

Lingonberries – legendary in Scandinavia, elusive in the Antipodes.

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For many years I have harboured a fascination of sorts with the lingonberry, *Vaccinium vitis-idaea*. I had a number of flatmates at university who were either on exchange from, or had been on exchanges to Scandinavian universities - we were all pretty enthusiastic about food from other cultures, and the virtues of the lingonberry were often extolled in conversation. This pea-sized red berry is borne on unassuming dwarf shrubs and belongs to the Ericaceae or heath family, along with the blueberry, huckleberry, bilberry and true cranberry. It is a circumboreal species, native to the northern regions of North America and Eurasia, where it is found throughout taiga (boreal forest) and Arctic tundra ecosystems. Various preparations of the fruit are commonly consumed across Scandinavia, Russia, Canada, Alaska and Japan, with considerable quantities imported into North America to satisfy expatriate appetites. Although the area under commercial cultivation in areas such as the USA's Pacific Northwest has increased in recent years, the area under commercial cultivation stands at only 71 acres worldwide, and the majority of the crop is still harvested from the wild. Over 25 common names exist for this fruit, among them mountain or rock cranberry, cowberry and partridgeberry, tyttebær (Norwegian and Danish), puolukka (Finnish) and simply lingon in Swedish.

Botany and distribution

Lingonberry plants are dwarf, evergreen shrubs, of which there are two known races. *V. vitis-idaea* is larger in size and considered to be a lowland race, found throughout Europe (and hence commonly referred to as the European or cultivated lingonberry). *V. vitis-idaea* subsp. *minus*, known as northern mountain cranberry, is a dwarf Arctic montane race and is the recognised subspecies found growing in the wild in North America. The two are distinguished mainly by size, *V. vitis-idaea* reaching around 30 cm in height with leaves measuring approximately 2.5 cm long and 1 cm wide. *V. vitis-idaea* subsp. *minus* rarely grows above 20 cm in height, with leaves roughly half the size of the larger European form, 1 cm long and 0.5 cm wide. In some regions, the lingonberry naturally hybridises with the dwarf bilberry, *V. myrtillus*.

European lingonberry

V. vitis idaea

This species is found from Iceland to Nova Zembla (a Russian archipelago in the Arctic Ocean), throughout northern Europe from Scandinavia to northern Italy, the Pyrenees and the Caucasus, from the north Russian coast to north Mongolia, and is also found in Korea and Honshu, Japan.

It is found in England as far south as Devonshire, with the region of most abundant distribution across northern England and Wales being the moorlands of the south-eastern Pennine Hills and Cumbria. In Scotland, lingonberries are abundant in pinewoods (natural and plantations) and locally dominant in upland and montane heaths in the highlands. In Ireland, they are absent from the southwestern counties and much of the central plateau. It is accepted that the limiting climatic factor in terms of distribution is temperature, with the maximum summer temperature delineating the southernmost distribution in England.

In the British Isles, lingonberries are associated with the Northern Coniferous Forest zone in four community types: montane heaths, upland heaths, pinewoods, and eroded bog communities. Heath ecosystems are a type of shrubland habitat, with predominantly free-draining infertile, acidic soils and open, low-growing woody vegetation. Moorlands are generally high-ground heaths with a cool,

damp climate. In pinewoods, lingonberries are often co-dominant in the shrub layer, demonstrating a degree of shade-tolerance by achieving maximum vegetative and reproductive performance in the lower light conditions.

(Northern) mountain cranberry

V. vitis-idaea subsp. *minus*

Found in North America from north-western Greenland, across the Canadian Arctic and down to New England in the south. It grows west towards Great Lakes and British Columbia and is also found on islands in the Bering Sea.

Lingonberries form dense, low-growing mats, reproducing and spreading by means of rhizomes (underground stems) and to lesser extent, via seed. They commonly form part of the understorey in forest communities and occur as a dominant or indicator species in dwarf shrubland or tundra-type ecosystems. Stems are slender and trailing, the roots form a fine, fibrous network extending 10-20 cm deep into the soil substrate and a taproot may be present. Leaves are simple, petiolate, thick and leathery, initially green but turning a purple hue in autumn. Flowers are bell shaped, light pink or white and produced singly or in clusters at the end of stems, pollinated by bumblebees and hoverflies. There are two bloom periods, the first in early-mid spring and the second in mid-late summer. The berries mature two to four weeks after pollination. Fruit is borne on one year old growth, with the bright to dark red globular berries measuring 6-11 mm in diameter and weighing 0.17-0.45 g.

Like most members of the Ericaceae, the lingonberry requires acidic soil conditions. Lingonberries have been reported growing in soils from pH 2.9 to 8.2, with the most favourable growth occurring at pH 4-4.9. They are tolerant of low fertility soils, but do best in substrates containing least two percent organic matter. The plants are extremely hardy, tolerating temperatures down to -40°C. They are normally protected by snow cover during winter in their natural habitat, but struggle to thrive in areas where summers are hot. In the northern United States and across Canada, lingonberries grow at altitudes ranging from sea level to 2,400 m. The berries and foliage are an important source of food for birds and other wildlife in these areas; I was most interested to read that moose will dig through up to 50 cm of snow to feed on the leaves in winter, but generally eat very little of the plant in summer. In the United Kingdom, lingonberries are rarely found growing below 200 m but are found in montane heath areas at elevations of 1000-1200 m, and in Europe at all levels from 200 m to over 1500 m.

