



**HEALTHY
FOREST BERRIES**





The clean untouched growing environment for forest berries is wide, since 86 % of Finland is covered by forests and on average there are only 18 people living per square kilometer. In summertime long and warm days and the midnight sun help berries ripen and get the high quality.

Finnish forests offer every summer a huge crop of forest berries. The annual crop of forest berries is over 500 million kilos – over 100 kilos to every Finn. That's why we have Everyman's rights. They allow also for tourists to pick berries and mushrooms and hike in the nature without any permission of the land owners.

About 60 % of households pick forest berries and 20 million kilos are collected for sale. Lingonberries and bilberries are the most common ones in Finnish forests, household use, domestic and foreign trade. Furthermore, a wide range of Finnish forest berry products are exported: dried berries, berry powders, berry seed oils, berry mueslis, snacks, berry juices, jams, soups, liqueurs, berry wines, honey products, berry chocolates, other sweets, food supplements, cosmetics and other wellness products.

There is nowadays a great deal of worldwide interest in forest berries and their beneficial health effects. Medical and nutritional studies are being conducted in many countries concerning the chemical contents of forest berries and their health implications. It has been shown that Finnish forest berries can form a significant component of a healthy diet owing to their

- *high content of phenolic compounds*
- *health-promoting seed oils*
- *low energy content*
- *high fiber content*
- *a wide range of vitamins, particularly high content of vitamins C and E*
- *a wide range of minerals, but low sodium content*

Finnish forest berries contain high concentrations of water (approx. 80-90 %) and are, therefore, low-energy foodstuffs. Most of the energy content of forest berries derives from the presence of various sugars. However, they also contain proteins and fat, albeit in very low proportions (< 1 g/100 g) with an exception of sea buckthorn berry (5 g/100 g). The fat (oil) content of forest berries is of very high quality as it consists of essential health-promoting fatty acids (figure 1.). Most of the oil is held in the seeds. For this reason berry seeds should not be discarded during food preparation. Forest berries contain no cholesterol, gluten or lactose.

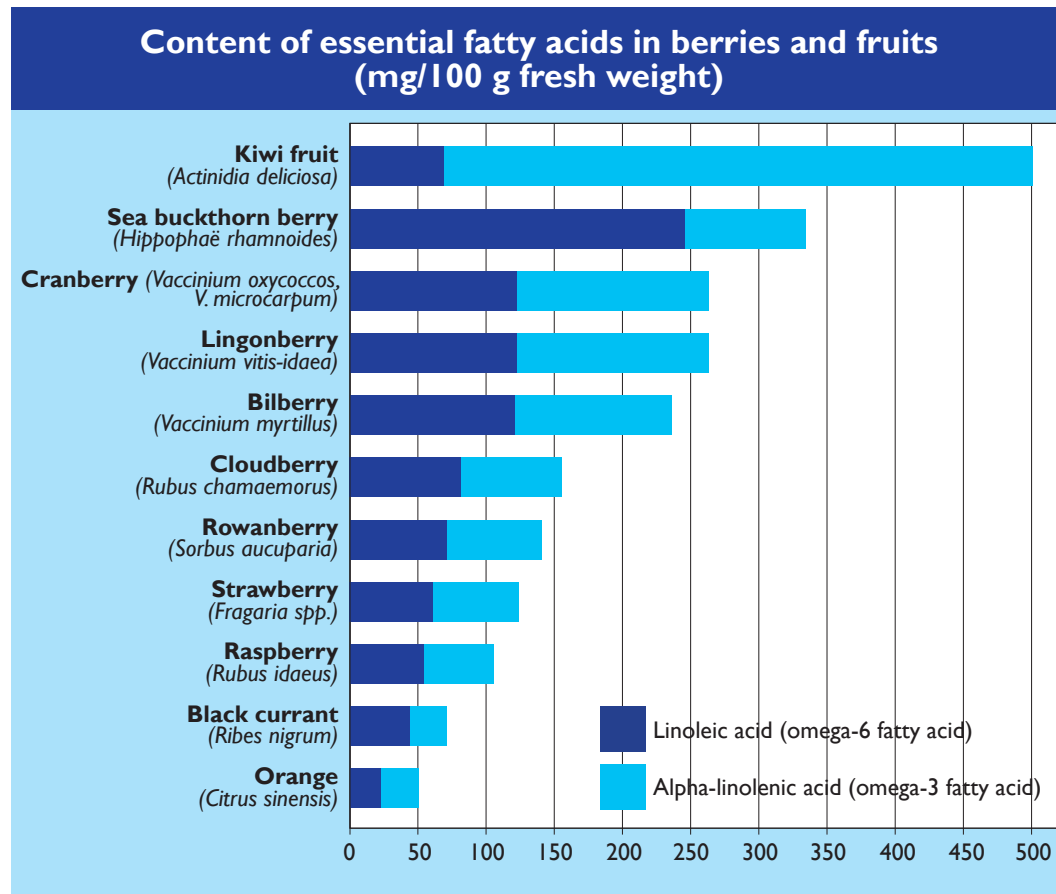


Figure 1. Source: National Institute for Health and Welfare, Nutrition Unit, Fineli Food Composition Database 16, 2013. www.fineli.fi

Forest berries contain significant amount of both soluble and insoluble fiber (figure 2.). The concentrations of the various fiber types vary according to the berry in question. Particularly cloudberry, sea buckthorn berry and rowanberry are rich sources of dietary fiber.

