

NJF Report • Vol 3 • Nr 1 • Year 2007

Nordic Association of Agricultural Scientists —



NJF Seminar 399

Beneficial health substances from berries and minor crops –

- How to increase their concentration
in cultivated species, eliminate losses
in processing and enhance dietary use

Piikkiö, Finland, 14-15 March 2007

Water, Ethanol and Carbon Dioxide in Fractionation and Isolation of Berry Metabolites

Heikki Kallio, Professor, Food Chemistry, Department of Biochemistry and Food Chemistry, University of Turku, FI-20014 Turku, Finland. Tel. + 358 40 503 3024 heikki.kallio@utu.fi

When selecting and optimizing industrial processes for berry products, we have to meet demands of the consumers: safety, sensory properties, health aspects and natural composition. The primary selection criteria in shops are taste, flavour and outlook. Nowadays, however, education and common opinion have raised the health effects of wild berries to a special position.

Processes recommended for edible berries are based on non-destructive unit-operations which retain the natural composition of the nutritionally and sensorially important compounds. In addition to mechanical steps such as grinding, pressing, sieving and centrifugation, various extraction processes are common practice. There is no real need for use of harmful solvents. Water, ethanol and liquid or supercritical carbon dioxide are in most cases enough. Fractions obtained by extraction do not contain pure or complete compound classes such as aroma compounds in the water extract, phenolic compounds in the ethanol extract or lipids in the CO₂ extract.

There is typically no commercial need to obtain very narrow and sharp cuts in the fractions of berries because the chemically "pure" compounds do not give any special value added in the sensory or nutritional properties of the end products. Some phospholipids in the oil fraction, triterpenoic acids in the flavonoid fraction or other flavonoids in the anthocyanin fraction do not cause a problem. Artifact formation should be avoided, since only seldom the new compounds formed have some positive effects in the end-products.

Optimization and standardization of the raw materials and the process unit-operations is significant. This is relevant also for clinical trials of various fractions such as anthocyanins in water or ethanol extracts, or tocopherols in seed oil in CO₂ extracts. Only in extreme cases pure metabolites are worth to be isolated and, if they are, then typically not for food or food supplement use. However, the top quality food chemistry is always needed to characterize the natural compounds in edible berries.