



Healthy FOREST BERRIES

- *Lingonberry* • *Bilberry*
- *Cloudberry* • *Crowberry*



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 berries and their health implications. It has been shown that 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
- high content of vitamins C and E
- high content of potassium and other minerals
- low sodium content

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 (< 2 g/100 g). The fat (oil) content of forest berries is of very high quality as it consists of essential health-promoting fatty acids. 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.

Forest berries are rich in both soluble and insoluble fiber (figure 1.).The concentrations of the various fiber types vary according to the berry in question. Particularly cloudberry and sea buckthorn berry contain significant amount of dietary fiber.

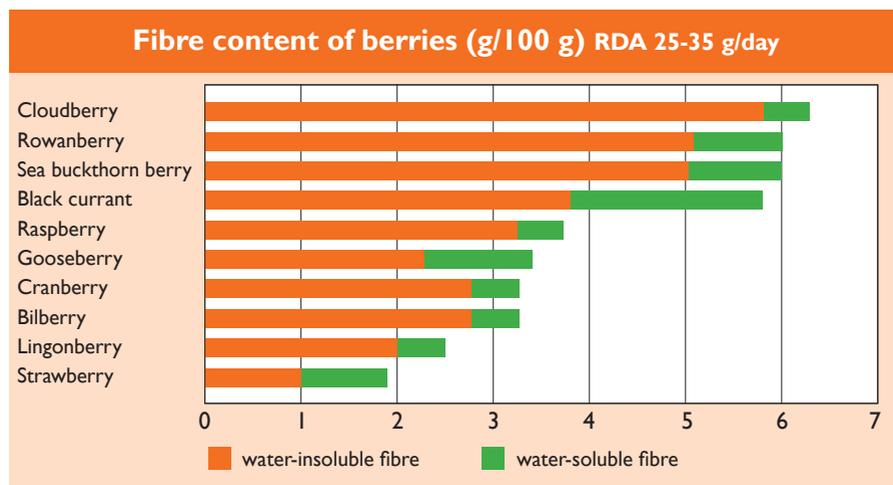


Figure 1. Source: National Institute for Health and Welfare 2010. Fineli – Finnish Food Composition Database. www.fineli.fi.

Forest berries are also excellent sources of vitamins C and E. Forest berries contain as much as or more vitamin C than commonly consumed fruits and vegetables. Sea buckthorn berry, cloudberry and rowanberry contain more vitamin C per unit weight than do oranges (figure 2.).

Forest berries also contain a wide range of minerals, such as potassium (figure 3.), zinc, magnesium and manganese. As with vitamins, the mineral concentrations of forest berries compare favourably with those of fruits. Moreover, sodium concentrations are generally very low, thus making berries of significant health value to those suffering from raised blood pressure.

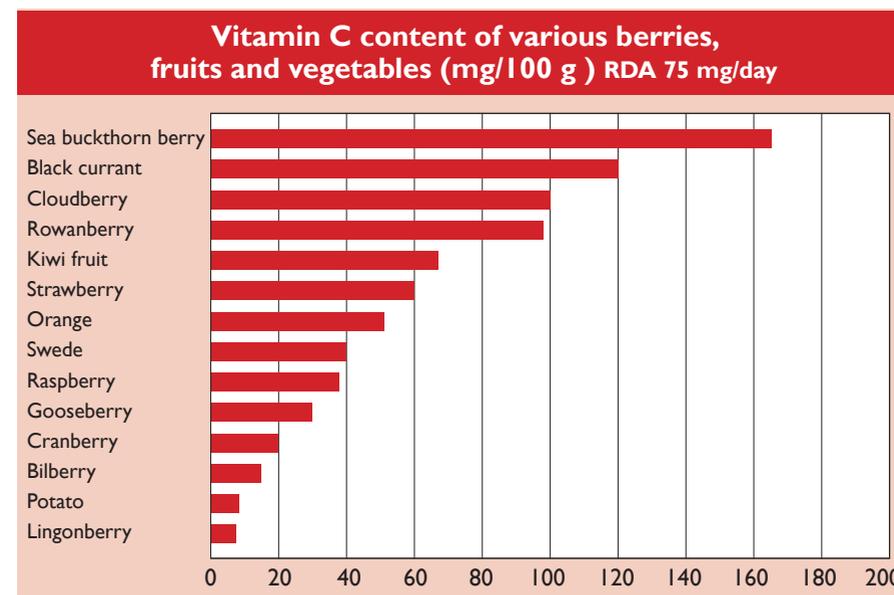


Figure 2. Source: National Institute for Health and Welfare 2010. Fineli – Finnish Food Composition Database. www.fineli.fi.