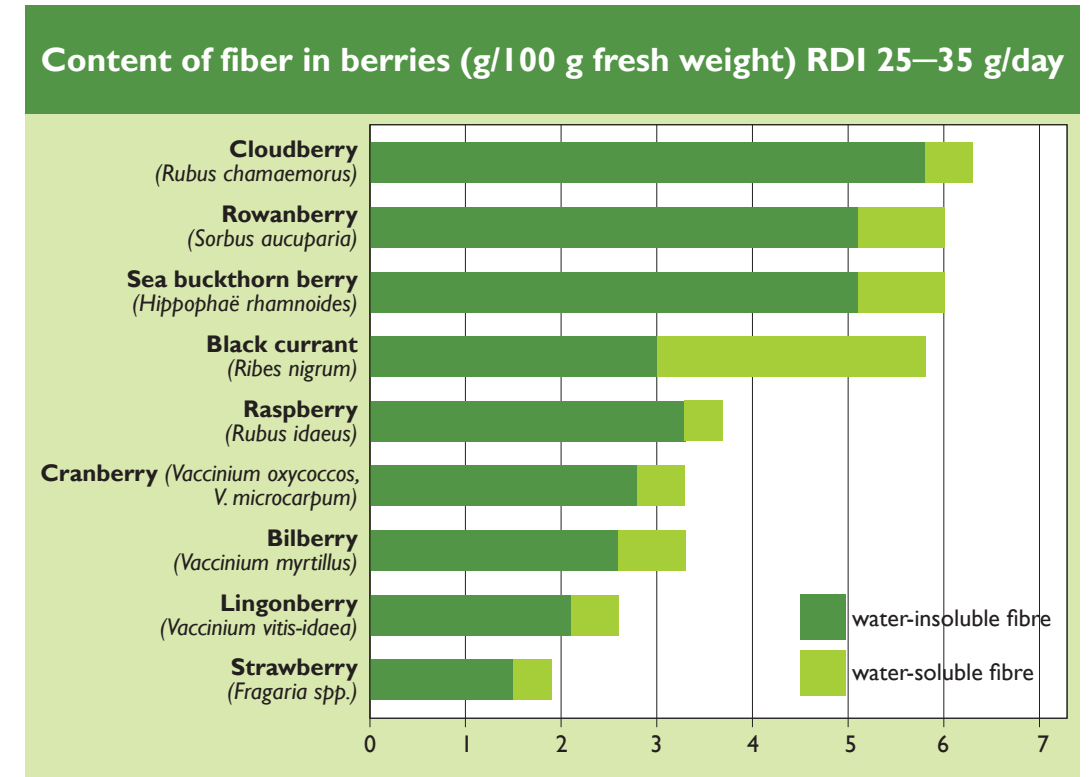


Figure 2. Source: National Institute for Health and Welfare, Nutrition Unit, Fineli Food Composition Database 16, 2013. www.fineli.fi and RDI (Recommended Daily Intake) Finnish Nutrition Recommendations 2014 by the National Nutrition Council www.ravitsemusneuvottelukunta.fi/portall/en/nutrition+recommendations/

Forest berries are equal rich in vitamin C than fruits. Sea buckthorn berry, cloudberry, rowanberry and raspberry are rich sources of vitamin C (figure 3 a.). Bilberry, cloudberry, lingonberry and sea buckthornberry can act as sources of vitamin E (figure 3 b.). Furthermore, cloudberry and raspberry can act as source of folic acid and sea buckthornberry as source of thiamin (vitamin B1).

Forest berries contain a wide range of minerals, such as potassium, zinc and magnesium. As with vitamins, the mineral concentrations of forest berries compare favourably with those of fruits. Moreover, sodium concentration is very low, thus making berries of significant health value to those suffering from raised blood pressure.

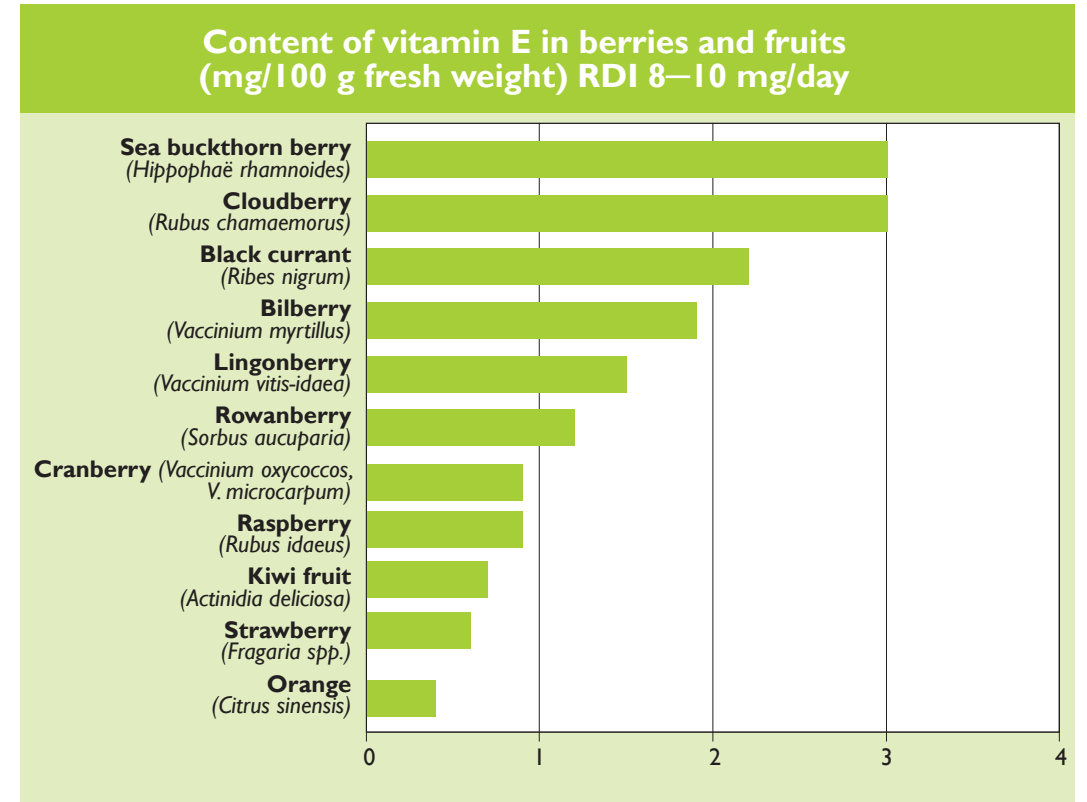
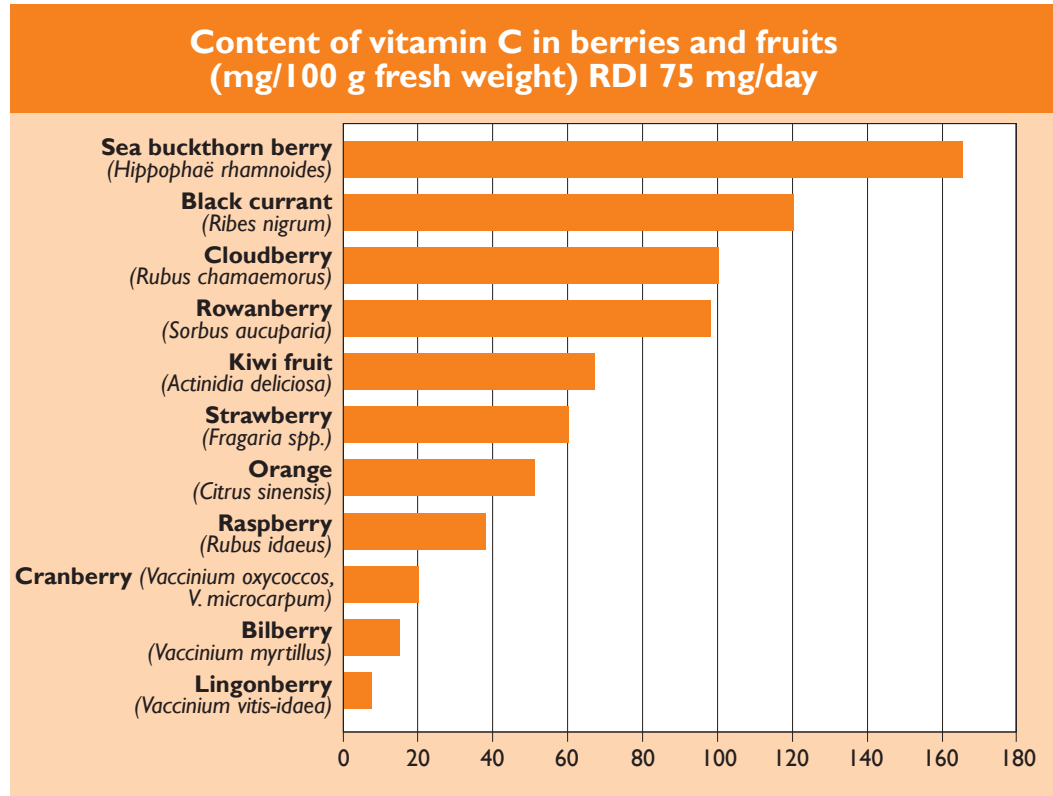


