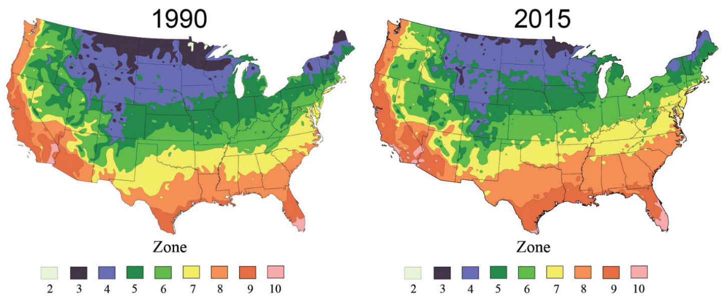
introduction



Map courtesy of the Arbor Day Foundation

Most of Minnesota lies within the USDA hardiness zones 3 and 4, and gardeners often wish they could grow a larger cultivar of fruit. Cold winters kill or harm trees and branches, while short growing seasons prevent certain crops from properly maturing. In spite of these shortcomings, a surprising diversity of new and unusual crops can grow here. Some crops grow better here than in surrounding states, and the number of Zone 3 and 4 crops available to plant is increasing. In some cases, crops that were forgotten by older generations are being rediscovered; while in other cases, cold hardy varieties and species are being introduced from Eastern Europe and Asia. Meanwhile, some native plants with commercial potential are still being domesticated. A major driving force behind the growth in new crops is the recently discovered and rediscovered health benefits of berries and other fruits.

Our current base of knowledge for these emerging crops is extremely small compared to crops like apples or strawberries. Most of what we know about emerging crops comes from people who experiment in their own yards or farms. Innovative growers are constantly discovering new varieties or developing new ways of growing emerging crops. Most of the emerging crops covered in this publication currently have a small market. Many crops would benefit from breeding work to improve fruit quality or disease resistance. All these crops require labor-intensive management. Few of these crops are suitable for the fresh market, so they must be processed into value-added products like juices, jam, or jelly. The economic potential for these crops will increase as innovative farmers, food entrepreneurs, and researchers discover or re-learn better ways to plant, manage, harvest, process, and market these crops. Investment in an emerging fruit crop could pay good dividends down the road.

DOMESTICATION

Domestication occurs when people select wild plants with desirable characteristics and propagate those plants. Berries and tree fruit are first selected for fruit quality, which includes flavor, yield, fruit size, and ease of harvesting. Other desirable traits such as disease resistance have often been neglected in the first rounds of selection. If people can't find wild plants with all the desired traits, they breed plants with specific traits to create the desired plants. Many species of plants have extremely complex genomes, and breeding and selecting can take decades in order to develop fruit with good flavor and decent size that is easy to harvest. Most of the fruit we buy today was selected for decades, centuries, or millennia in order to develop fruit with commercially acceptable quality.

Domestication of trees and shrubs can be grouped into four stages. In Stage 1, the crop is harvested without any varietal selection. Stage 2 starts when a person sees a wild plant in the field with desirable traits and propagates the plant without further breeding or selection. In Stage 3 plant breeders conduct simple first and second generation crosses to produce new varieties. At Stage 4, plant breeders establish breeding lines that continue for multiple generations. With Stage 4 breeding, people can develop varieties that look and taste quite different than wild plants. Nearly all fruit grown commercially in the United States is at the fourth stage of domestication, while many emerging crops are still at the second stage.