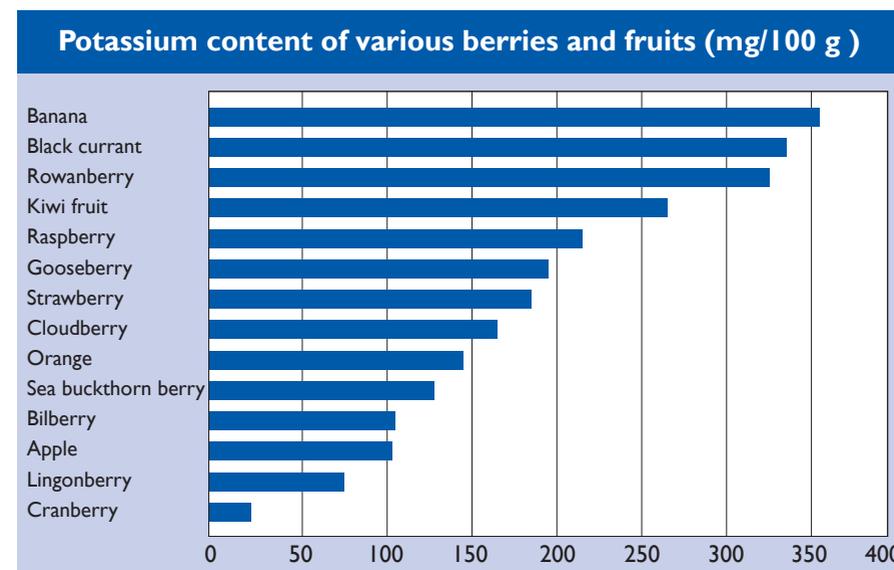


Figure 3. Source: National Institute for Health and Welfare 2010. Fineli – Finnish Food Composition Database. www.fineli.fi.

Besides vitamins and minerals, berries contain polyphenols, which are not actually classified as a nutrient. Polyphenols are the subject of intensive research and have been found to have beneficial effects on human health as well. Wild berries are one of the best sources of polyphenols and also contain more of these compounds than any other plant. Each kind of berry typically produces certain polyphenols (figure 11.).

Phenolic compounds which berries consist are:

flavonoids

- flavonols (bog bilberry, sea buckthorn)
- anthocyanins (bilberry, crowberry, bog bilberry)
- catechins (lingonberry)

tannins

- proanthocyanidins (lingonberry, cranberry, crowberry)
- ellagitannins (cloudberry, raspberry, arctic bramble)

phenolic acids (rowanberry, bilberry)
lignans (lingonberry, cranberry)

stilbens

- resveratrol (lingonberry)

One of the most widely studied groups of these compounds are flavonoids. We know that many fruits (e.g. apples), vegetables (e.g. onions) and tea contain high concentrations of flavonoids. Recent studies have also tested forest berries for their flavonoid content and have found them to be rich sources (figure 4.).

The phenolic compounds are concentrated in the skin of the berry. It is therefore important to use the whole berry in food preparation and not to waste the skin or seeds. The concentrations of phenolic compounds in forest berries and their health effects are under continuous study both in Finland and elsewhere in the world.

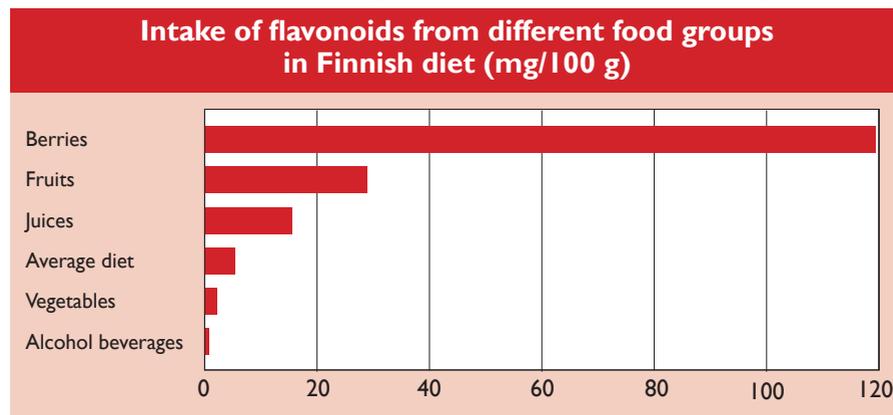


Figure 4. From: Kumpulainen 2001.

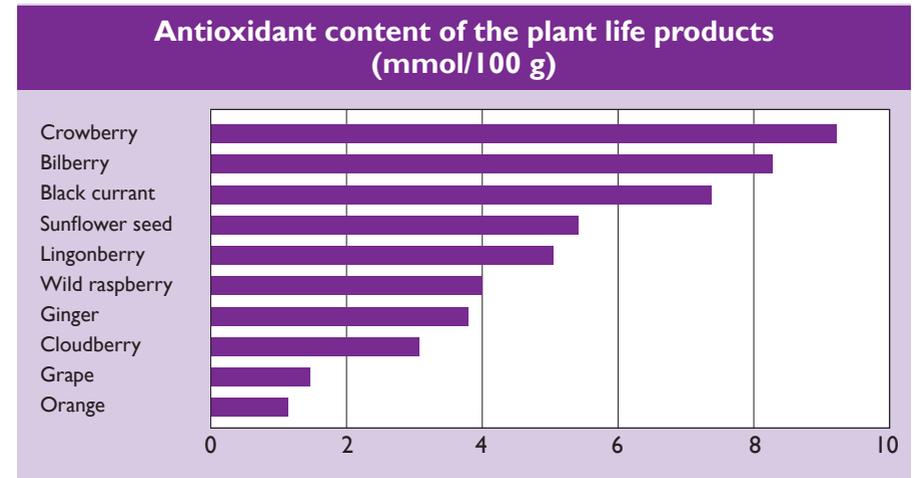


Figure 5. Source: Halvorsen et al. 2002.

The flavonol (quercetin, kaempferol and myricetin) content in forest berries has been studied quite systematically. From the results of these studies it may be concluded that berries are excellent sources of flavonols (figure 6.) although concentrations vary significantly between different types of

berries. Cranberry, bog bilberry, lingonberry and crowberry are excellent sources of flavonols. Bilberry is also a good source. Each of these berries contains higher concentrations of flavonols than do apples and tea leaves.

