is recommended that netting be put over the growing area or else over every individual bush. Birds are the only pest thus far and there is only one disease but it is not threatening. It is powder mildew and does not start until July when it is substantially hotter and the berries are already harvested.

iii. Harvesting

Bushes will start to produce berries in their 3rd or 4th year. It will start with only a few kilos per bush but as the years pass the yield will increase to around 7 kilos. Usually in the 1st half of June the berries ripen and are purple inside and out. There are no harvesting machines made to specifically harvest haskap but some fruit harvesting machines already on the market may be able to be adapted to Haskap. Some non-mechanical methods are shaking the berries from the plant and into an umbrella or device that is laid out under the plants to catch the berries or you can pick the berries by hand. The Japanese have a reverence for the Haskap berry and so they harvest by hand with gloves and full body suits so as to not contaminate the berry. They are very careful to not bruise the berry. If Canadian growers look to market in Japan a way to sustain fruit quality to their high standards must be developed.

(Growing Haskap / Blue honeysuckle in Canada-Dr. Bob Bors, Assistant Professor, Department of Plant Sciences, University of Saskatchewan)

Nutritional Research

In my research I sampled for three things: mineral content, antioxidants, and ascorbic acid. I chose these procedures because they were the easiest and least costly tests that could be done over the period of a week, the length of time that I had access to the Richardson Centre and Ellis Food Science Building, Winnipeg, Manitoba.

Procedures

Mineral Content

1. 5 varieties of berries
2. Measured crucible weights for each sample
3. Weighed a small sample of crushed berry for each variety(close to 3 grams)
4. Put a sample into crucible and put into ashing jar(air proof glass container)

5. Put glass container into ashing oven and left over night
6. After ashing was complete weighed the total weight(crucible and ash from sample)
7. Calculate: (Total after ash-Total of crucible)/sample weight x 100