Table 1. Stages of domestication for some common and emerging perennial fruit crops.	
Domestication Stage	**Fruit species**
Stage 1: Wild, no breeding or selection	lowbush blueberries, native black currants, wild plums, blue elderberries, mountain huckleberries (Northern Rockies), bilberries (Europe)
Stage 2: Wild plants selected and propagated	saskatoons, chokecherries*, black raspberries, American elderberries, Autumn olive, hardy kiwi, sand cherries, gooseberries (*Ribes hirtellum*) Nanking cherries**,
Stage 3: Simple first and second generation crosses to produce new varieties	Aronia, European elderberries, seaberries, cherry plums, Minnesota (half high) blueberries
Stage 4: Extensive breeding, varieties can look and taste different than wild plants	Currants, gooseberries (*Ribes uva-crispa*), honeyberries, pears, apples, European plums, Japanese plums, strawberries, red raspberries
*While there are about 8 cultivars of chokecherries, nearly all commercial harvest is from wild blocks **Most cultivars of Nanking cherries have been lost, so the species in the U.S. is at Stage 2	

A few emerging fruits, like currants, have been domesticated for hundreds of years, and have dozens of varieties suitable for many climates. Because some emerging fruit crops are still being domesticated, they have undesirable traits that were long ago bred out of other domesticated plants such as thorns, astringency, and male and female plants. Thorns were bred out of common crops like plums and apricots. Wild pears are naturally astringent, causing the same drying sensation in the mouth that gives chokecherries and chokeberries (aronia) their name. Few pear consumers have ever eaten an astringent pear because plant breeders have developed varieties without astringency. Wild strawberries have female and male flowers on separate plants, but breeders rarely release strawberry varieties unless the flowers contain both male and female parts. Undesirable traits on emerging fruit crops could likewise be selected out in the future as new varieties are developed.

SCIENTIFIC NOMENCLATURE

All plants are designated by genus and species, which is how the scientific name is derived. Genus and species name are typically italicized and typically in Latin. For example, the black chokeberry or black aronia has the scientific name *Aronia melanocarpa*. Within one genus, there are often several closely related species which have obvious similarities. The species *Aronia melanocarpa* and *Aronia arbutifolia* (red chokeberry) belong to the same genus and are easy to confuse, but the two species have slightly different leaves and fruit color. In this case, knowing the species is critical, because only *Aronia melanocarpa* has palatable fruit.

In some cases, cultivated plants are interspecific crosses, which are designated with an "x" between the genus and species name. A naturally occurring cross between the black and red aronia species is the purple aronia, often designated as *Aronia x prunifolia*. In a few cases, a plant will be crossed from two genera, and then the plant is designated with an "X" in front of the name. According to some sources, the aronia cultivar 'Viking' is a cross between the American *Aronia melanocarpa* and the European mountain ash, which would put it in the genus X*Sorbaronia*. The name X*Sorbaronia* combines the genus for mountain ash (*Sorbus*) with aronia.

Scientists are constantly evaluating and reevaluating the relationship between different species of plants. For many emerging crops, there is some controversy about their genus, species or even family. One nursery or technical paper will use one species name, while another technical paper will use a different name for the same species. For example, the purple chokeberry is listed as both *Aronia x prunifolia* and *Aronia floribunda*, depending on the author and the nursery.

A cultivar is a group of plants within a species with distinct features that can be passed from one generation to the next. The terms variety and cultivar are often used interchangeably. The word cultivar is coined from the words cultivated variety. Cultivars are usually propagated asexually. If propagated from seed, their distinctive traits are not always passed from one generation to the next. A true cultivar name is not italicized. The aronia cultivar 'Viking' is primarily propagated by seed and has consistent traits from one generation to the next. The scientific name most commonly applied to this cultivar is Aronia melanocarpa var. 'Viking'. 'Viking' aronia plants do fall into both the variety and cultivar categories, so the name can also be written Aronia melanocarpa 'Viking'. In the case of aronia, the genus name has become the common name, so it is not italicized in the remainder of this book.

PROPAGATION

The plants for many emerging crops are difficult to find in catalogs or nurseries, and some varieties are prohibitively expensive for a person who wants a small, commercially viable plot. Most people who want to grow these crops find themselves propagating many of their plants themselves.

