The n-3 polyunsaturated fatty acid content of commonly available green vegetables in Australia

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Diet has long been considered to play a critical role in human health, with green vegetable consumption being claimed to have health benefits mainly due to the vitamins, minerals and phytonutrients (such as vitamin C, folate, antioxidants etc). Additionally green vegetables are known to contain a relatively high proportion of omega-3 polyunsaturated fatty acid in the form of α-linolenic acid (18:3n-3). However, there are no data available on fatty acid composition and concentration of the commonly consumed green vegetables in Australia.

The present study determined fatty acid content in eleven commonly available green vegetables in Australia: spinach (Spinacea oleracea), watercress (Nasturtium officinale), parsley (Petrolelinum crispum), Chinese cabbage (Brassica chinensis), brussel sprouts (Brassica oleracea var. gemmifera), bok choy (Brassica chinensis), cos lettuce (Lactuca sativa), broccoli (Brassica oleracea), Chinese broccoli (Brassica alboglabra), baby bok choy (Brassica chinensis) and mint (Mentha viridis, M. spicata, M. Crispa). For all samples in this study, only the leaves or heads were analysed which contain the chloroplasts whereas the stems do not appear to contain many chloroplasts since they usually had little green colour. Prior to analysis the samples were blotted to remove adhering moisture and then the leaves or heads were chopped and blended. To determine any variation in lipid content, six sub-samples each weighing approximately 10 g were analysed for each of eleven vegetables. Lipid was extracted with 50.0 mL of methanol-chloroform (2:1 v/v) containing 10 mg/L of butylated hydroxytoluene and 0.2 mg/mL of tricosanoic acid (C23:0) as an internal standard. The fatty acid methyl esters of the total lipid extract were prepared by saponification of using KOH (0.68 mol/L in methanol) followed by transesterification in BF_3 in methanol. Fatty acids were identified by comparison with standard mixtures of fatty acid methyl esters and the results were calculated using respone factors derived from chromatograph standards of known composition. Silver ion TLC was used to identify any peaks on the GC traces that could not be identified using the standards.

Total fatty acid concentration of 11 green vegetables ranged from 44 mg/100g wet weight in Chinese cabbage to 372 mg/100g in watercress. There were three polyunsaturated fatty acids in all vegetables analysed 16:3n-3, 18:2n-6 and 18:3n-3. Green vegetables contained a significant quantity of 16:3n-3 and 18:3n-3, ranging from 23 to 225 mg/100g. Watercress and mint contained highest 16:3n-3 and 18:3n-3, and parsley had a highest 18:2n-6 in both percentage composition and concentration. Mint had a highest concentration of 18:3n-3 with a value of 195 mg/100g, while watercress contained a highest concentration of 16:3n-3 with 45 mg/100g. All eleven analyzed green vegetables contained a high proportion of PUFA, ranging from 59 to 72% of total fatty acids. The omega-3 PUFA composition in 11 analyzed vegetables ranged from 40 to 62% of total fatty acids. Monounsaturated fatty acid composition of the 11 analyzed vegetables was less than 6% of total fatty acids. The proportion of saturated fatty acid ranged from 21% in watercress and mint to 32% of total fatty acids in brussel sprouts. No eicosapentaenoic and docosahexaenoic acids were detected in any of the samples in the present study. Consumption of green vegetables would contribute to the 18:3n-3 PUFA intake, especially for vegetarian populations. The data obtained could contribute to the Australian food composition database to provide information for further research and to the general public.