Figure 3 a and 3 b. Source: National Institute for Health and Welfare, Nutrition Unit, Fineli Food Composition Database 16, 2013. www.fineli.fi and RDI (Recommended Daily Intake) Finnish Nutrition Recommendations 2014 by the National Nutrition Council www.ravitsemusneuvottelukunta.fi/portall/en/nutrition+recommendations/



CLOUSBERRY
(*Rubus chamaemorus*)

Besides vitamins and minerals, dietary polyphenols are natural compounds occurring in berries, fruits and vegetables (figure 4.). Chemically, polyphenols are a large heterogeneous group of compounds which are generally classified into flavonoids and nonflavonoids. Polyphenols are not actually classified as a nutrient. However, they are the subject of intensive research and have been found to have beneficial effects on human health as well. The phenolic compounds are concentrated in the skin of the berry. It is therefore important to use the whole berry in food or foodstuff preparation and not to waste the skin or seeds.

Phenolic compounds which berries consist are:

flavonoids

• anthocyanins

- cyanidin, delphinidin, peonidin, petunidin, malvidin
- berry sources: bilberry, crowberry, bog bilberry

• flavonols

- quercetin, isorhamnetin, kaempferol and myricetin
- berry sources: bog bilberry, sea buckthorn

• catechins (flavan-3-ols)

- berry sources: lingonberry, (bilberry, crowberry)

nonflavonoids

• tannins

- proanthocyanidins
- berry sources: lingonberry, cranberry, crowberry
- ellagitannins
- berry sources: cloudberry, raspberry, arctic bramble

• phenolic acids

- hydroxycinnamic acids, hydroxybenzoic acids
- berry sources: rowanberry, (bilberry, crowberry)

• stilbens

- resveratrol
- berry sources: lingonberry

• lignans

- berry sources: lingonberry

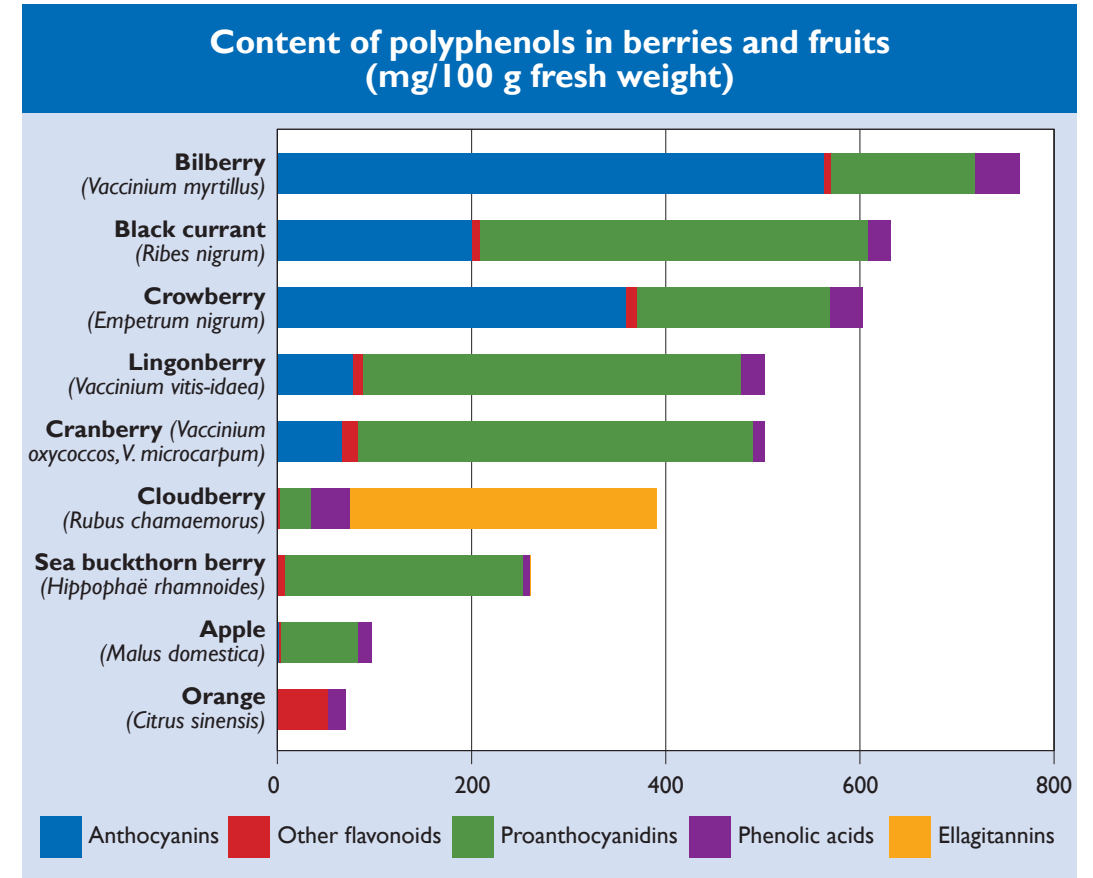


Figure 4. Source: Koponen et al. 2007. Hellström et al. 2009.

The flavonol (quercetin, isorhamnetin, kaempferol and myricetin) content in forest berries has been studied quite systematically. It may be concluded that all forest berries contain flavonols, even though their concentrations vary significantly among different berry species (figure 5.). Flavonol content is high in cranberry, bog bilberry and sea buckthorn berry, higher than in apples and tea leaves.