Plants can either be propagated vegetatively or by seeds. Plants propagated vegetatively are identical to the parent while plants grown from seeds typically are not. A row of shrubs grown from seed will have plants that bloom at different times; fruit that ripens at different times; have different colored fruit, different fruit size, flavor, or productivity; have differing levels of winter hardiness; grow to different heights; and have variable resistance to diseases. Most fruiting trees, shrubs and vines are propagated vegetatively primarily to assure uniform fruit quality and ripening times. Vegetative propagation is almost always faster than using seeds, because some plants propagated from seed go through a juvenile period of several years before they bloom. Vegetatively propagated plants have no juvenile period and will bloom as soon as the plants reach sufficient size.

A few emerging crops consistently produce edible fruit with good quality when propagated from seeds, including aronia, the various juneberry species, and autumn olive. Elderberry, chokecherry, and Nanking cherries seedlings produce good fruit about half the time, but often with variable ripening times. Other crops should not be reproduced by seed unless trying to develop new varieties.

To develop new varieties suitable for a climate or location, a large number of seeds (20 to 1000) are planted. The seedlings vary in growth rate, fruit quality and disease resistance. Most professional plant breeders start to eliminate unsuitable seedlings the first year by removing slow growing or disease-susceptible plants. Most perennial plants take five or more years before they bear fruit. With patience, new varieties can be selected, and then the new cultivar is propagated vegetatively.

Common types of vegetative propagation for trees and shrubs include:

1) Rootsuckers: shallow roots next to the mother plant that sprout and grow into new plants, which can be dug up in the spring and transplanted before the leaves sprout. This is a

low-tech form of propagation easy for the home gardener, but is often too labor intensive and expensive for large nurseries.

2) Grafting: a small branch is placed into the wood or bark of a larger plant.
3) Budding: a dormant bud is placed into the bark of a larger plant
4) Layering: roots form on a stem while still attached to the mother plant. Layering often occurs naturally when a low branch sits on the ground and forms roots. Tip layering is where actively growing shoots spontaneously form roots
5) Mound layering or stool beds: the dormant tree or shrub is pruned next to the ground to encourage new shoots to form. As the shoots grow, soil, mulch, or sawdust is piled over the plant before the shoots become woody. The new shoots send roots into the mulch. After the shoots have a good root system, the shoot can be cut from the mother plant and transplanted into a pot or in the field.
6) Hardwood cuttings: dormant branches are cut into pieces containing at least one bud, placed in moist soil, and the dormant branches spontaneously form roots.
7) Softwood cuttings: actively growing branches are placed in a moist environment and will form roots. This is usually done in a mist chamber.
8) Micropropagation (tissue culture): the tips of actively grown shoots are placed in an artificial media, where they form roots and leaves. Tissue culture requires both expensive equipment and expertise by the operator. Large nurseries use tissue culture to rid plants of viruses or they may use it to propagate many plants quickly. With proper techniques, one growing tip of a plant can be used to make hundreds of small plants. Tissue culture is not genetic engineering. Tissue culture is a way to grow new plants from very small segments of a parent plant, but it doesn't change the genetics of either the parent or the new plants.

RESOURCES FOR MORE INFORMATION ON PLANT PROPAGATION:

Layering
https://content.ces.ncsu.edu/plant-propagation-by-layering-instructions-for-the-home-gardener
Stem cuttings
https://content.ces.ncsu.edu/plant-propagation-by-stem-cuttings-instructions-for-the-home-gardener
Propagation with softwood, semi-softwood, and hardwood cuttings
https://unlcms.unl.edu/ianr/extension/hort-update/Cuttings1

PLANT PATENTS

People who select and propagate plants from the wild or use artificial breeding often patent their new varieties. Once a plant is patented, it cannot be vegetatively propagated without permission from the person holding the patent. Most varieties mentioned here have no plant patent, or the patent has expired.

Many new haskap and saskatoon varieties are patented and should not be vegetatively propagated. Woody fruiting plants still covered by plant patents can be propagated by seed, but the new plants are almost always so different from the parent plants that they are a new cultivar.