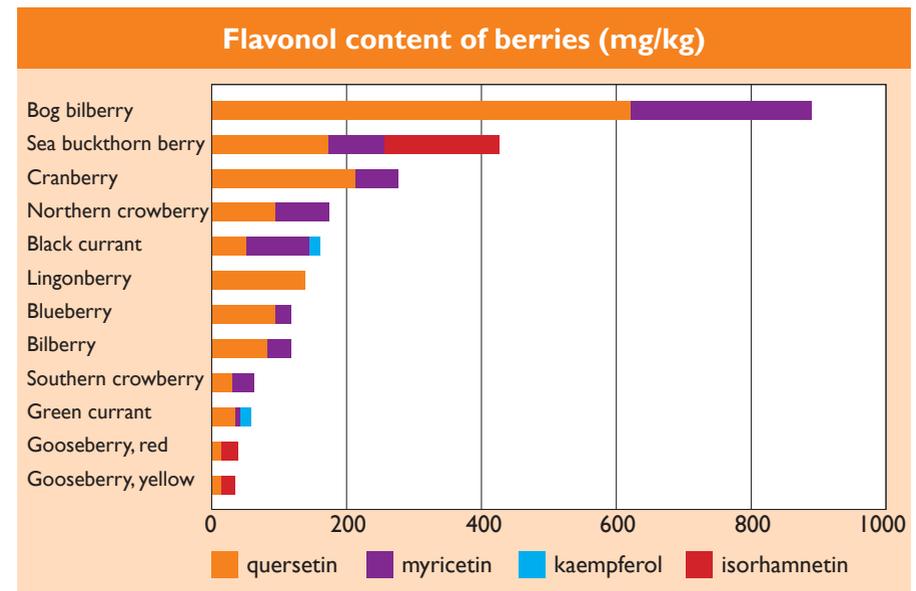


Figure 6. Source: Riihinen 2005.

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LINGONBERRY (*Vaccinium vitis-idaea*)

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.

Lingonberry is prized for its unique and sharp taste. Lingonberries may be preserved in their own juice as they contain all the necessary natural acids and sugars. 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.

Lingonberries contain less vitamins and minerals than other berries but concentrations,

nevertheless, compare favourably with those found in most common fruits. The particular strength of the lingonberry lies in the high concentrations of flavonoids and lignans present (figure 7.). Lingonberries contain lignans, phenolic phytoestrogens in much higher concentrations than do other berries. Lingonberries contain also significant amounts of widely studied phenolic compound resveratrol which is also present particularly in grapes and red wine (figure 8.). In addition to these compounds lingonberries contain also tannins, like proanthocyanidins (figure 9.). These compounds have been reported to demonstrate antibacterial, antiviral and anti-inflammatory activities.

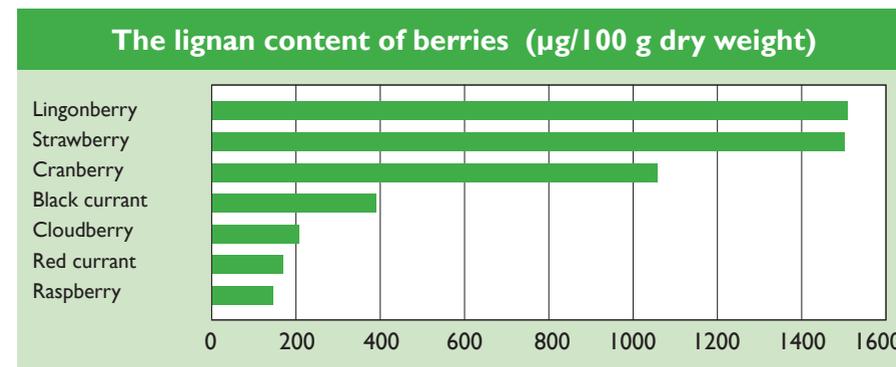


Figure 7. Source: Mazur et al. 2000.

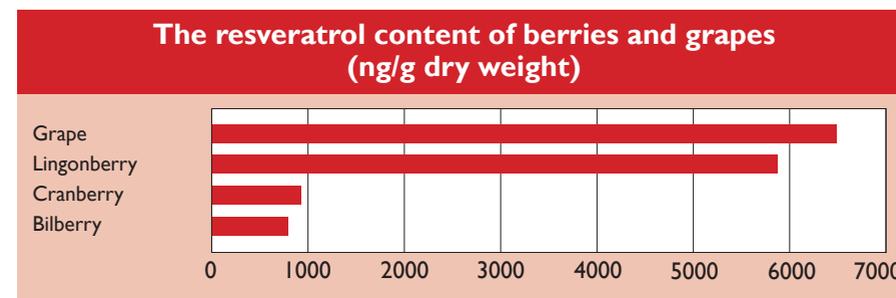


Figure 8. Source: Rimando et al. 2004.

