CO₂-extracted blackcurrant seed oil for well-being of the skin

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Super-critical CO₂ extraction is a preferred method for production of bioactive lipopolignic extracts from plants to be used as ingredients in nutraceuticals and cosmetics. Super-critical CO₂ at high pressure and low temperature has the capacity to penetrate and elute matrices efficiently. The low temperature applied, and the absence of oxygen, ensures loss of no bioactivities. At the end of the extraction process, the CO₂ is released from the extract, producing a safe and solvent-free product without thermal stress. There is no need for refinement steps, which could affect the valuable bioactive compounds. In comparison to the other methods of commercial oil production – organic solvent extraction (hexane) and cold pressing – larger amounts of bioactive compounds have been reported in CO₂-extracted oils. In fish oil production, the method was reported to be superior to the other methods in that it produces less oxidised oil, with reduced contaminant contents.

Aromtech Ltd (of Tornio, Finland) produces bioactive extracts from Northern plants by using supercritical CO₂ extraction. This gentle method produces berry oils with high antioxidant activity and clinically proven beneficial effects. Recently, the effects of CO₂-extracted blackcurrant seed oil for the skin were investigated in two clinical studies.

The unique composition of blackcurrant seed oil
Blackcurrant (Ribes nigrum) berries are known for their high content of vitamin C and anthocyanins, which are enriched in the skin and soft parts of the berries. In the Northern countries, blackcurrant juice is traditionally used for treatment and prevention of the common cold.

Seeds account for approximately five percent of the fresh weight of blackcurrant berries. They are rich in oil that has a unique fatty acid composition. The main fatty acid is the essential fatty acid linoleic acid (LA, 18:2n-6), which makes up 40% of the fatty acids in the oil. The n-3 ω–linolenic acid (ALA, 18:3n-3) accounts for 15-15% and 2-3% of total fatty acids, respectively (3, 11–13).

In humans, the essential fatty acids can in enzyme-catalysed reactions be converted into fatty-acid derivatives of longer chain length in the same n-family of fatty acids. These, in turn, may act as precursors to eicosanoids, which locally regulate several important functions of the body, including inflammation. The n-3-fatty-acid-derived eicosanoids generally attenuate inflammation or have neutral effects. Although typically the effects of n-6-derived eicosanoids are considered pro-inflammatory, there are exceptions. Dihomo-γ-linolenic acid (DGLA, 20:3n-6), a derivative of GLA, is a precursor of anti-inflammatory prostaglandin E14.

The conversion of n-6 essential LA to GLA and n-3 ALA to SDA is catalysed by the enzyme Δ6-desaturase. Deficiency in the activity of Δ6-desaturase has been associated with several detrimental conditions, including atopic dermatitis14–17. The natural composition of blackcurrant seed oil, including the essential fatty acids LA and ALA in combination with their Δ6-desaturase derivatives GLA and SDA, makes it promising for human well-being.

The effects of CO₂-extracted blackcurrant seed oil on atopic dermatitis in children
The effects of CO₂-extracted blackcurrant seed oil on atopic dermatitis in children were investigated in a double-blind, randomised, placebo-controlled study at the University of Turku, in Finland. In total, 322 pregnant women were randomised for the study, half assigned to the blackcurrant seed oil group and half to the placebo group. In all, 177 mother-child pairs completed the trial.

The pregnant women consumed blackcurrant seed oil or a placebo daily from the 8th–16th week of pregnancy until the end of the exclusive breast-feeding period. After that, the infants were given a blackcurrant seed oil supplement or placebo oil until reaching the age of two years.

The blackcurrant seed oil used in the study was produced by Aromtech Ltd with supercritical CO₂ extraction. The placebo oil was olive oil. During pregnancy and lactation, the mothers consumed 5 mL of oil each day, in the form of six capsules. The daily dose of oil for the infants was 1 mL of liquid blackcurrant or olive oil. The prevalence and severity of atopic dermatitis in the children were evaluated at the ages of three months and one and two years. Severity was assessed by means of the SCORAD index.

At one year of age, the prevalence of atopic dermatitis was significantly (p = 0.035) lower in the blackcurrant seed oil group than in the olive oil group. The prevalence in the blackcurrant seed oil group was 33%, in contrast to the 47% in the olive oil group (see Figure 1). At two years of age, there was a trend of decrease in atopic dermatitis in the blackcurrant seed oil group (p = 0.18), but the difference between groups was no longer statistically significant. At two years, the prevalence figures for atopic dermatitis were 39% and 49% in the blackcurrant seed oil group and olive oil group, respectively (3, 11–13).

In the blackcurrant seed oil group, the total SCORAD index was lower at two years than at one year. Atopic dermatitis was diagnosed in 32% of the infants in the blackcurrant oil group at two years, compared to 44% in the olive oil group. Prevalence of atopic dermatitis in the blackcurrant seed oil group in comparison to the olive oil group was no longer statistically significant. At one year of age, the prevalence of atopic dermatitis was 40% in the blackcurrant seed oil group and 59% in the olive oil group. At two years of age, the prevalence of atopic dermatitis in the blackcurrant seed oil group was 49%, compared to 61% in the olive oil group. The difference between the groups was statistically significant (p = 0.005).

Atopic dermatitis is associated with inflammation, low activity of Δ6-desaturase, and
supplementation on skin hydration was investigated in a study of 40 healthy volunteers aged 36 to 61 years, and all except one were women. The study was an open one-group trial. During the intervention period of three months, the participants consumed 2 g of blackcurrant seed oil per day, in the form of four capsules. Again, the participants reported a significant reduction in the sensation of dryness and redness of the skin from the beginning of the intervention to the end. It is possible that blackcurrant seed oil fatty acids affected the eicosanoid profile of the participants and, via this mechanism, induced the beneficial effects on skin well-being. Effects of the composition of skin ceramides may have manifested themselves as well. Linoleic acid, abundant in blackcurrant seed oil, is a component of skin ceramides. Ceramides are essential lipid components of the stratum corneum permeability barrier of the skin and therefore vital for normal hydration. Insufficient yield of polyunsaturated fatty acids causes increased transepidermal water loss. From the recent clinical trials with CO2-extracted blackcurrant seed oil, one can conclude that it has great potential in maintaining and supporting the well-being of the skin among both children and adults.

References