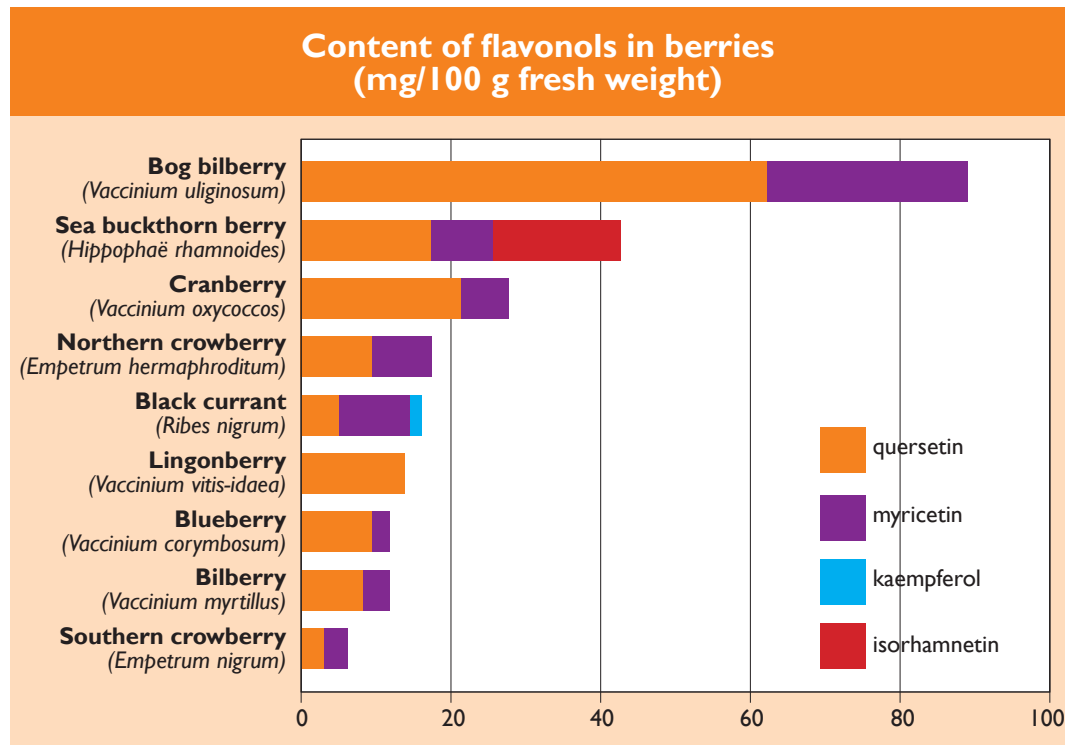


Figure 5. Source: Riihinen 2005.



LINGONBERRY (*Vaccinium vitis-idaea*)

The Finnish lingonberry grows on dry forest soils, typically in pine forests and on lichen heaths where the undergrowth is sparse. The dark red berries can be found growing in clusters on small shrubs close to the ground. The thick, wax-coated leaves are dark green in colour. Lingonberries are ready for picking between late August and the end of September. The average annual crop in Finnish nature is estimated 257 million kilos.

Lingonberry is prized for its unique and sharp taste. Before freezers and refrigerators lingonberries were mashed in their own juice and preserved in cellars of Finnish homes. Lingonberries contain natural preservative, benzoic acid. Lingonberries have many applications in the kitchen and are commonly made into jams, jellies, juices, pasties, pies and porridges. They may also be used to flavour bread, cookies, milk products etc.

Lingonberry contains typically low amount of energy but significant amounts of vitamin E (figure 3 b.), quercetin (figures 5. and 6.) and proanthocyanidins (figure 7.) and catechins as well. Lingonberries contain also significant amounts of widely studied phenolic compound resveratrol which is also present particularly in grapes and red wine (figure 8.). Lignans, which are phenolic phytoestrogens and general compounds in linen and rye, exist also among compounds of lingonberry.

According to the recent publications lingonberries are studied in maintaining blood vessels health and preventing type 2 diabetes.

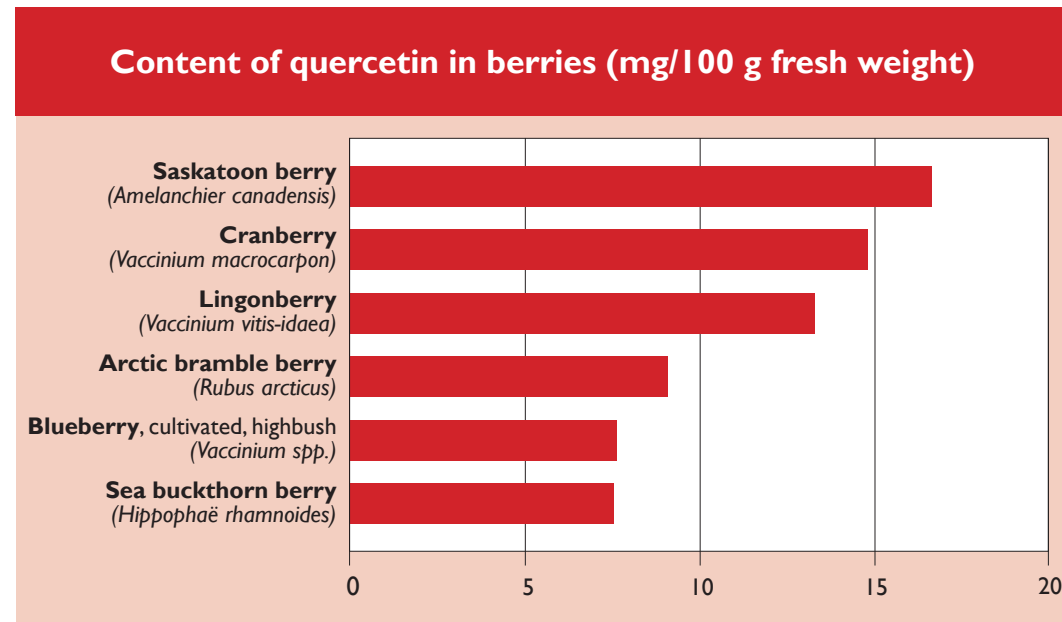


Figure 6. Source: U.S. Department of Agriculture, Agricultural Research Service. 2013. USDA National Nutrient Database for Standard Reference, Release 26. Nutrient Data Laboratory Home Page, www.ars.usda.gov/balbhnrc/nd/