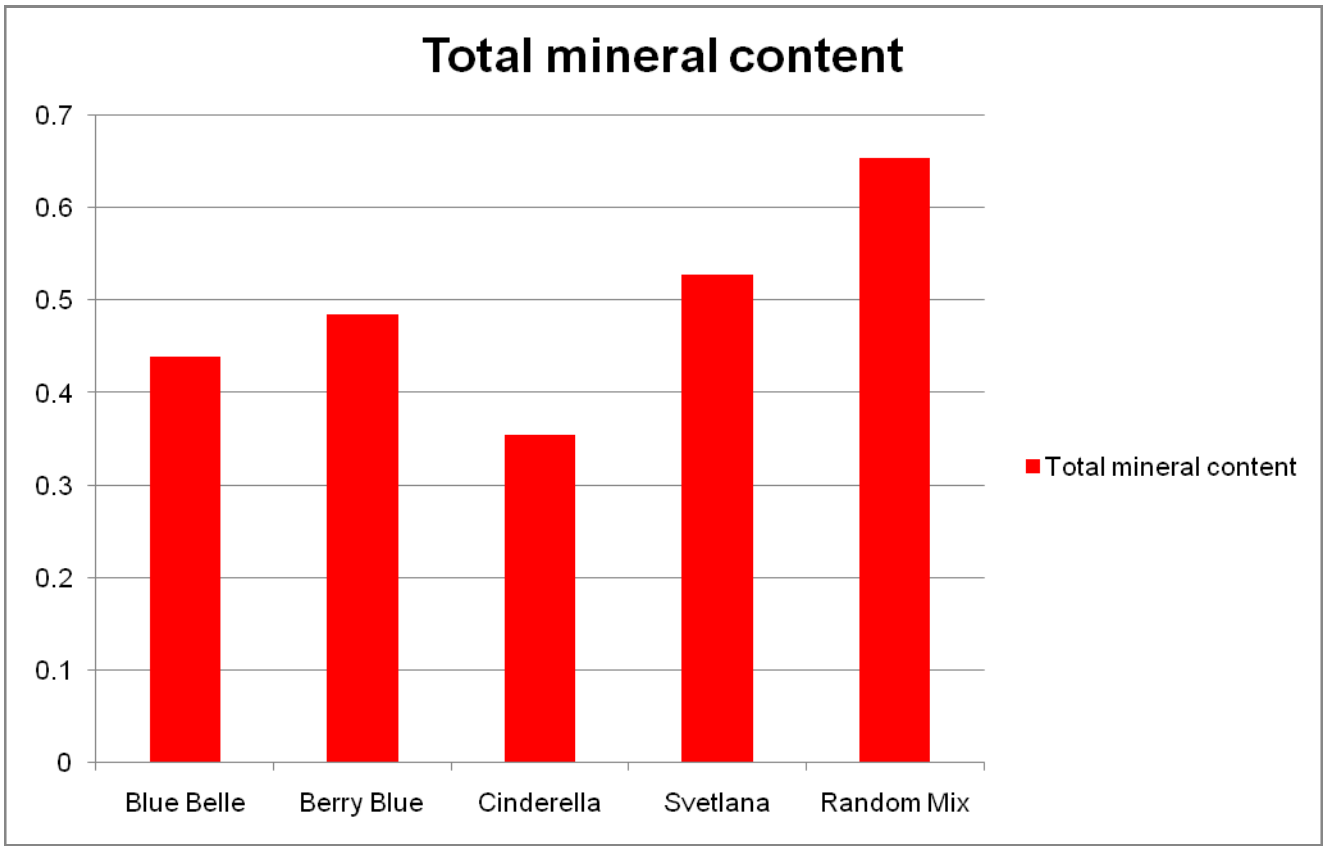
Antioxidants

1. Squeezed the berries in a cheesecloth to make juice
2. Samples: 2 sets of juice samples/variety, 2 sets of full berry samples/variety, 2 sets of pulp samples/variety.
3. Added methanol to the samples to make it more transparent, to break the samples down, and to help the reaction
4. Made dye to be added to samples-must be kept in the dark
5. Used a pipet to add dye to the samples (0.5 ml)
6. DPPH method was used to monitor the free radical scavenging activities of the sample (DPPH is the free radical). The higher the % discoloration, the higher the DPPH scavenging activity(antioxidant activity).
7. Calculate: % of discoloration= [1-(Absorbance at time=30 min/Absorbance at time=0min)] x 100
8. Percentage of antioxidant that reacted in the given time period

Ascorbic Acid

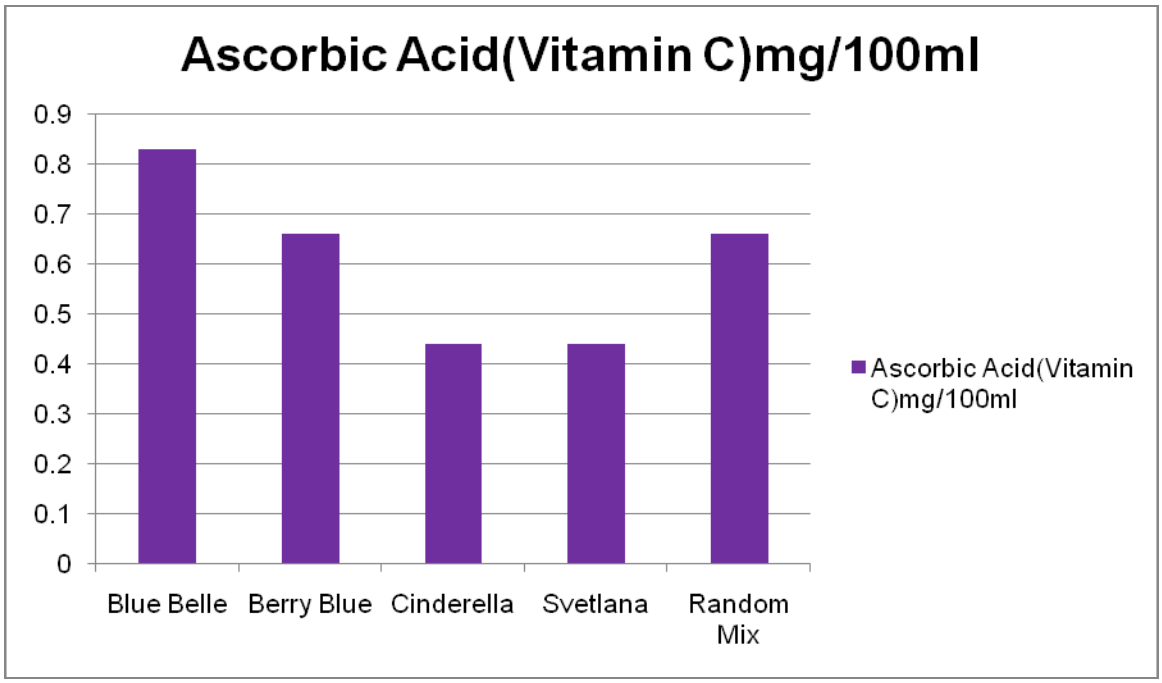
1. Squeezed berries in a cheesecloth to make juice
2. 5 samples one for each variety
3. Made a DIP dye to add to the juice to change the color
4. Used titration to drop DIP dye into the sample
5. Added only enough dye so that the %T was around 70% for a standard
6. Spectrophotometer was used to measure the % transmittance of the sample to measure the intensity of color change (the lower % transmittance, the more intense the redness)
7. Calculate: Juice Vit C (mg ascorbic acid/100 ml juice)=0.2/4.5 x (vol of DIP dye used to titrate for individual samples) x 25/0.5 x 100
8. Calculate: Pulp Vit C (mg ascorbic acid/100g pulp)= 0.2/4.5 x (vol DIP dye used to titrate for individual samples) x 100/20 x 100