Under cultivation

Lingonberries are a quintessential component of the Nordic diet, but it is interesting to note that commercial plantings only commenced in Sweden, Norway and Finland in the 1960s, with most of Sweden's lingonberry research being carried out at the Department of Horticultural Breeding in the Swedish University of Agricultural Sciences in Bålsgård from the mid-1970s onward. Other areas to commence research and cultivation programmes at similar time periods were Germany, several Eastern European nations and Alaska in North America.

In terms of climate and soil type, the requirements of lingonberries under cultivation are similar to those of wild plants. They require physical protection if temperatures drop below -12°C without snow cover. In the USA's Pacific Northwest, plants flower twice, in March-April (fruit ripens mid-August) and again in July-August (fruit ripens mid-October). There are 16 cultivars and five numbered selections currently available to North American growers, many of which originate from Bålsgård, with others from breeding programmes in Germany, Holland, Norway and the USA.

Provision of polliniser cultivars is recommended to increase fruit set via cross-pollination. The plants are fairly easy-care, only requiring pruning after four or five years, at which the plants reach full production. After this age, alternate rows can be mowed to five centimetres in height every three to six years to stimulate production of one-year-old fruiting wood. Plantings can be expected to remain productive for approximately 20 years. Typical commercial yields of 5.8-35.7 t/ha (USA), 1.2-14.8 t/ha (Germany) and 2.5-8.9 t/ha (Sweden) have been achieved. Fertiliser requirements are minimal, buried driplines are the preferred method of irrigation, and stringent weed control measures are necessary during the establishment phase. Very few arthropod pests of significance affect the plants, although the plants are highly susceptible to several fungal pathogens including *Phytophthora* and *Rhizoctonia* spp. (causing root rots) and *Phomopsis* spp. (causing dieback). Harvesting is commonly carried out using hand rakes (as used for harvesting dryland cranberries) and mechanical harvesters used for lowbush blueberries and cranberries can be adapted for use in lingonberry crops.

Lingonberries in New Zealand

I spoke to berry breeder Harvey Hall, who brought lingonberry seed back to New Zealand in 1985 under an import permit after a trip to the Swedish University of Agricultural Sciences at Bålsgård, southern Sweden. Lingonberry plants were grown from this seed at the then DSIR Research Station at Riwaka, near Motueka, for a number of years. The warm Tasman climate wasn't ideal for this cold-loving species, and although the plants produced a small amount of fruit they eventually died out. Harvey saw lingonberry plants growing wild in pine forests in Scotland, as well as in the wild and under cultivation in Sweden, with the latter growing the size of a large dinner plate in circumference and 20-25 cm high. In the wild, he observed lingonberry plants growing in barren areas, including out of cracks in rocks and appearing to benefit from the absorbed solar warmth provided by this particular substrate.

Lingonberries could be suited to the cooler southern regions of New Zealand, especially if provided with protection from peak summer temperatures by being grown in semi-shade or as an understorey plant. Given that the North American (true) cranberry (*V. macrocarpon*) grows well in the pakihi soil type common on the west coast of the South Island, it would be interesting to see how the lingonberry would do in say, southern Westland.

Although I have heard reports of lingonberry plants being available at garden centres in the North Island in the past, and one recorded observation on iNaturalistNZ from Invercargill, I am yet to find anyone growing or selling lingonberry plants after following up numerous potential leads. For more about my search, see the sidebar article. Here's hoping that this article will stimulate interest and perhaps a source of plants will surface. Lingonberry is not listed as basic on the MPI Plants Biosecurity Index, so seed would be time-consuming and potentially costly for the general public to import.

A note on chilling requirements

A plant's chilling requirement is the minimum period of cold weather required to enable a plant to then flower and set fruit (the process of vernalisation). Chill hours can be calculated in several different ways, but all result in a sum of the total number of hours in winter spent at a certain temperature. A base optimum temperature at below which chilling hours accumulate is chosen – most commonly 7°C. When the actual temperature drops say, 4° below the base temperature for one hour, four chilling hours accumulate, with the eventual number of chilling hours experienced per year summed to give the accumulated total. Plants from the Arctic Circle do not have large chill

requirements – for lingonberries, this is 300-800 hours, compared with say, apples, which are native to Central Asia, with a chilling requirement of 1200-1500 hours. Chilling requirements are zero at the poles, and zero at the equator. The highest winter chill requirements are at latitude of about 45°N, for example New York and Washington State in the USA. North of these locations, the chill requirement reduces. The chilling effect drops away to zero as the temperature approaches 0°C, and also falls away at higher temperatures above the base temperature. If a plant acquires its chill requirement early on in winter, it enters a dormant state, ready to commence growth as soon as warmer spring conditions arrive.