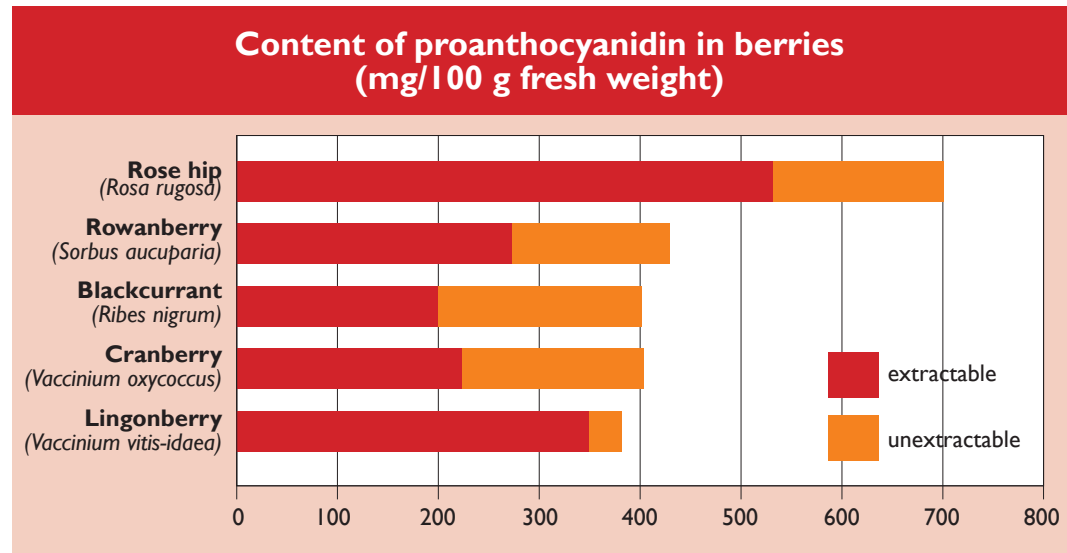


Figure 7. Source: Hellström et al. 2009.

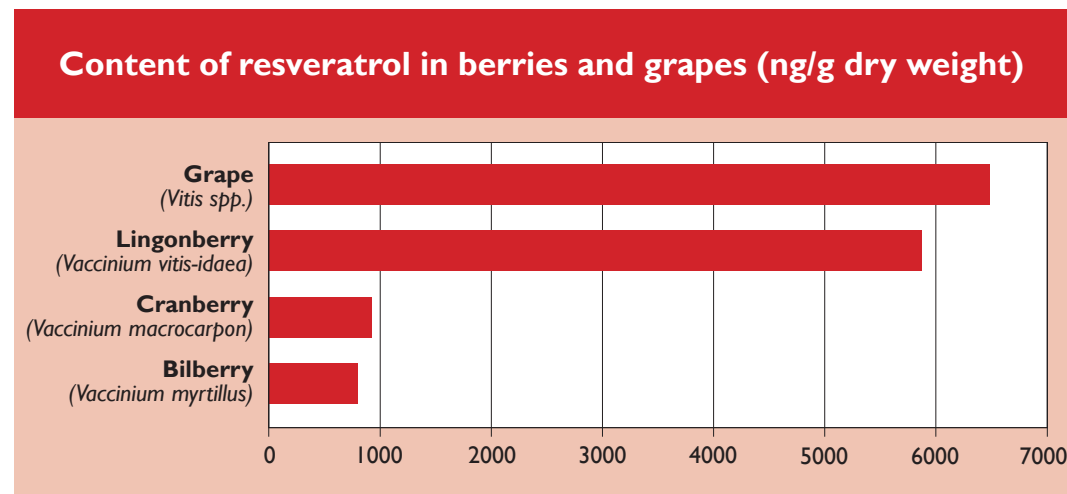


Figure 8. Source: Rimando et al. 2004.

BILBERRY (*Vaccinium myrtillus*)

The Finnish forest bilberry (*Vaccinium myrtillus*) differs from the cultivated blueberry (*Vaccinium corymbosum*, *V. angustifolium*). The bilberry is smaller and has a unique, sweet and juicy taste thanks to the climatic conditions and wild environment of the far north. The bilberry is also blue inside – indeed, it is rich in colour. Forest bilberries require a lot of water and are therefore typically to be found growing in spruce forests. The leaves of the bilberry shrub are light green in colour while the berries are dark blue. Bilberries are suitable for picking between late July and the beginning of September. The average annual crop of bilberries in the Finnish nature is about 184 million kilos.

The Finnish forest bilberries have a sweet flavour even though they do not contain very much sugar. They are used in soups, puddings, pastries and even porridges. Freshly baked bilberry pie is, without doubt, one of the best-loved delicacies. Bilberry juice may be served with meals and warm bilberry soup is an excellent form of refreshment when out hiking or skiing on a freezing winter's day.



The Finnish forest bilberry contains typically significant amounts of fiber (figure 2.), vitamin C (figure 3 a.) anthocyanins and such phenolic acids as hydroxycinnamic acids, hydroxybenzoic acids (figure 4.).Anthocyanins give to the Finnish forest bilberry peel and pulp their dark blue pigmentation. The Finnish forest bilberries have three times more amount of anthocyanins compared to the cultivated blueberries (figures 9. and 10.).

According to the recent publications the Finnish forest bilberries (or their isolated fractions) are studied in preventing heart diseases, cancers, type 2 diabetes and eye disorders.

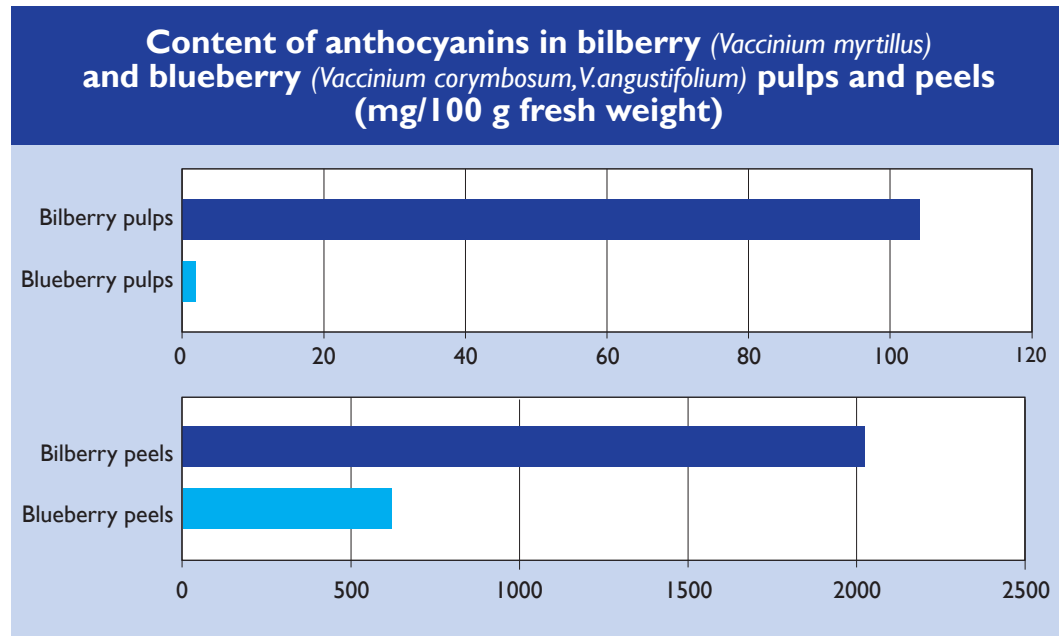


Figure 9. Source: Riihinen et al. 2008.