Results



Calculation: (Total after ash-Total of crucible)/sample weight x 100

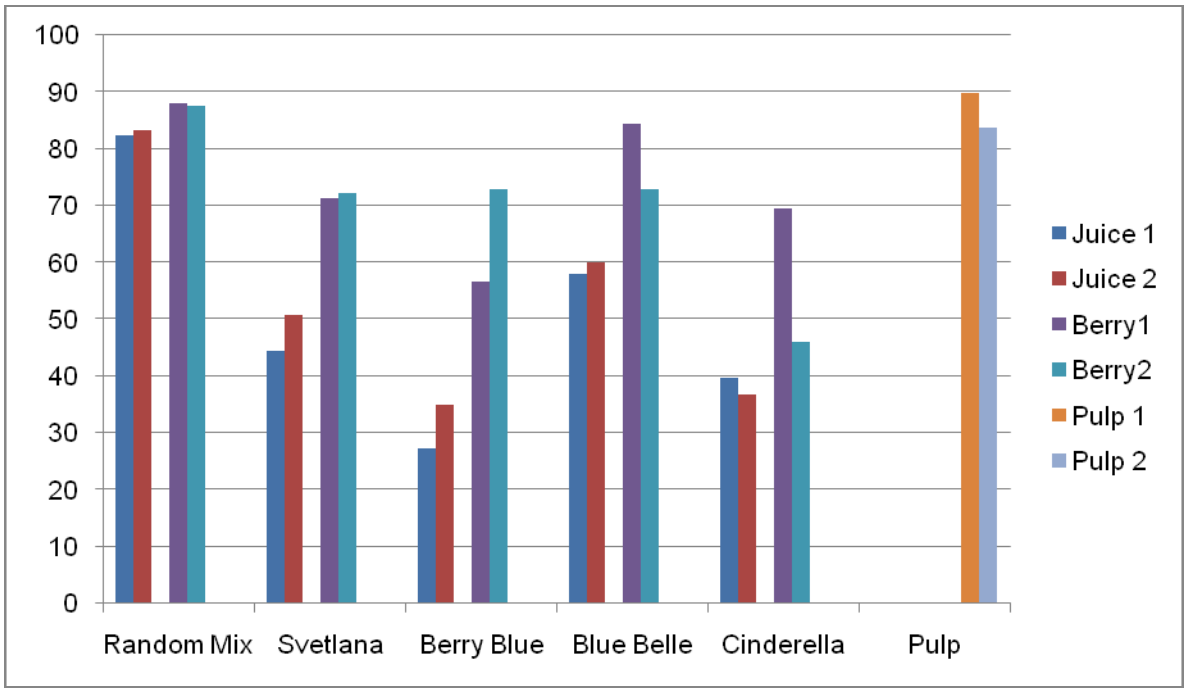
Blue Belle .43885%
Berry Blue .485515%
Cinderella .355173%
Svetlana .52865%
Random Mix .65429%
(University of Saskatchewan Mix--- varieties unknown)



