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Analysis of Leafy Vegetables for Antioxidant Activity, Ascorbic Acid and Nitrate in Morogoro, Tanzania

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Abstract

Leafy vegetables are an important part of the diet in Morogoro region, Tanzania, and are used, among others, to make sauces. They are rich in several phytochemicals including antioxidants, ascorbic acid and dietary nitrate, which play important roles in human nutrition and health. However, a higher concentration of nitrate in leafy vegetables has been associated with health risks and bitter flavour that may affect acceptability. Knowing the nutritional value of these traditional vegetables would increase consumer awareness, intensify their inclusion in diets and contribute to food and nutrition security. The present study aimed to screen antioxidant activity, ascorbic acid and nitrate contents of African leafy vegetables from Morogoro, Tanzania. Fresh vegetable samples of African nightshade (*Solanum spp.*), cassava (*Manihot esculenta*) and cowpea (*Vigna unguiculata*) leaves were collected from 23 farms and 9 markets within 2 districts in Morogoro region. Antioxidant activity was analysed using 2, 2-diphenyl-1-picrylhydrazyl (DPPH) solution while the ascorbic acid and nitrate contents were analysed semi-quantitatively using strips. The antioxidant activity ranged from 17 % to 64 % which is comparable to citrus fruits. Cassava leaves showed the highest value (55.96 %) followed by cowpea leaves (43.02 %) and African nightshade leaves (29.95 %). The ascorbic acid content ranged from 491 to 7000 mg/L. Cassava leaves showed the highest value (55.96%) followed by cowpea leaves (43.02%) and African nightshade leaves (29.95%). The ascorbic acid content ranged from 491 to 7000 mg L⁻¹. The highest ascorbic acid content was observed in cassava leaves (4419 mg L⁻¹) followed by African nightshade (1464 mg L⁻¹) and cowpea leaves (1283 mg L⁻¹) which is much higher compared to citrus fruits (literature reports: 300 to 990 mg L⁻¹). Nitrate content ranged from 95 to 5000 mg L⁻¹ being highest in African nightshade (2735 mg L⁻¹) followed by cowpea leaves (647 mg L⁻¹) and cassava leaves (295.98 mg L⁻¹). However, the observed nitrate contents were about 60 % to 90 % lower compared with spinach and about 15 to 90 % lower compared with collard greens as reported in the literature. The disparate nutrient values were related to fertiliser application, leaf age and harvest time as reported by farmers and market vendors where the leaves were collected. The high contents of these essential nutrients and comparably low values of nitrate show the nutritional importance of these African leafy vegetables.

Keywords: Antioxidants, ascorbic acid, health, leafy vegetables, nitrate, nutrition