EMERGING CROPS FOR COMMERCIAL PRODUCTION

Many fruit crops are easy to grow, but may not be suitable for commercial production. In order to be a commercially viable crop, the following traits should be considered:

1) Potential market
2) The number of uses for the fruit, including if it can be eaten fresh
3) Yield per acre
4) Harvest efficiency
5) Diseases and insect pests
6) Potential return on investment

The market for all emerging fruit crops is small but changing. Growers who are interested in investing in an emerging fruit crop should realistically assess its market potential before ordering plants. For instance, there is no reason to plant an acre of aronia berries if the market you can reach only buys 100 pounds per year. Crops with many uses will have a larger potential market than crops that can only be made into jelly. Crops that can be eaten fresh are easier to introduce to the public than crops that must be processed.

Prospective growers should always be on the lookout for new or unusual marketing opportunities. Some crops can be grown specifically for immigrant groups. In areas with a large Eastern European population, there is an existing market for black currants and seaberries. Even a small population of Eastern European immigrants could support an acre of pick-your-own black currants. The health benefits of some emerging crops may provide excellent marketing opportunities in the future.
With the growing popularity of craft beers, some breweries are producing small batches of fruit beers, often called "sours." Unusual fruits, with strong flavors and high tannin levels, are well suited to this emerging market.

Before investing in a new crop, estimate both the yield and the time it will take to harvest the crop. Most fruit and vegetable crops in Minnesota are not commercially viable unless over $5,000 an acre in product can be grown and sold. Many crops look good on paper until it is discovered that they either have low yields or cost more to harvest than the retail value of the crop. Most of the crops described in this publication are harvested by hand. In Europe, currants and aronia are harvested with machinery, but in Minnesota these crops have too small of a market to justify buying expensive mechanical harvesting equipment. Fruit that grow on clusters are usually easier to harvest by hand than fruit that are borne individually. Larger fruit are more efficient to harvest than small fruit. A few crops have fruit that sticks tightly to the plant. Some crops are tough to pick because of large thorns. Most of the emerging crops will become easier to harvest as new varieties are developed. Finding faster and easier ways to harvest these fruit will be a key in turning them into profitable crops.

Many emerging crops have few leaf or fruit diseases. Others have so many diseases in Minnesota that organic production may not be feasible. Always be skeptical of any crop that comes with the claim of "not susceptible to any insects or diseases." Every species is going to be susceptible to one or two diseases. The emerging crops are poorly studied, and their diseases may not have been identified. Farms in Minnesota are often surrounded by forests that can harbor unusual and largely unknown disease organisms. Growers who want to specialize in a particular crop should expect to find diseases or insect pests that aren't listed in any guidebook.

EMERGING CROPS FOR HOME GARDENERS

Most of the plants listed here have ornamental value in addition to producing fruit, making them ideal additions to the edible landscape. Crops that are not economically viable for commercial producers can be planted as ornamental shrubs, made into hedges, or even used as arbors.

Many of these crops, especially native plants, are already being incorporated into the pollinator habitats that fruit growers are establishing throughout Minnesota to increase populations of native bees. For example, the native clove currant has marginal fruit quality but produces a first rate flower for bees. Elderberry flowers always provide excellent midsummer forage for bees and other pollinators. Growers interested in emerging crops can always add a few plants into a windbreak to see how they grow.

CLASSIFICATION

Many emerging crops are completely unrelated to common temperate fruit sold in stores. Nearly all the temperate fruit sold in the grocery store comes from species of two plant families: the rose family and the heath family. The rose family includes apples, cherries, peaches, plums, raspberries, blackberries, strawberries and pears. The heath family includes blueberries and cranberries. By contrast, emerging crops belong to more than eight families:

Rosaceae: rose family
- aronia
- saskatoons and juneberries
- wild plums and cherry plums
- chokecherries

Caprifoliaceae: honeysuckle family
- elderberries
- honeyberries

Elagneacae: oleaster family
- seaberries
- autumn olive and goumi

Actinidiaceae: Chinese gooseberry family
- hardy kiwis

Emerging fruit crops that are unrelated to more common fruits are often susceptible to entirely different diseases and insect pests. In some cases, we don't know the diseases on these crops, or we see new insect pests that haven't been previously described. Many of these crops have entirely different nutrients and health benefits than fruit commonly sold in the grocery store.

