

Flavour

How do Saskatoon Berries get their unique irresistible flavour?

The unique flavour of a fruit is a complex phenomenon. Mostly, the flavour is governed by the composition and the ratio of fruit sugars and organic acids. When the sugar content is higher than the acid content that fruit is sweet; when acid content is higher the sugar content that fruit is sour. Among different types of sugars present in fruits, fructose is 120% sweeter than sucrose and the sweetness of glucose is 64% of that of sucrose; as such fruits rich in fructose tend to be sweeter. The citric, malic and tartaric acids are the common contributors to the acidity of fruits. Among them, citric is the most acidic followed by malic and tartaric, and have acidity levels of 90% and 80% of that of citric acid, respectively. Nonetheless, composition of minerals in a fruit influences the flavour. The other factors that govern fruit flavour are polymerised phenolics such as tannins and proanthocyanidins, which contribute to the astringency. Aroma of a fruit, originated from volatile organic compounds, is an important attribute of the total flavour profile. The most critical factor, which governs all the other factors determining flavour, is the ripeness of fruit. The unripened fruit is astringent and acidic; as fruit matures some of these organic compounds are converted into sugars enhancing sweetness and reducing acidity and astringency.

The ripening of Saskatoon berries is characterized partly by the changes in chemical properties, as listed below, and partly by the observable changes in fruit colour. An immature Saskatoon berry is dark green and small. It grows to full maturity passing through the stages of dark green, green-light green, light green-pink, pink-red, red, dark red, purple-red, and dark purple. A fourfold increase in the anthocyanin content has been reported during the last three stages of ripening of Saskatoon berries.

The sweetness of fully mature, ripened Saskatoon berries is a result of having equal amounts of glucose and fructose; about 4.0 grams of each sugar in one hundred grams of fresh berries. Additionally, Saskatoon berries carry sucrose, 0.5 grams, and sorbitol (a natural non-caloric sweetener), 1.2 grams in each 100 grams of fresh berries. Part of these sugars is present in the fruit juice as free-sugars and the rest is bound to anthocyanins and other phenolic compounds. The mature Saskatoon berries are slightly acidic. Malic acid (malate) is the major contributor to the acidity of Saskatoon berries and its level can vary seasonally from 0.27% to 0.37%. In the decreasing order of significance, succinic acid, citric acid, and galactouronic acid contribute to the acidity of ripened Saskatoon berries. The fully mature Saskatoon berries have pH (a measure of acidity) values in the range of 4.2-4.4. Benzaldehyde is the volatile organic compound responsible for the unique aroma of Saskatoon berries and its concentration varies from 20-28ppm.

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Fresh Saskatoon berries	Green	Green-Light Green	Green-Light Green-Pink	Light Green-Pink	Pink-Red	Red	Dark Red	Purple-Red	Dark Purple
pH	4.8	4.8	4.68	4.6	4.28	4.28	4.20	4.23	4.23
Titrateable acidity (mEq/100g)	2.8	3.2	3.3	3.5	4.0	4.5	5.0	3.8	3.5
Brix	4.0	5.0	8.0	8.0	10.0	12.0	14.0	14.5	16.0
Glucose (mg/g)	3.0	3.0	4.0	5.0	10.0	20.0	25.0	35.0	38.0
Fructose (mg/g)	5.0	5.0	5.0	6.0	15.0	20.0	28.0	33.0	37.0
Sucrose (mg/g)	1.5	2.0	1.75	1.25	1.0	1.25	1.0	1.25	0.4
Organic Acids									
Malate (mg/g)	3.0	2.7	2.5	2.8	3.3	3.5	3.3	3.1	2.8
Succinate (mg/g)	18.0	10.0	6.0	4.0	3.0	2.0	1.5	1.5	1.0
Citrate (mg/g)	0.5	0.6	0.5	0.32	0.3	0.2	0.3	0.25	0.25
Galactouronate (mg/g)	1.3	1.4	1.1	0.8	0.7	0.5	0.7	0.4	0.1

How do we know?

Flavonoid Profile of Saskatoon Berries (*Amelanchier alnifolia* Nutt.) and Their Health Promoting Effect (abstract)

Stephenson, N.G., Cenkowski, S., Muir, W. E., Izydorczyk, M., and Tessier, S. 2002. Canadian Biosystems Engineering, 44, 3.1-3.6.

Rogiers, S. Y., and Knowles, N. R. 1996. Canadian Journal of Botany, 75, 1215-1225.