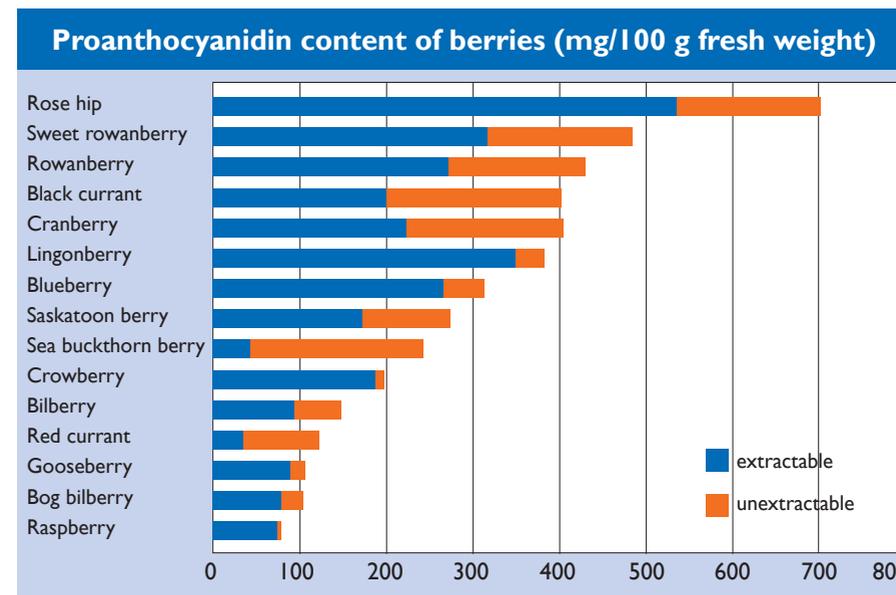


Figure 9. Source: Hellström et al. 2009.

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BILBERRY (*Vaccinium myrtillus*)

The forest bilberry differs from the cultivated blueberry. 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. Wild 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 a dark blue. Bilberries are suitable for picking between late July and the beginning of September.

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.



Forest bilberries contain only modest levels of vitamins (see e.g. vitamin C content in figure 2.). However, they have other excellent properties. The forest bilberry contains high concentrations of phenolic compounds, such as flavonoids, hydroxycinnamic acids and hydroxybenzoic acids. The dark blue colour of

bilberry comes from anthocyanins, the group of flavonoid compounds. The concentration of anthocyanin is significantly higher in bilberry than in cultivated blueberry (figure 10.).

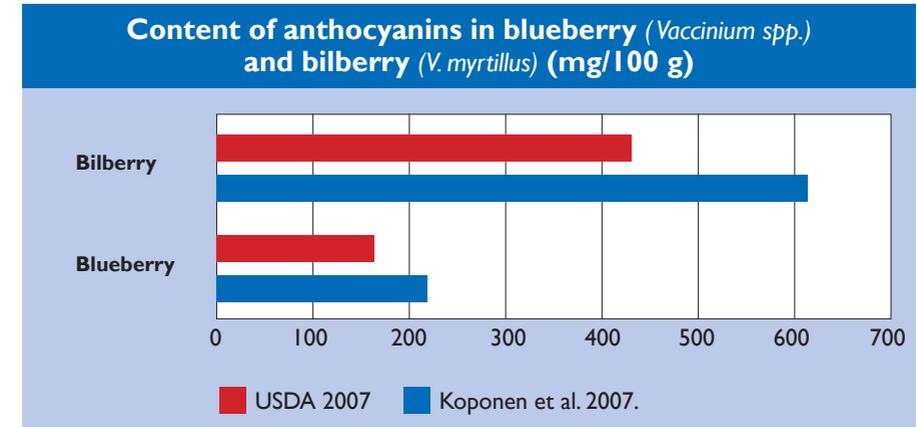


Figure 10. Source: USDA 2007. Koponen et al. 2007.

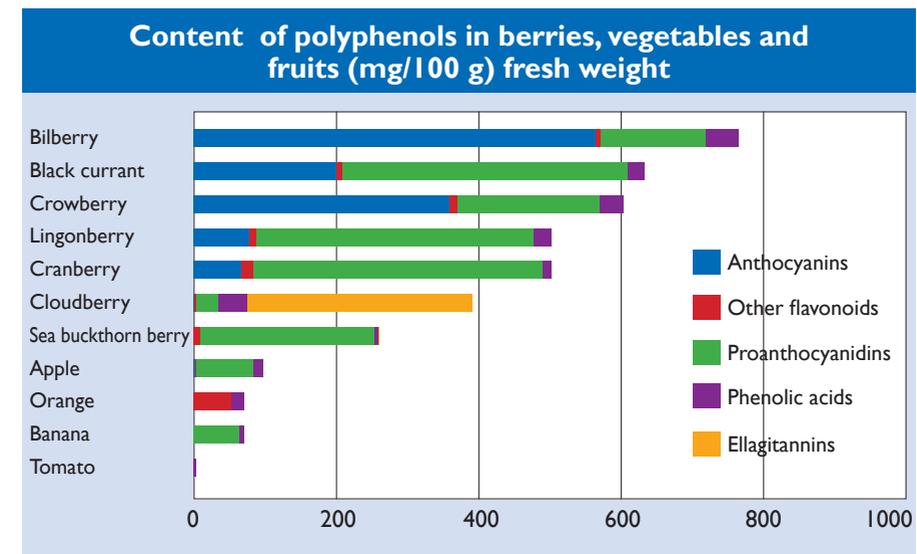


Figure 11. Source: Koponen et al. 2007. Hellström et al. 2009.

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CLOUBERRY (*Rubus chamaemorus*)

The cloudberry grows on remote swamps and forest mires. It is generally confined to 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.

Cloudberrys are at their best when served freshly picked, for example, on pancakes or waffles with some ice cream. Cloudberrys have a subtle and irresistible flavour, and are commonly used in bakeries to decorate

cakes and desserts. The food industry uses cloudberrys 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 both vitamins C and E (figures 2. and 12.), as well as having a higher fibre content than any other berry. Cloudberrys contain much more vitamin E than do common fruits, vegetables or cereal.

found cloudberrys to be rich in ellagitannins (figure 13.). These compounds are typical for all the berries with aggregates of drupes, like raspberry and arctic bramble. Ellagitannins in cloudberry has been proved to possess inhibitory effects on pathogenic bacteria like *Salmonella typhimurium* (in vitro).