Solanaceae: nightshade family
- goji berries

Moraceae: mulberry family
- mulberries

Cornaceae: dogwood family
- Cornelian cherry

Grossulariaceae: currant family
- currants and gooseberries

Berberidaceae: barberry family
- mahonia and barberry

HEALTH BENEFITS

One reason to look into emerging crops is the possible health benefit. The health benefits of fruit crops have been known for millennia, because emerging crops were incorporated into traditional diets around the globe, from Siberia to Montana. In Eastern Europe, Russia, and China, scientists started to study the health benefits of fruits in the middle of the twentieth century.

For most of the twentieth century, western scientists tried to narrow down the nutrients essential for humans to survive. Carbohydrates, fats and proteins were discovered first, because they are macronutrients needed in large quantities. Then micronutrients, which are only required in small quantities, were discovered. Micronutrients include vitamins and minerals. Scientists became so good at narrowing down the list of essential nutrients that science fiction writers of the 1960s and 70s often portrayed people in the future acquiring all of their nutrition from a pill.

For most of the twentieth century, the health benefits of fruits and vegetables were usually attributed to their vitamin content. Fruits were considered essential because they contained Vitamins A and C. Currants were found to be an important source of Vitamin C in northern climates, but when oranges became widely available and vitamin supplements were developed, currants were considered irrelevant. During the 1980s a prominent scientist summed up the attitudes of the time by frequently saying "Other than Vitamin C, most fruit is nothing but sugar and water." We knew that berries were chemically complex, but most scientists assumed that the minor acids and pigments in fruit like blueberries were either broken down in the gastrointestinal tract or not absorbed into the body.

In the West, the first evidence that fruit may hold other health benefits started to emerge shortly after World War II, when stories emerged that English fighter pilots claimed to see better at night when they were regularly fed jam made from bilberries. Bilberries are close relatives of lowbush blueberries.

In the early 1990s, several scientists published review papers that analyzed previously published work which compared cancer rates of people who consumed little fruits and vegetables with people who consumed a lot of fruits and vegetables.[1,2] The papers only considered studies to be valid if they looked at cancer rates in people of one ethnic group or country. For example, the review cited a study comparing cancer rates among African-Americans in Louisiana who ate vegetables with neighbors who didn't eat vegetables. Rates of gastrointestinal cancer among Turkish men who ate citrus fruit less than once a month were compared to those who ate citrus once a week. When all the studies were considered, the authors concluded that those who ate fruits and vegetables more frequently had fewer health problems and lower cancer rates, and that vitamins only explained part of the health benefits.

There have been few studies comparing the health of people who eat or do not eat fruit, but available evidence points out that fruits are just as healthful as vegetables. In a study of post-menopausal women in Iowa, women who ate at least one serving of strawberries or blueberries a week had reduced mortality from cardiovascular diseases. Similarly, men in eastern Finland who ate berry products also had reduced risk of heart failure compared to those who ate no berries.

Many emerging crops have a diverse combination of healthy compounds, including vitamins, minerals, nonessential nutrients, and medicinal compounds. Medicinal compounds are specific chemicals within a fruit or vegetable which cure a specific disease or alleviate the symptoms of a disease. Nonessential nutrients are compounds which humans don't need to consume in order to survive, but have the potential to reduce or prevent diseases. The nonessential nutrients are alternatively called nutraceuticals or phytonutrients, and include the antioxidants.

[1] Ames, B. N., M. K. Sigenaga and T. M. Hagen. 1993. Oxidants, antioxidants and the degenerative diseases of aging. *Proc. Natl. Acad. Sci.* 90:7913-7922.

