



Issue 20: May, 2024: This e-bulletin is aimed at health professionals, consumers, growers, farmers, packers, processors, distributors, retailers, and others in the plant foods area.

Coffee: - 'Drink or Drug'?

The answer to the question is both - and there is more as well. Coffee is a very popular drink as evidenced by the plethora of coffee shops/cafes in Ireland and in most developed countries. Coffee is also a 'drug' in the sense that many consumers need their morning coffee 'fix' to help them face the world and challenges of the day. Coffee silver skin and spent coffee grounds are high volume by-products of the coffee industry that are mostly discarded but these have a range of highly valuable bio-actives that are now being valorised. This 2-pager gives brief details of: (i) health aspects of coffee; and (ii) bio-actives from coffee silver skin and spent coffee grounds.

Health aspects of coffee

In 2021, Bewley's Coffee Consumption Report found that 78% of Irish adults drank coffee each day with three cups the predicted daily per capita consumption. With this level of consumption the effects of coffee on human health become centre stage. Recent scientific reviews have shown that: (i) coffee may contribute to the prevention of inflammatory and oxidative stress-related diseases, such as obesity, metabolic syndrome and type-2 diabetes; (ii) coffee consumption is associated with a lower incidence of several types of cancer plus a reduction in the risk of all-cause mortality; (iii) consumption of up to 400 mg/day (1-4 cups per day) of caffeine is safe (Barrea et al., 2023; Poole et al. (2017)). However, most of the data were based on cross-sectional and/or observational studies and thus, randomized controlled studies are needed to identify a causality link. Some consumers have concerns about coffee consumption and raised blood pressure. However, Mesas et al. (2011) have shown that current evidence does not support an association between longer-term coffee consumption and increased blood pressure or between habitual coffee consumption and an increased risk of cardiovascular disease in those with hypertension. Caffeine is a mild stimulant and psychoactive drug; it is slightly/moderately addictive and is beneficial for mental and physical endurance, mood and well-being of cognitive health (Ramesh et al., 2023). Negatives may arise when consumed to excess, e.g. more than five cups of coffee per day; small amounts may negate sleeping in some individuals.

Coffee silver skin

Coffee production and processing generates significant waste which is largely discarded with consequent negative environmental impact. About six million tonnes are generated globally per annum with circa 9,000 tonnes in Ireland (Priyadarshini et al., 2019). The waste comprises coffee silver skin (seed coat/'chaff') and spent coffee grounds. The former is a by-product of the coffee roasting process and the latter the residue left in the coffee making machine post coffee extraction. Both coffee silver skin and coffee grounds contain a wealth of beneficial bio-active compounds. For example, Priyadarshini et al. (2019) have shown that coffee silver skin is rich in dietary fibre

(64.5), protein (14.6), calcium (1.48) and potassium (1.21%; dry weight basis). Martuscelli et al., (2021) also found a high content of dietary fibre (50%) and additionally, high contents of total phenolic compounds, chlorogenic acid, caffeine, and caffeic acid resulting in a high antioxidant capacity and potential for controlling the onset of inflammatory diseases. They concluded that coffee silver skin is a source of valuable compounds with potential as food-safe ingredients. For example, biscuits enriched (4% replacement of wheat flour) with decaffeinated coffee silver skin had raised dietary fibre content, readily available polyphenols and high consumer acceptance (Cantele et al., 2022).

Coffee grounds

Spent coffee grounds contain significant amounts of organic compounds including fatty acids, amino acids, polyphenols and polysaccharides (Bevilacqua et al., 2023). Most of these have bioactive properties thus making valorisation of coffee grounds a major priority (Zhao et al., 2024). Extracts of coffee grounds exhibit antioxidant, anti-inflammatory, anti-cancer and anti-aging properties and are suitable as functional food ingredients, e.g. in beverages, dairy and bakery products. Nordmann partner Kaffe Bueno has opened the world's first coffee bio-refinery in Denmark which marks a major milestone in valorisation and sustainability (Nordman, 2024). It has a capacity of 500 tons of coffee grounds per annum. Products include KAFFIBRE® and KAFFOIL®. The former is a gluten-free, low-fat caffeine-free fibre derived from processed coffee grounds which is rich in proteins and insoluble fibre with application in baked goods. The latter is made from processed Arabica coffee grounds. It is rich in polyphenols, tocopherol and essential fatty acids and is used in a range of food products.

Conclusions

Current advice is that coffee consumption in moderation (2-4 cups/day) is safe and may confer health benefits due to the content of beneficial bio-actives such as polyphenols and other antioxidants. However, most of the evidence is epidemiological and there is need for well controlled clinical trials to finally prove cause and effect. Valorisation of by-products (silver skin and grounds) remains a major priority for sustainability and for adding value to overall coffee streams.

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