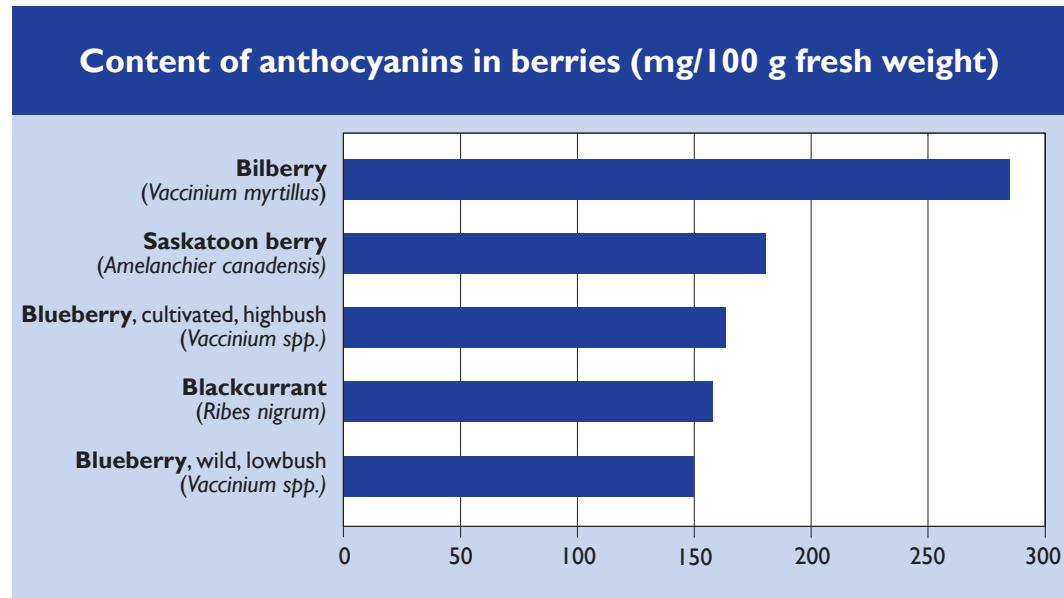
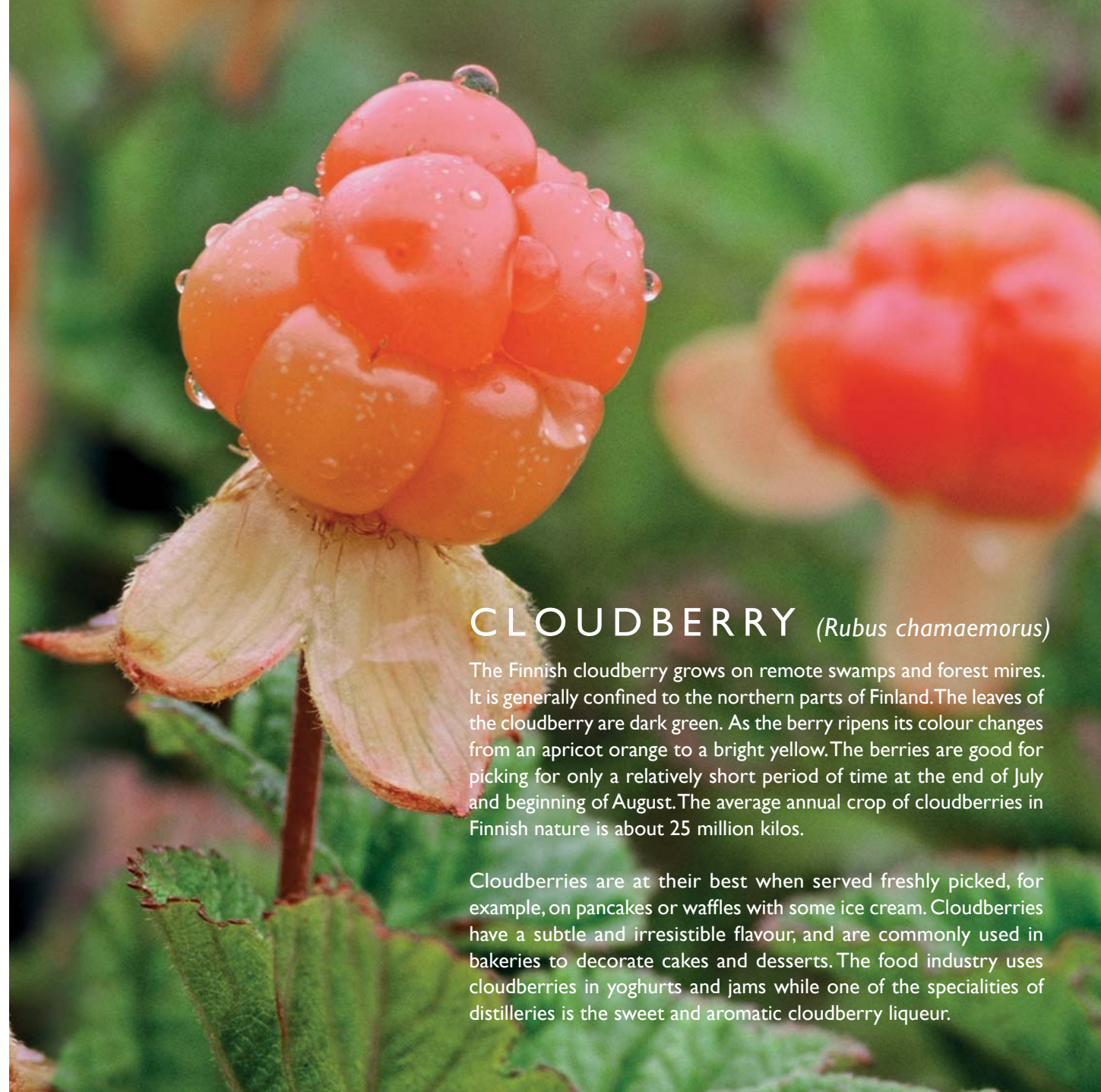


Figure 10. Source: U.S. Department of Agriculture, Agricultural Research Service. 2013. USDA National Nutrient Database for Standard Reference, Release 26. www.ars.usda.gov/ba/bhnrc/ndl



BILBERRY
(*Vaccinium myrtillus*)



CLOUDBERRY (*Rubus chamaemorus*)

The Finnish cloudberry grows on remote swamps and forest mires. It is generally confined to the northern parts of Finland. The leaves of the cloudberry are dark green. As the berry ripens its colour changes from an apricot orange to a bright yellow. The berries are good for picking for only a relatively short period of time at the end of July and beginning of August. The average annual crop of cloudberrries in Finnish nature is about 25 million kilos.