Cloudberrys do not contain high flavonoid levels. However, other phenolic compounds are present in abundance. Researchers have

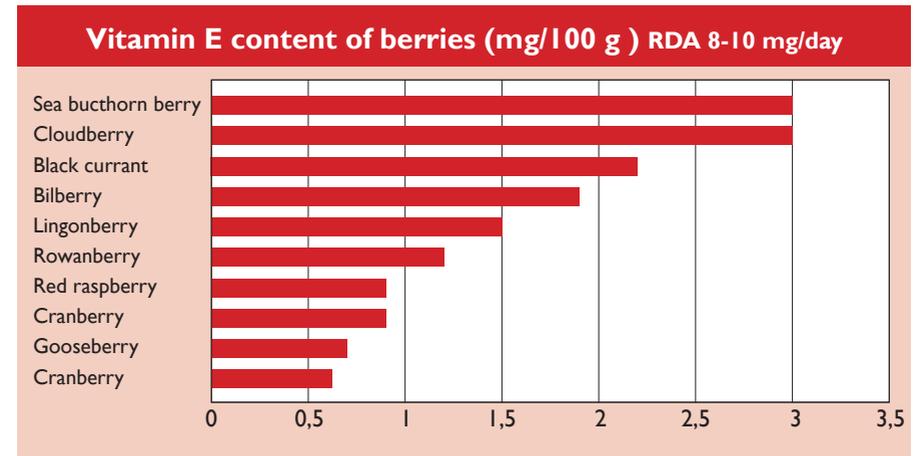


Figure 12. Source: National Institute for Health and Welfare 2010. Fineli – Finnish Food Composition Database. www.fineli.fi

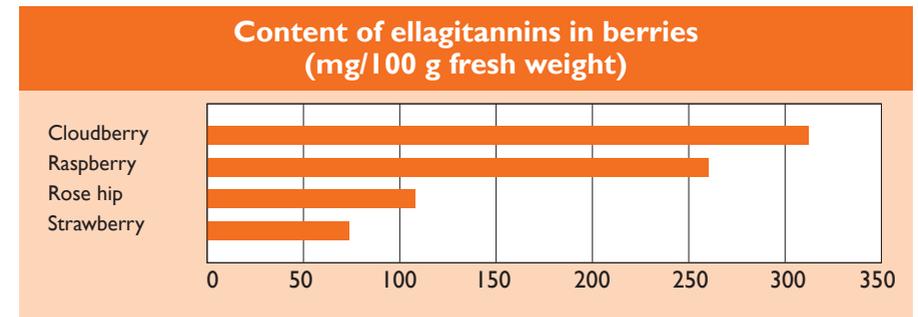


Figure 13. Koponen et al. 2007.

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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. The berries contain hardly any natural acids. For this reason crowberry jelly or juice blends well with other, more acid berries. In addition to juices and jellies, crowberries are used in soups, pies, and other berry preparations.

Crowberries contain high levels of flavonoids, such as flavonols and anthocyanins (figure 14.). Many studies confirm crowberry to have almost as much anthocyanins as bilberry has. 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!

Content of anthocyanins in berries
(mg/100 g fresh weight)

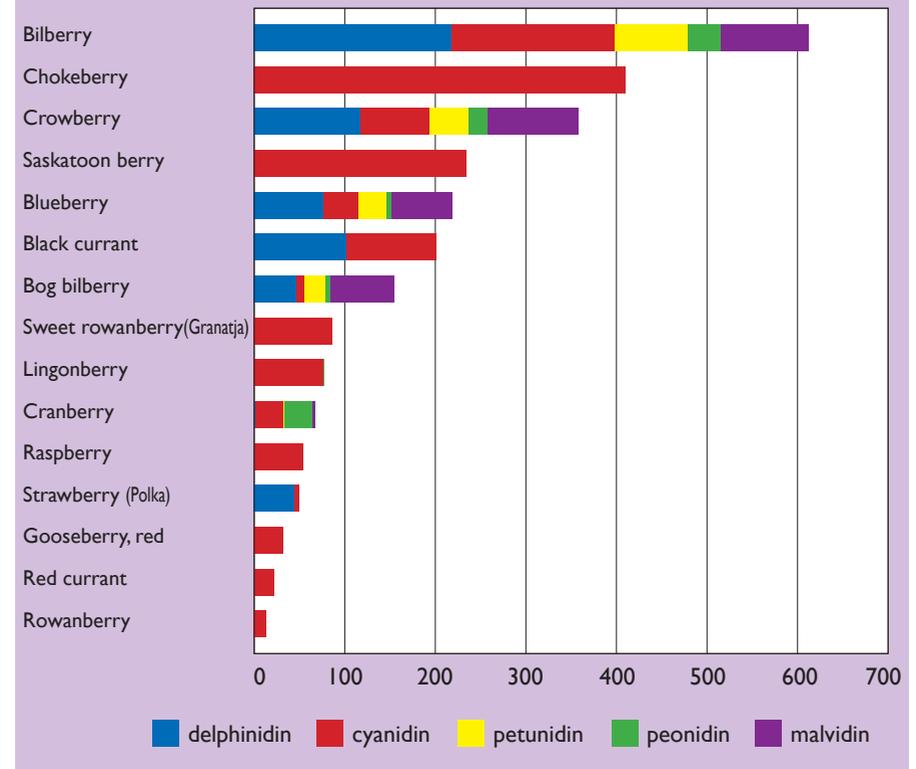


Figure 14. Source: Koponen et al. 2007.