Culinary and cultural uses

Lingonberries are firmly enmeshed in the fabric of Nordic society, with the eminent Swedish botanist Carl Linnaeus, father of binomial nomenclature, giving an account of the sale of lingonberries in markets by farmers in northern Sweden in 1732. The berries are reasonably tart and a little bitter, so are often consumed sweetened, in sauce or jam form and commonly served as an accompaniment to meat dishes such as Swedish meatballs with cream-based gravy, and game meats such as reindeer or elk steaks. The berries are reportedly more palatable fresh than cranberries, juicier, and lacking the polystyrene-like texture of fresh cranberries! Lingonberries contain considerable levels of benzoic acid, a natural compound with antifungal and preservative properties, which allows the fruit to be stored for long periods with little need for lengthy processing or heat treatment. The berries can simply be mashed with sugar, and the resulting preserve stored in sealed containers at room temperature, or frozen for longer periods. Another traditional way of preserving lingonberries is to store the fruit in jars or bottles, covered with water, resulting in *vattlingon*, literally watered or water lingonberries. Lingonberry juices and cordials are widely available and popular as a mixers with vodka, the fruit is also used to make a liqueur and several traditional fruit desserts.

In Eastern Canada (Newfoundland, Labrador and Nova Scotia) in addition to jams and syrups, wild-harvested berries are a common inclusion in baked goods. Newfoundland and Labrador in fact form the largest lingonberry-producing area in North America (exceeding 100,000 kg/year, harvested from unmanaged stands). The fruit are an important Native American food resource across Alaska and Canada, either fresh, frozen for later use or in various preparations along with sugar and/or traditionally-prepared fats derived from fish or seals.

Lingonberries contain high levels of vitamin C, and flavonoids (including anthocyanins, flavonols and proanthocyanidins) all of which may have pharmaceutical, nutraceutical and industrial value, for example the use of anthocyanins as natural food colourings. Lingonberry leaves and stems contain the glycoside arbutin, which is used in skin-lightening treatments.

The taste test...

As part of my research for this article, I purchased some imported lingonberry jam online. The jar I bought was labelled 'rårörda lingon', meaning preserved uncooked. I assume there was some form of heat involved in the canning process as the jar was vacuum sealed like any other preserve, but in preparation the berries are apparently stirred with sugar in their raw form. On opening the jar, the aroma reminded me first of red plum jam, as did the colour, before catching a whiff of cooked peach – not unlike blackboy peach jam. The set is a softish gel which spreads easily. The flavour is very vaguely reminiscent of cranberry, but without the acidity, which instead is replaced with a gentle, not unpleasant bitterness, which I would liken to that of the bitterness provided by quinine in tonic water. Nuggety semi-dried berry pieces were dispersed throughout, which gave an interesting texture. I spread the jam on some crepes for breakfast, and found it to be an excellent combination

- not really tart but also not overly sweet, like a lot of other jams can be. I could have happily eaten several pancakes in a row spread with lingonberry, whereas after one or two spread with ordinary jam I find the sweetness too cloying. I can understand why lingonberry jam is the condiment of choice for serving with traditional Scandinavian meatballs in cream sauce and other savoury dishes. I also purchased some lingonberry juice concentrate which I will try at a later date. If you are curious about this fruit, I would recommend trying the jam. As with most imported products, it comes at a price, so I would put it in the category of a 'Sunday morning breakfast treat'!

References

Hjalmarsson I, Ortiz R. 2002. Lingonberry: Botany and horticulture. In *Horticulture Reviews*, Volume 29:79-123. Janick, J (Ed). John Wiley & Sons.

<https://books.google.co.nz/books?id=JkUIUnYFZLOC&pg> Accessed 20 April 2020.

Penhallegon R. 2006. Lingonberry Production Guide for the Pacific Northwest. Oregon State University Extension Service. <https://catalog.extension.oregonstate.edu/pnw583> Accessed 15 April 2020.

Ritchie JC. 1955. Biological flora of the British Isles: *Vaccinium vitis-idaea* L. *Journal of Ecology* 43(2):701-708. DOI: 10.2307/2257030

Small, E. 2013. North American Cornucopia: Top 100 Indigenous Food Plants. Pp. 431-432. CRC Press.

<https://books.google.co.nz/books?id=iZBFAQAAQBAJ&pg> Accessed 26 April 2020.

USDA/USFS Fire Effects Information System, Index of Species Information: *Vaccinium vitis-idaea*

<https://www.fs.fed.us/database/feis/plants/shrub/vacvit/all.html>

Accessed 15 April 2020.

Use and Interpretation of Weather Information: Factsheet 3.7 Chilling measurement.

<http://www.hortinfo.co.nz/factsheets.asp> Accessed 24 April 2020.

Vaccinium vitis-idaea. (n.d.). In *Wikipedia* https://en.wikipedia.org/wiki/Vaccinium_vitis-idaea

Accessed 16 April 2020.

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