Calculation: Juice Vitamin C (mg ascorbic acid/100 ml juice)=0.2/4.5 x (vol of DIP dye used to titrate for individual samples) x 25/0.5 x 100

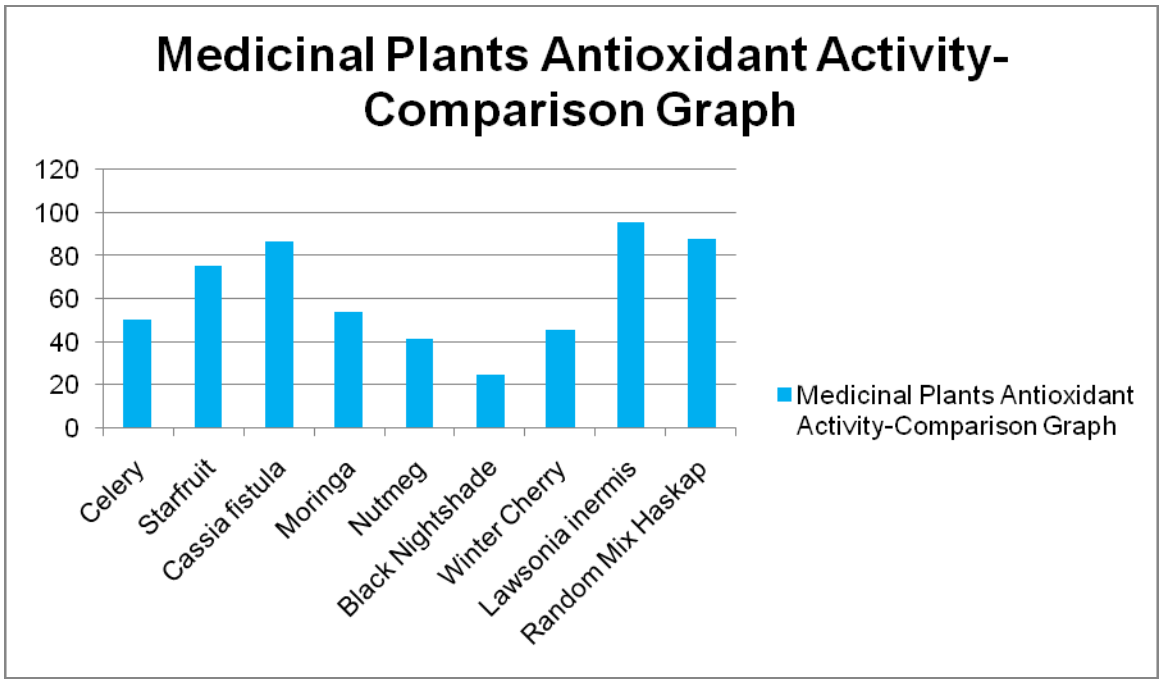
Blue Belle .83mg/100ml
Berry Blue .66mg/100ml
Cinderella .44mg/100ml
Svetlana .44mg/100ml
Random Mix .66mg/100ml
(University of Saskatchewan Mix--- varieties unknown)

Antioxidant %



Calculation: % of discoloration= [1-(Absorbance at time=30 min/Absorbance at time=0min)] x 100

	Juice 1	Juice 2	Berry1	Berry2	Pulp 1	Pulp 2
Rand. Mix	82.353%	83.36%	88.07%	87.66%		
Svetlana	44.5%	50.75%	71.22%	72.2375%		
Berry Blue	27.255%	35.09%	56.74%	72.94776%		
Blue Belle	57.943%	59.96%	84.36%	72.985%		
Cinderella	39.7727%	36.69%	69.629%	45.987%		
Pulp					89.8%	83.8%



All of the plants listed in the graph above can be used for medicinal uses. As you can see the values on this graph are in standing with the Haskap results. Therefore Haskap may be able to be used for medicinal purposes as well.