FOREST BERRY recipes



Grandma's Bilberry Pie

Crust:
2,5 dl water or milk
25 g yeast
1 tsp salt
1/2 dl sugar
1 egg
7-8 dl wheat flour
75 g melted margarine

Filling:
1,5 l bilberries; mash them a bit
about 1 dl potato flour
2 dl sugar

Dissolve yeast in hand warm water or milk. Add salt, sugar and egg. Knead the flour into the dough. Mix the dough strongly either by hand or a mixer. Pour the melted margarine into the dough. Knead the dough solid. Roll the dough into a plate of the size of the oven pan.
(Use the remaining dough as bars forming a grid on top of the bilberries.)
Mix the fillings together. Place the filling evenly onto the pie dough plate. Bake in 175-200 °C for some 30 minutes.

Berry-flavoured Toast

2 slices of toast
1 tbsp of cream cheese
(seasoned with vanilla sugar)
2 dl forest berries
(sugar or honey)

Toast the bread slices if you wish. Spread the cream cheese and berries with a bit of sugar or honey onto the bread.

Bilberry Pancake

2 eggs
8 dl milk
4 dl wheat flour
1/2 tsp salt
5 dl bilberries
2 tbsp sugar
2 tbsp oil or liquid margarine

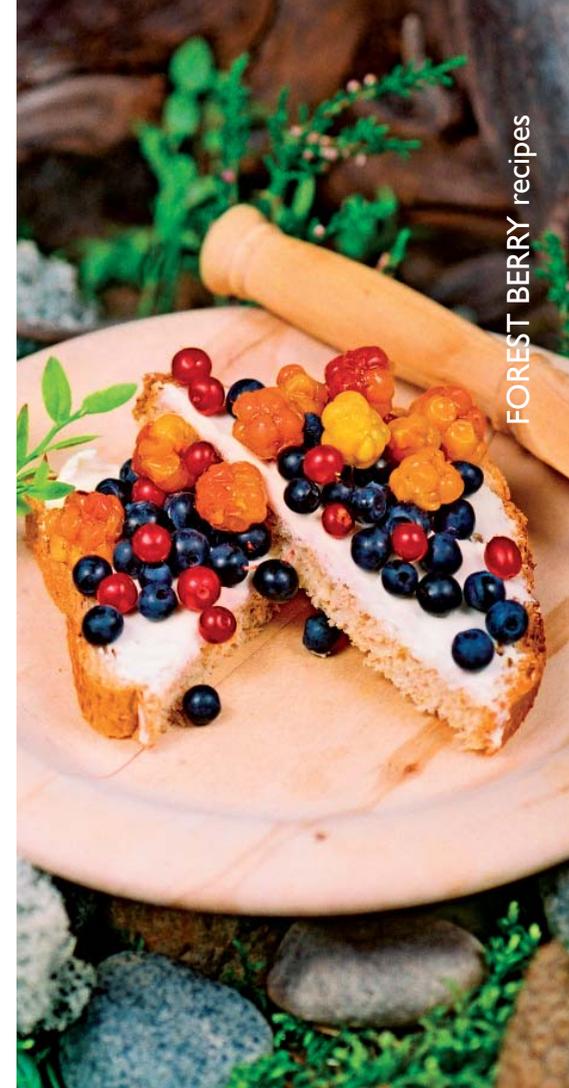
Beat the eggs. Add the milk, flour, salt, berries, sugar and oil. Spread the dough onto a baking plate covered with baking paper. As an alternative to baking paper you may coat the plate with oil or margarine. Bake the pancake at 225 °C for about 20 minutes.

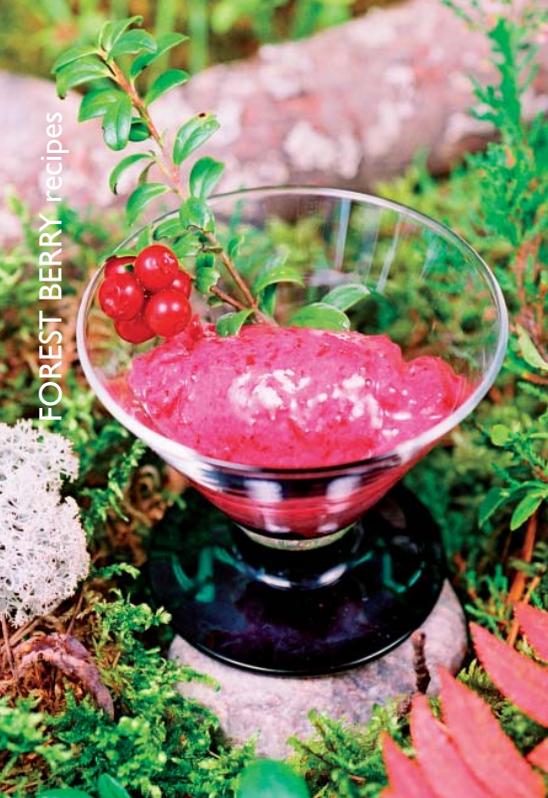
Berry Omelette

Filling:
2 dl forest berries
1/2 apple
1/2 dl berry juice, lemon juice
(berry liqueur)

Omelette:
2 eggs
1 tbsp water

Slice the apple. Mix the forest berries and apple slices with berry juice seasoned with lemon juice (and berry liqueur). Let season for about one hour. Prepare the omelette by mixing eggs, water and salt. Pan-fry the omelette. Place onto a plate. Add berry mix on top. Serve right away.





