



Issue 7: July, 2020: This e-bulletin is aimed at health professionals, consumers, growers, farmers, packers, processors, distributors, retailers, and others in the plant foods area.

Antioxidant dietary fibres:- key food ingredients and therapeutic agents?

Antioxidant dietary fibres (ADFs) are defined as powders with a dietary fibre content >50% and a free radical scavenging capacity equivalent to at least 50 mg of vitamin E (DPPH method, Saura-Calixto, 1998). ADFs have been reviewed as potential functional food ingredients derived from plant processing by-products (Eskicioglu *et al.*, 2015). Issues 1 and 5 of PlantFoods-ucd stressed the importance of dietary fibre and antioxidants in the diet as agents for preventing/alleviating inflammatory diseases and other conditions. A UCD study in 2019/2020 investigated alcohol-insoluble-solids (AIS) powders derived from fruit, vegetables, mushrooms and algae as potential ADFs. It was conducted by Mary Sexton (4th year food science research project) in cooperation with Dr Heleena Moni Bottu, Professor Lorraine Brennan and Professor Ronan Gormley of the UCD Institute of Food and Health, University College Dublin.

Fibre content of alcohol-insoluble-solids (AIS)

AIS powders are the fraction of finely blended (pureed) fruit, vegetables or algae (250g lots) insoluble in boiling 80% aqueous ethanol (PlantFoods-ucd, Issue 4). AIS powders were separated from seven vegetables, six soft fruits and white mushrooms (*Agaricus bisporus*) and the fibre content of the AIS powders was estimated via proximate analysis by subtracting moisture, protein, fat and ash contents from 100. This normally equates to the carbohydrate content but in non-starchy fruit, vegetables and mushroom AIS the 'carbohydrate' fraction is largely fibre. The fibre content (%) of fruit and mushroom AIS in descending order was: 81.8 (apple), 80.4 (blueberry), 77.7 (green strawberry), 77.5 (raspberry), 76.8 (blackberry), 75.3 (strawberry), 61.0 (mushroom-stipes), 54.5 (mushroom-flats), 49.6 (mushroom-buttons), and for vegetable AIS: 80.6 (carrot), 76.4 (turnip), 74.6 (onion), 72.2 (celery), 62.1 (green beans), 55.6 (broccoli) and 55.5 (cauliflower). All above are >50% fibre except for button mushrooms AIS and so qualify as ADFs on fibre content.

Antioxidant status of alcohol-insoluble-solids (AIS)

A DPPH (2,2-diphenyl-1-picrylhydrazyl) assay was used to test free radical scavenging activity (FRSC) of the AIS powders (Sonklin *et al.*, 2018). Aqueous ascorbic acid (1mg/ml) was used as the standard antioxidant and results were

expressed as % free radicals scavenged. The FRSC equivalent to at least 50mg of vitamin E defined by Saura-Calixto (1998) as a requirement for ADFs is an arbitrary figure and in the current study >0.4mg/ml ascorbic acid was chosen. This equates to circa 50% scavenging of the free radicals. FRSC (%) of fruit and mushroom AIS in descending order were: 74.4 (green strawberries), 65.9 (blackberries), 41.1 (blueberries), 35.2 (raspberries), 34.0 (mushroom-flats, 23.9 (mushroom-stipes), 22.1 (apples), 20.5 (ripe strawberries), 20.4 (mushroom-buttons), and for vegetable AIS: 37.2 (cauliflower), 25.7 (carrot), 24.5 (broccoli), 19.9 (turnip), 16.8 (onion), 16.2 (celery). On the basis of fibre >50% and FRSC >50% both green strawberry and blackberry AIS qualify as ADFs. AIS from fruit had much higher FRSC values than vegetable AIS due to the high content of anthocyanins in the former. Green strawberries had a much higher FRSC than ripe strawberries presumably due to their higher content of ellagic acid (a powerful antioxidant). Ellagic acid content declines in most strawberry cultivars as they ripen (Muthukumaran *et al.*, 2017).

Antioxidant dietary fibres (ADFs) - food ingredients & therapeutic agents

ADFs supply dietary fibre and antioxidant potential and are ideal for adding to consumer food products to increase functionality. Eskicioglu *et al.* (2015) cited the inhibitory effect of grape ADF on lipid oxidation in chicken hamburgers, fish mince, yogurt and salad dressing. In the current study AIS powders from green strawberries and blackberries are potentially valuable as food ingredients and possibly as therapeutic agents. For, example apple AIS was shown to lower total cholesterol, raise HDL-cholesterol fraction and aid treatment of Type-2 diabetes (Mayne *et al.*, 1982).

Conclusions

AIS powders from green strawberries and blackberries are potentially valuable as food ingredients and possibly as therapeutic agents. Proof of this requires further trials on their performance in controlling lipid oxidation in fat-containing foods and also clinical trials on their efficacy in treatment of inflammatory diseases. Assessing the former requires routine laboratory tests but the latter is more difficult due to ethical considerations and the high cost of clinical trials.

References

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See previous 6 issues of PlantFoods-ucd at: <https://www.ucd.ie/foodandhealth/newsandevents/plantfoodsucd/>

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