[2] Block, G, B. Patterson and A. Subar. 1992. Fruit, vegetables and cancer prevention: a review of the epidemiological evidence. *Nutrition and Cancer.* Lawrence Erlbaum Associates.

The nonessential nutrients in the emerging fruits have been given the greatest attention by the public and provide the greatest potential for increasing sales. When nonessential nutrients are incorporated into a daily diet, they show the potential of slowing the aging process, reducing cancer, and decreasing cardiovascular diseases. The best known nonessential nutrients are the antioxidants. Antioxidants have the ability to neutralize free radical forms of oxygen that are formed during cell respiration. Free radical oxygen can react with and cause damage to cell membranes, proteins, and DNA. Some gerontologists believe that free radicals are a major factor contributing to aging. Our bodies have developed defense systems against free radical oxygen using a variety of enzymes. The antioxidants are believed to strengthen the defense system, especially when more free radicals are being produced than the enzymes can neutralize.

The most famous antioxidant is Vitamin C, but Vitamin C often only accounts for 15% or so of the antioxidant capacity in many types of fruit. The most common antioxidants in fruit are the anthocyanins; pigments that give most types of fruit their distinctive red or blue color. Generally, the darker the fruit, the higher the anthocyanin and antioxidant level. In many dark blue berries like juneberries or haskaps, the anthocyanins are in the skin, and are more difficult to digest. Red fruit like cherries and gooseberries have lower anthocyanin levels, but since the anthocyanins are dissolved in the fruit juices, they may be easier for the body to absorb. Anthocyanins are a diverse group of compounds. Some types of fruit may have four types of anthocyanins, while others have 20 types of anthocyanins. Some are certainly better than others, but we don't know which anthocyanins have the most health benefits.

Antioxidant levels are usually measured by the ORAC assay (Oxygen Radical Absorbance Capacity) which gives numbers in Trolox equivalents expressed in micrograms of Trolox equivalents per gram of fruit. ORAC tests have been conducted on most of the crops covered here (Table 2). The ORAC tests do not distinguish between antioxidants that are absorbed by the body and those that are not, but do give us an idea of which fruits have the highest potential for increasing antioxidant consumption.

Scientists are still determining how cooking, canning, fermenting, or freezing fruit affect antioxidant levels. Some antioxidants are destroyed by heat, while others become available when the processing releases compounds from the cell walls and membranes.

Many consumers are trying to increase their antioxidant consumption, but some nutritionists are still skeptical, quickly pointing out that anthocyanin extracts have shown few health benefits in controlled studies. As a result, the FDA and other organizations frown on people making health claims about products made from fruit. Bilberries have been extensively examined, and only half of 30 studies showed that bilberry extracts improved vision. The studies were inconsistent, because some studies used extracts while others used bilberry jam. Some looked at vision in people whose eyesight was already good while others used test subjects with poor vision. Scientists have hypothesized that health benefits are increased when anthocyanins are absorbed with other compounds in the fruit such as ellagic acid. The health benefits of berries could thus be due to a synergism between naturally occurring compounds. In addition to anthocyanins, the seeds of some berries contain gamma linolenic acid, which some scientists believe helps reduce body fat by facilitating fatty acid oxidation in the liver.

Antioxidants are only one type of healthy compound found in fruit, and some species with the lowest ORAC levels have the most health benefits due to medicinal compounds. In many cases, the medicinal benefits of these fruit have been known for centuries or even millennia, but only recently have scientists found the modern chemical constituents responsible for the ancient cures. For some fruits, like goji or seaberries, the medicinal benefits were widely known in China, but not in the West. For elderberries, the medicinal benefits were written about in ancient Rome and Persia.

Some of the more extravagant health claims for berries will undoubtedly be proven wrong. On the other hand, the scientist who said that berries were only sugar and vitamin C was also wrong. The emerging fruits not only taste good, they are good for you.