Lingonberry Mousse

2 dl	mashed lingonberries
1	egg yolk
2 tsp	potato flour
2 tsp	lemon juice
1/4 dl	sugar
1	egg white
1 tbsp	icing sugar

Measure the mash, egg yolk, potato flour and sugar onto a pan. Mix well. Heat while continuously mixing, until the mix thickens. Cool it off.

Whip the egg white into a hard mousse. At the end of whipping, add icing sugar little by little while still strongly whipping. Mix the egg white mousse with the lingonberry mash. Serve right away. You may serve the lingonberry mousse with wild berries.

Traditional Berry Soup

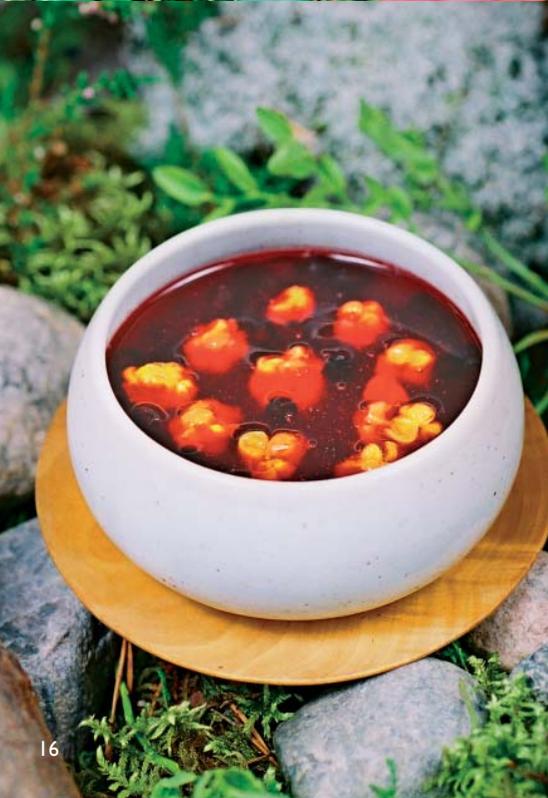
1 l	water
1/2 l	lingonberries or 3 dl crushed lingonberries
1-1 1/2 dl	sugar

Thickening:

1 dl	cold water
5 tbsp	potato flour
3 dl	forest berries (cloudberries, bilberries) (sugar)

Boil the lingonberries in water. Strain the juice and place it into another kettle and add sugar. Boil until the sugar dilutes.

Use the skin of the berries in baking and cooking other dishes. Take the kettle off the electric stove. Dilute the potato flour in cold water. Pour the water-flour mixture into lingonberry juice and stir thoroughly. Put the kettle back on the stove and heat until the soup is brought to boil and thickens. Add the cloudberries. Pour the soup into a serving bowl and add a little sugar on.



Wild Berries in Sweet Melon Sauce

4 dl	forest berries
1/4	honeydew melon (sugar or honey)

Prepare the watermelon sauce by mashing the watermelon bits with a mixer stick. Sweeten if you wish. Pour the sauce onto a plate or at the bottom of a bowl. Place the berries on top of the sauce.

Lingonberry Smoothie

1 can (200 g)	unseasoned yoghurt
1 dl	milk
4 dl	lingonberries
2 tbsp	sugar or honey
1-2 tsp	lemon juice

Put ice cubes into glasses. Mix all ingredients into porous a drink with a mixer stick or mixer. Pour the drink into glasses. If you wish, add an ice cube into glasses before serving the drinks.

Berry-Melon Nectar

2 dl	forest berries (bilberries, lingonberries)
3 dl	watermelon bits
a pinch of	sugar or honey

Place melon bits, berries and sugar onto a high bowl. Mash with a mixer stick or mixer into a solid drink. Pour into glasses.