Cloudberrries are at their best when served freshly picked, for example, on pancakes or waffles with some ice cream. Cloudberrries have a subtle and irresistible flavour, and are commonly used in bakeries to decorate cakes and desserts. The food industry uses cloudberrries in yoghurts and jams while one of the specialities of distilleries is the sweet and aromatic cloudberry liqueur.

The cloudberry is especially rich in nutrients. It contains very high concentrations of fiber (figure 2.) as well as vitamins C and E (figure 3 a. and 3 b.). Cloudberry does not contain high flavonoid levels. However, another phenolic compounds, called ellagitannins, are present in abundance (figure 11.). Researchers have found, that these compounds are typical for all the berries with aggregates of drupes, like raspberry and arctic bramble.

According to the recent publications cloudberry (or their isolated fractions) are studied in their antimicrobial and anticarcinogenic properties.

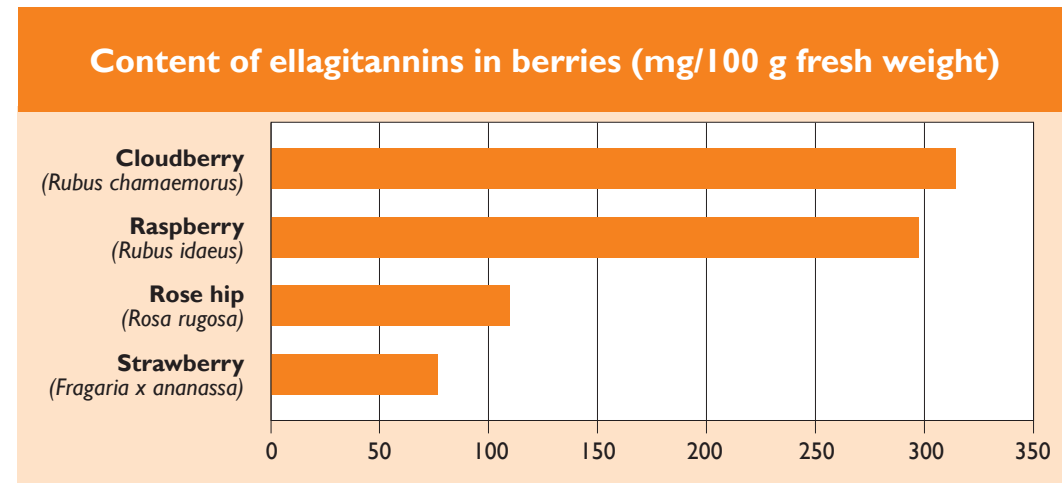


Figure 11. Koponen et al. 2007.

CLOUSBERRY
(Rubus chamaemorus)



CROWBERRY
(Empetrum nigrum, E. hermaphroditum)

The crowberry grows throughout Finland. With its green shoots and black berries, this dwarf shrub grows on the dry heaths of hills, on raised bogs and even on the barren peatlands and fields of Lapland. The crowberry season begins in August and lasts until the first snows. Crowberry jelly or juice blends well with other berries like bilberries. In addition to juices and jellies, crowberries are used in soups, pies, and other berry preparations. The average annual crop of crowberries in the Finnish nature is about 120 million kilos.

Crowberries contain high levels of flavonoids, such as flavonols (figure 5.) and anthocyanins (figure 12.). Many studies confirm, that crowberries are rich in anthocyanins such as forest bilberries. In addition to the health-promoting effects of these compounds, they lend the berry its deep blue colour. These pigments are used by foodstuff industry as natural colours.

Each of the Finnish forest berries has an unique combination of different nutrients, phenolics and other compounds. Thus, the best nutritional benefit is got by using a wide range of berry products, which contain whole berries instead of their isolated fractions or single compounds.

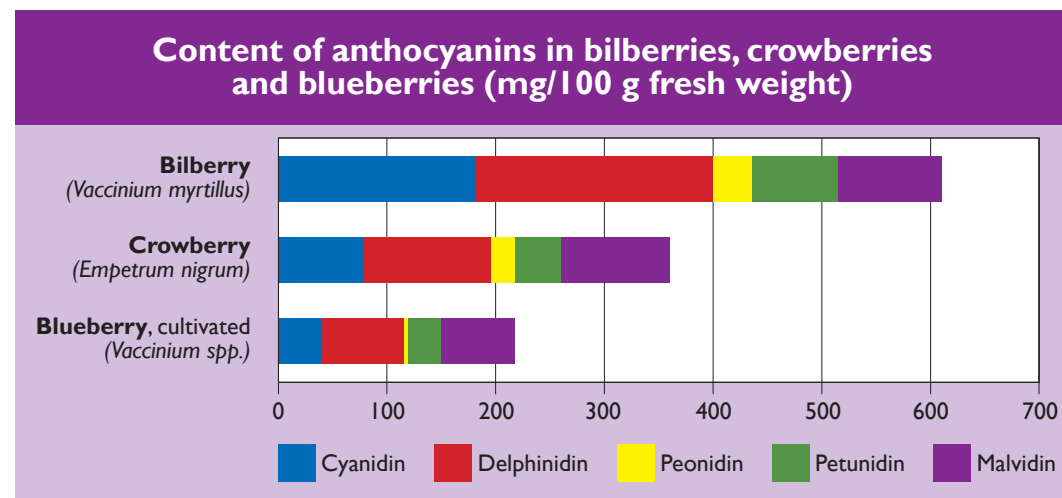


Figure 12. Source: Koponen et al. 2007.

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Tips for enjoying of healthy berries!

- Eat one hundred grams of berries a day!
- Berries are a light food to munch on. Replace salty snacks with nutritious, low-calorie berries.
- You can make quick, tasty snacks by combining berries with plain yoghurt, soy yoghurt, cottage cheese, curd cheese, and various kinds of nuts, seeds or bran.
- To make delicious and healthy milkshakes and beverages, combine berries with berry juice, plain yoghurt, buttermilk, milk, water, soy or oat milk, and different sorts of seeds or nuts.
- Berry powder can be easily added to yoghurts, cereals, porridge or tea.
- One tablespoon of berry powder is equivalent to about 1.5 dl of fresh berries.
- Berry powder is easy to take with you to work or on trips.
- Keep the berry powder in an airtight container so that you can take it along even in warm or humid weather.
- Dried berries are easy to carry along as a snack, and can be used instead of raisins in baking.
- Combine berry juice with mineral water for a bubbling celebration drink.
- Partly frozen berries with chocolate, caramel or vanilla sauce can be served as a quick dessert even on special occasions.
- You can make a refreshing summer treat by puréeing fresh or frozen berries with ice cream.
- Welcome to Finland: Everyman's rights allow You to find and pick the forest berry and mushroom treasures and hike freely in the nature. Although, the berry picking season is short, there is always a wide range of commercial Finnish forest berry products available!