Table 2. Vitamins and antioxidants in fruit, and proposed medicinal benefits.

Crop	Vitamins and Minerals	Beneficial Compounds	ORAC* values	Proposed Medicinal Benefits
Black Currants	Vitamin C, Iron	Anthocyanin	7,957[1]	Increased blood flow
Red Currants	Vitamin C, Iron	Anthocyanin	3,387[1]	
Gooseberries	Vitamin C	Anthocyanin	3,332[1]	
Aronia	Vitamins A and E	Anthocyanin	16,062[1]	Improved heart function
Juneberries	Vitamin A	Anthocyanin	1,731[2]	
Elderberries	Vitamin A	Anthocyanin	14,697[1]	Antiviral, combats cold and fever
Honeyberries	Vitamin C	Anthocyanin		
Chokecherries	Vitamin K, Riboflavin	Anthocyanin, quercetin	3,504[2]	Diarrhea, abdominal cramps
Nanking cherries	Vitamin C	Anthocyanin		
Actinidia (Hardy Kiwi)	Vitamin C		1,210[1]	
Goji berries	Vitamin A	Long chain Polysaccharides	3,290[1]	Boost immune system
Autumn Olive/Goumi	Vitamin A	Carotenoids, Lycopene		
Seaberry	Vitamin E	Carotenoids, fatty acids	1,433[2]	Skin care, sunburn

*Oxygen Radical Absorbing Capacity; a measure of antioxidant activity
[1] From D.B. Haytowitz and S. Bagwhat, 2010
[2] From W. Li, F.S. Hosseinian, A.W. Hydamaka, L. Lowry and T. Beta. 2008

Table 3. Vitamin Content of Fruits[1]										
	Vitamin C, total ascorbic	Thiamin	Riboflavin	Niacin	Vitamin B-6	Folate , DFE	Vitamin A, RAE	Vitamin A, IU	Vitamin E (alpha-tocopher-	Vitamin K (phylloquinone)
Unit (Value per 100g)	mg	mg	mg	mg	mg	µg	µg	IU	Mg	µg
Aronia	0.8	N/A	N/A	0.40	N/A	N/A	N/A	900	3.3	20
Blueberries	9.7	0.037	0.041	0.418	0.052	6	3	54	0.57	19.3
Chokecherries	5.5	0.034	0.173	0.628	0.198	N/A	8	168	0.35	21.1
Currants, black	181.0	0.050	0.050	0.300	0.066	N/A	12	230	1.00	N/A
Currants, red	41.1	0.04	0.050	0.1	0.07	8	2	42	0.1	11.0
Elderberries	36.0	0.070	0.060	0.500	0.230	6	30	600	N/A	N/A
Goji Berries (dried)	48.4	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A
Gooseberries	27.7	0.040	0.030	0.300	0.080	6	15	290	0.37	N/A
Haskaps or Honeyberries[2]	44	N/A	N/A	N/A	N/A	N/A	N/A	130	1.1	N/A
Kiwi	92.7	0.027	0.025	0.341	0.063	25	48.4	87	1.46	40.3
Mulberries	36.4	0.029	0.101	0.620	0.050	6	1	25	0.87	7.8
Oranges	53.2	0.087	0.040	0.282	0.060	30	11	225	0.18	0.0
Raspberries	26.2	0.032	0.038	0.598	0.055	21	2	33	0.87	7.8
Seaberries	360.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	13	N/A
Sour Cherries	10.0	0.030	0.040	0.400	0.044	8	64	N/A	0.07	2.1
Strawberries	58.5	0.024	0.022	0.386	0.047	24	1	12	0.29	2.2

[1] *USDA Food Composition Databases*. https://ndb.nal.usda.gov/ndb/ Accessed 04 April 2017.
[2] Cassells, L. 2016. Your essential honeyberry and haskap guide. Published by AgriForest Bio-Technologies Ltd.