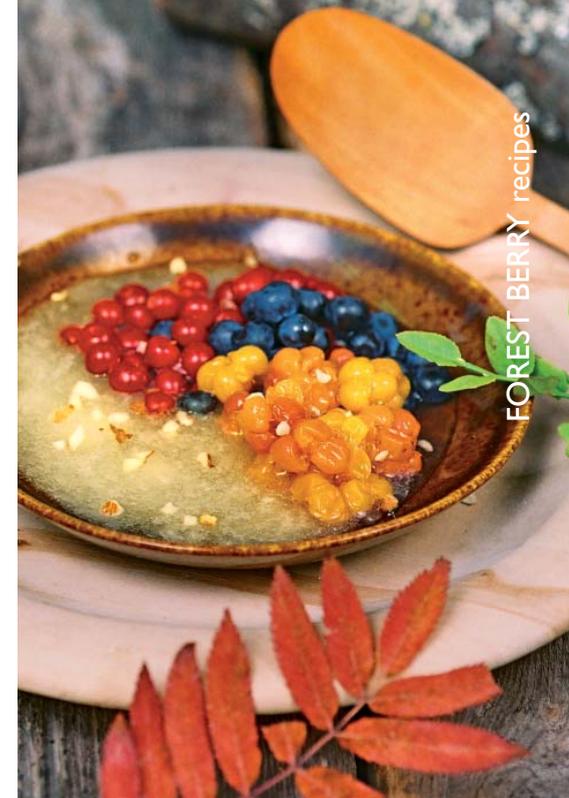
Crowberry Jam and Delicious Cheeses

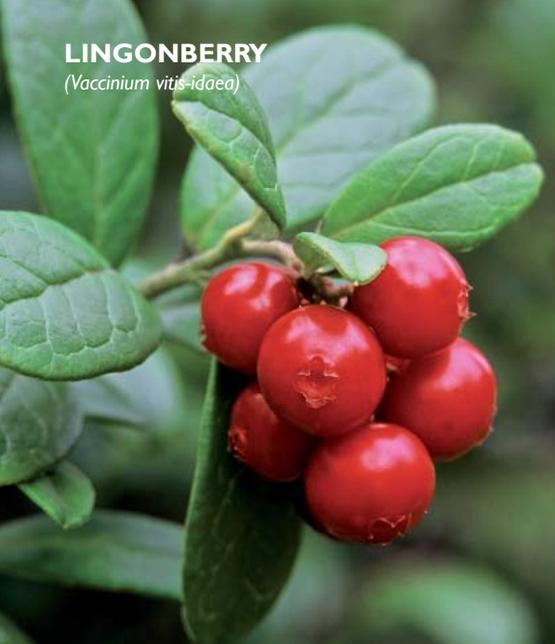
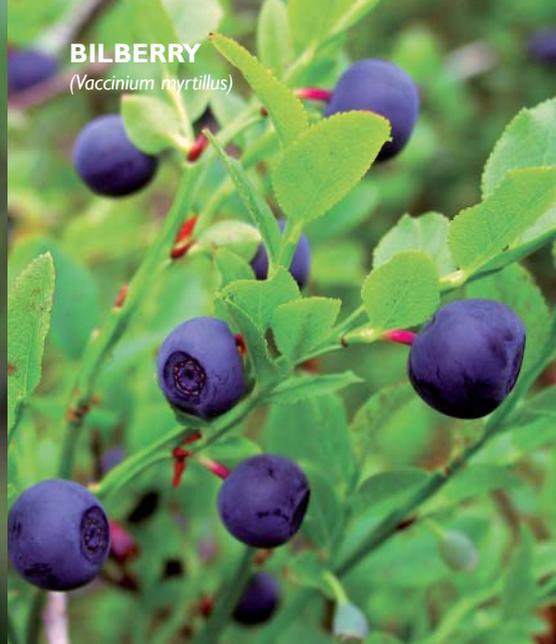
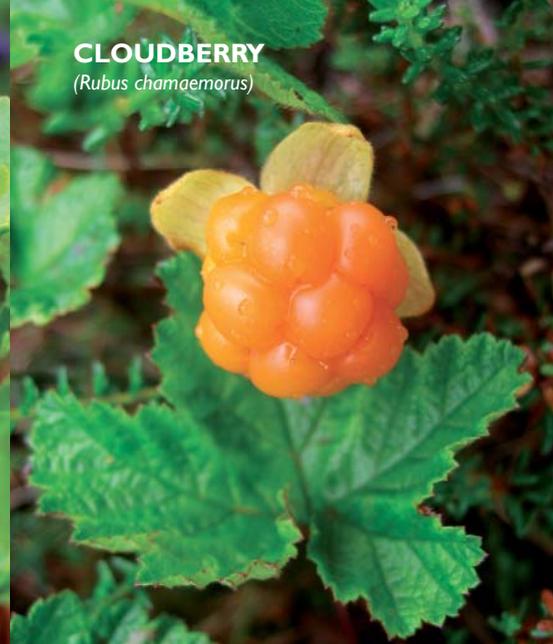
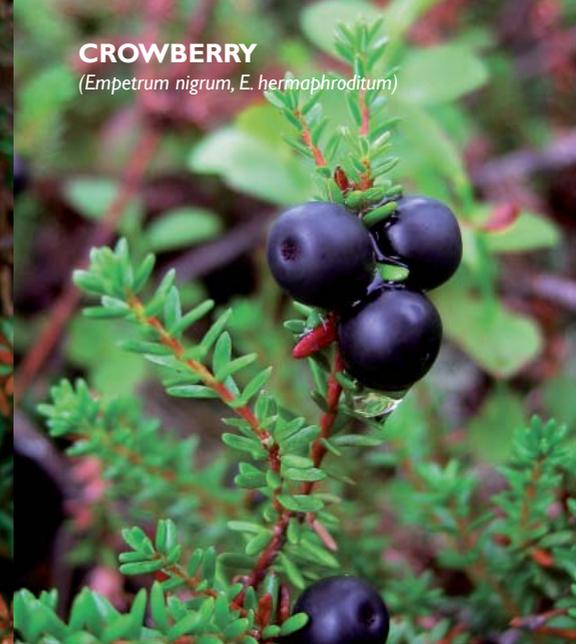
Various cheeses according to your choice

Jam:

1/2 kg	crowberries (or crowberries and lingonberries)
3 dl	sugar

Mash the berries and pour the mash onto a pan. Add sugar. Slowly boil some 30 minutes and mix every now and then. Pour the jam onto clean jars while hot. Keep in cold. Enjoy with strong-flavoured cheeses.



LINGONBERRY*(Vaccinium vitis-idaea)***BILBERRY***(Vaccinium myrtillus)***CLOUDBERRY***(Rubus chamaemorus)***CROWBERRY***(Empetrum nigrum, E. hermaphroditum)***REFERENCES:**

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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 refreshing summer 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 berries with ice cream.

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Arctic Flavours Association

Kauppakatu 20, 89600 Suomussalmi, Finland

Tel. +358-8-6155 5590,

fax +358-8-6155 5592

E-mail: info@arctic-flavours.fi

www.arctic-flavours.fi