Effect of Cooking Treatment on Antioxidative Properties of Extracts from Broccoli in Taiwan

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ABSTRACT

ABSTRACT The broccoli (Brassica oleracea L var italica Plenck) was used as materials and sampled as four groups, including fresh, precooked (50°C, 10 min), cooked (boiling, 8 min), and precooked-cooked, to investigate the effect of cooking treatment on the textural change of broccoli. These four samples were extracted using methanol, and the antioxidative properties of extracts, including reducing power, ferrous ion chelating power, α , α -diphenyl- β -picrylhydrazyl (DPPH) radical scavenging activity, and inhibitory effect on lipid peroxidation were measured and compared with those of alpha-tocopherol and butylated hydroxyanisole (BHA). Data showed that the relative peak force of the tissue after boiling for 8 min was 51% of fresh tissue; the relative peak force of the tissue after precooking at 50°C for 10 min was 172% of fresh tissue; the relative peak force of the tissue after precooking plus cooking was 119% of fresh tissue, which was much higher than that of directly cooked. This result revealed that the cooked tissue with precooking was soften slower than that without precooking, that is, the tissue with precooking could show higher resistance to soften during cooking. In the results of reducing power, the extracts from precooked, cooked, and precooked+cooked broccoli had high reducing power, which was higher than those of alpha-tocopherol and BHA when the ratio of sample weight/solvent volume was at 8 mg/g, and was 1.5~1.7 times as high as those of alpha-tocopherol and BHA when the ratio of sample weight/solvent volume was at 20 mg/g. The reducing power of the extract from fresh broccoli was close to those of alpha-tocopherol and BHA. In the results of ferrous ion chelating power, the extracts of these four samples showed high ferrous ion chelating power. The extracts from fresh and precooked broccoli had the highest ferrous ion chelating power, a value of 90.5% when the ratio of sample weight/solvent volume was at 2 mg/g. alpha-Tocopherol and BHA showed no ferrous ion chelating power. In the results of DPPH radical scavenging activity, the extracts of these four samples also showed high values of activity, which were 96.8、97.3、98.6 and 97.9% when the ratio of sample weight/solvent volume was at 20 mg/g. and were close to alpha-tocopherol and BHA. In the results of inhibitory effect on lipid peroxidation, the extract from direct cooked broccoli had the highest inhibitory effect among these four samples, however, which was only 0.4 times as high as those of alpha-tocopherol and BHA. The inhibitory activity of the extracts from fresh and precooked-cooked broccoli was 0.2 times as high as those of alpha-tocopherol and BHA. The extract from precooked broccoli had no inhibitory effect. In the results of heat stability of antioxidative properties, the extract from direct cooked broccoli showed the highest heat stability of antioxidative properties from 30 to 60°C, which was 0.7 times as high as those of alpha-tocopherol and BHA at 50°C. In the pH stability, it showed that the pH stability of antioxidative properties was dependent upon the cooking treatment. At pH 3, the extract from precooked+cooked broccoli had high stability, which was 0.8 times as high as that of BHA and 0.85 times as high as that of alpha-tocopherol. At pH 5, these four samples showed equivalent stability; at pH 7 and 9, the extract from cooked broccoli had the highest antioxidative activity. In the analysis of components of the broccoli after different cooking treatment, data showed that the direct cooked broccoli had the highest content in all components; carotenoids content was 0.07 mg/g, which was 1.1~2.3 times as high as those of fresh, precooked, and precooked+cooked broccoli; flavonoids content was 4.39 mg/g, which was 1.1~1.9 times as high as those of fresh, precooked, and precooked+cooked broccoli; ascorbic acid content was 3.11 mg/g, which was 1.4~2.7 times as high as those of fresh, precooked, and precooked-cooked broccoli; polyphenols content was 14.77 mg/g, which was 1.3~2.9 times as high as those of fresh, precooked, and precooked+cooked broccoli. From above results, it revealed that direct cooked broccoli had high contents of carotenoids, flavonoids, ascorbic acid and polyphenols, and so that had high values of reducing power, ferrous ion chelating power, DPPH radical scavenging activity, and inhibitory activity on lipid peroxidation, and showed high stability of antioxidative properties. Therefore, appropriate cooking treatment could assist the releasing of antioxidative components from broccoli tissue, and increase its antioxidative activity. Key word: Broccoli, Texture, Antioxidative, Reducing power, Ferrous ion chelating power, DPPH radical scavenging activity.

Keywords : Broccoli ; Texture ; Antioxidative ; Reducing power ; Ferrous ion chelating power ; DPPH radical scavenging activity

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