Arctic Flavours Association
Kauppakatu 20, 89600 FI-Suomussalmi, Finland
Tel. +358-8-6155 5590, fax +358-8-6155 5592
E-mail: info@arctic-flavours.fi
www.arctic-flavours.fi

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The Arctic Flavours Association is a nation-wide non-wood forest products industry association specialising in wild berries, mushrooms, herbs and special natural products. The aims of the Association are to promote the gathering, processing and use of natural products as well as to improve their quality.

The Arctic Flavours Association is guided by the following values in its work:

- Health
- Concern for the environment
- Northernness
- Genuineness
- Safety

The business concept and vision behind Arctic Flavours is:

- To produce services that support the development of the non-wood forest products industry for the benefit of companies, stake-holders in the industry and citizens
- To make non-wood forest products and the foods made from them a recognised part of a healthy diet in Finland and abroad

Firms exporting berry products



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Fenola Ltd is focused on manufacturing and selling health-promoting natural ingredients derived from the Arctic region's raw materials, berries, plants and herbs. A selection of bioactive compounds, liquid and powder extracts are supplied for Nutraceutical, Cosmetic and Food industries. Spray drying process. Contract manufacturing.

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*Finnatural Ltd. operates and exports Finblu – a labelled Finnish brand of bilberry product. Currently available products include bilberry juice, powder and capsule which are produced with 100% Finnish wild bilberry. Finnatural Ltd. wishes to establish mutual benefited cooperation with international customers in the area.
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Kalevala Spirit Ltd is a Finnish exports company. Everything we do is inspired by the worlds most translated mythology, The Kalevala. Design, Gourmet and Experiences are the three sectors we work in.

Kaskein Marja Oy

Portinkatu 4, FI-53830 LAPPEENRANTA
Tel. +358 5 544 7900
Email: info@kaskeinmarja.fi
www.kaskeinmarja.fi

In our product line you can find juices, jams and jellies, fresh (in the summer season) berries, dried berries, frozen berries, berry powders, marmalades, purees and concentrates. We sell the mushrooms fresh (in the summer season), dried, deep frozen, or in salt brine. Wild berries - and mushrooms are bought and sold.

Kiantama Ltd

Marjatie 1, FI-89600 SUOMUSSALMI
Tel. +358 40 068 1997
Email: kiantama@kiantama.fi
www.biokia.fi
www.kiantama.fi

Kiantama Ltd is specialized in the processing of wild berries. We produce and develop high-quality berry products and raw material for food, health supplement and cosmetics industries. Kiantama Ltd product assortments include: frozen berries, berry juice concentrates, berry NFC juices and syrups, berry purées with and without seeds, berry powders and crushed berries, dried berries and sugar infused berries and berry seeds and chocolate coated berries. The raw materials used are bilberry, lingonberry, mountain bilberry, cranberry, cloudberry, sea buckthorn berry, rowanberry and chokeberry.

Maa-Aitta Oy Ltd

Hietatie 6, FI-76850 NAARAJÄRVI
Tel. +358 40 066 3456
Email: info@maa-aitta.fi
www.maa-aitta.fi

We market in our region cultivated berries, wild berries and mushrooms. Bilberries, lingonberries, cranberries and cloudberry are bought in the summer season. Morels, chanterelles, trumpet chanterelles, black trumpet mushrooms, ceps and salted northern milk-caps are bought in the summer season.

Marja Bothnia Berries Oy Ltd

Yrittäjätie 5, FI-65610 MUSTASAARI

Tel. +358 50 384 5465

Email: kare.bjorkstrand@marjabothniaberries.fi
www.marjabothniaberries.fi

Marja Bothnia Berries Ltd organizes the collection of berries, their freezing, cleaning, sales and delivery to customers all over the world. The wild berries are collected in Finland's pure and clean forests. All our berries are frozen quickly after picking, which ensures that the vitamins and nutrients are preserved in the best possible way. The products for industrial use include: lingonberries, bilberries, cloudberry, crowberries, rowanberries, cranberries and sea buckthorn.

Marjami Oy

Kauppilantie 81, FI-60800 ILMAJOKI

Tel. +358 10279 1853

Email: mika@marjami.fi

www.marjami.fi

online shop: www.kauppa.marjami.fi

Our products are berry juices, lingonberry purees and frozen Berries, such as berry grists, berry slices, whole berries and berry blends. Wild and cultivated berry products wholesale and retail sales. Wild berries are bought and sold.

Maustaja Oy

Tuotetie 3, FI-92930 PYHÄNTÄ

Tel. +358 20 799 1399

Email: juha.korhonen@maustaja.fi

www.maustaja.fi

As an authentic contract manufacturer of jams and other fluid products Maustaja has a strong proficiency based on persistent product development. We manufacture and pack strawberry, raspberry, cloudberry, lingonberry and different kinds of compound jams to versatile consumer and foodservice packages. Plum flan fillings are manufactured seasonally. We also develop and manufacture healthy drinkable snacks from arctic berries and other compounds. The composition of all products are customer and product based. Customers are remarkable retail chains, marketing and industrial companies in Finland and abroad. Maustaja has ISO 22 000,

BRC and organic product certificates.

Nordic Natural Food Company

Kuivannontie 655, FI-16280 KUIVANTO

Tel. +358 40 550 3373

Email: mikko.maki@isomikko.fi

www.luonnonenergia.fi, www.juhlawa.fi

Our company operates trading company for the original Finnish natural berries and mushrooms, and the preparation for the products. Get more informations: www.isomikko.fi

Nordic Vitality Oy

Vasarakankaantie 17,

FI-83700 POLVIJÄRVI,

Tel. +358 50 401 1510

Email: kari.koljonen@nordicvitality.fi

www.nordicvitality.com

www.berryfect.com

BERRYFECT® is a Nordic Vitality Ltd. brand.

The company is researching berries nutritional functions and developing new innovative berry products with their partners.

Polarica Oy

PL 8176, Ahjotie 9, FI-96101 ROVANIEMI

Tel. +358 40 544 6546

Email: sari.korhonen@polarica.fi

www.polarica.com

Polarica is the leading European supplier of berries, mushrooms and game meat.

Our frozen berry selection includes both forest and cultivated berries as well as organic berries and berry juice concentrates.

Oy Roberts Ab

Inkilänkatu 3, FI-20300 TURKU

Tel. +358 400 630 227 Mikko Roberts

Email: mikko.roberts@roberts.fi

www.roberts.fi

High quality berry products such as jams, marmalades and innovative snacks made with whole Nordic berries.