Celery	50.2
Star fruit	75.2
Cassia fistula	86.9
Moringa	54.3
Nutmeg	41.6
Black Nightshade	24.7
Winter Cherry	45.7
Lawsonia inermis	95.9
Random Mix Haskap	88.07

(Prakash D., Suri S., Upadhyay G., and Singh B-Total phenol, antioxidant and free radical scavenging activities of some medicinal plants., International Journal of Food Sciences and Nutrition, February 2007)

Discussion

In my results I found that haskap does have many health benefits. First the greatest health benefit found was antioxidants. As earlier stated antioxidants help to slow and prevent oxidative damage. The antioxidants react to the free radicals. In the experiment the percent of antioxidants that were able to act as free radical scavengers was found. DPPH was added to the juice, berry and pulp solution and then measured at zero minutes. It was not until 30 minutes later that the % of discoloration was measured again. DPPH is a free radical. Adding the free radical enabled any possible antioxidants in the juice, berry, and pulp to react. In this way the percentage of antioxidant that was able to act as a free radical scavenger was found. Although this fruit is high in antioxidant activity, the ascorbic acid is only 0.3 mg-1mg/100ml. Also the mineral level is not high, ranging from 0.3% to 0.7% of the berry consisting of minerals. This, however, is the total mineral content of the berry. The specific minerals in the berry are yet to be discovered.

Prior Nutritional Analysis

1. The Nutritional Content of Haskap as analyzed for the University of Saskatchewan haskap program:

   ---please contact Haskap Canada for access to this information---

2. Fruit Constituency of Blue Honeysuckle-Lonicera Caerulea (Sarcov et al) -

Saccharides-	Total-	7.20%
Free-	Glucose-	3.2%
	Fructose-	2.9%
Bound-	Glucose-	0.8%
	Galactose-	0.2%
	Arabinose-	0.1%
Lipids-	Total-	1.52%
Dry Matter-	Total-	14.62%(of which 14.6% is soluble fibre)
Organic Acids-	Total-	12.2%
Components-		

Citric acid- 3.7%
Malic acid- 18.0%
Other- 2.4%

(Berry Fruits as a source of Biologically Active compounds: The case of Lonicera Caerulea,. Sarcova, Heinrich, Valentova, Biomed Pap Med Fac Univ Palacky Olomovc Czech Repub. 2007)

Prospects

The future is bright for this berry. If looking to market and produce this berry yourself there are a few options to be considered. First is a u-pick. A few growers have already started small u-picks and have been very successful. Farmer's markets are another possibility. There are also many products that can be developed out of this fruit, such as wine, jams, preserves, ice cream flavour, syrup, yogurt, and many other commercial products. There is also a large overseas market in Japan. In the Japanese culture haskap is extremely special. They even have a Haskap Day. Due to urbanization many of their haskap orchards have been destroyed. The new varieties that have been made are also bigger and better tasting than their varieties so there is a large demand for haskap in Japan. In the market in Japan a small 300g container sells for $10.00 and in an airport haskap has been selling for $20.00 - $30.00. If there is a way to transport haskap while still keeping the quality of the berry, this could prove to be very profitable. Since this is a new fruit variety, research with this berry is in its infancy. The development of products using this berry and the marketing of both the fresh berry and its by-products is in its infancy. The possibilities are numerous and exciting to consider.

Conclusion

To conclude haskap has many potential health benefits and is just starting to be discovered throughout the world. It is finally being fully researched. This berry has been very promising in all the experiments done thus far, and the people who have tasted and picked this berry can't wait to get more. It is my hope that this berry is one day seen in grocery stores and is known as well as blueberries and strawberries.

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