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Oxalate Content of Raw and Cooked Amaranth and Strawberry Spinach Grown in an Elevated CO_2 Atmosphere

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Abstract : Worldwide CO_2 levels are slowly rising, and this may have effects on the growth and nutritional composition of many food plants. The production of secondary metabolites such as oxalates has not been investigated in depth. The oxalate content of many food plants are known to have adverse nutritional effects on humans and reduction in the oxalate contents of food plants is a very positive move. Recent studies had shown that the oxalate content of the leaves of spinach and silver beet reduced when the plants were grown in an environment where CO_2 was increased. The response of amaranth and strawberry spinach leaves to changes in the high CO_2 environment have not been understood though it is known that the plants do contain appreciable oxalate contents. A study was conducted where amaranth and strawberry spinach plants were grown in identical plant growth chambers with the same environmental conditions except that one chamber was supplied with ambient air (CO_2 405 ppm) while the other chamber had the CO_2 level increased to 650 ppm. The total and soluble oxalate content of the leaves of raw and cooked amaranth and strawberry spinach were determined by HPLC and calcium levels were determined using ICP following 6 weeks of growth. The total oxalate content of the fresh leaves of amaranth and strawberry spinach were reduced by 29.5 % and 24.6% respectively in the leaves of the plants grown in increased CO_2 conditions compared to ambient levels. The soluble oxalate content of amaranth leaves grown under ambient and increased CO_2 conditions were future reduced by 42% and 26.8% respectively following cooking as the soluble oxalate was leached into the cooking water and discarded. The reduction of the oxalate and calcium levels of raw and cooked amaranth and strawberry spinach leaves following an increase in CO_2 content in the air is an interesting positive response to an otherwise significant environmental problem.

Keywords : amaranth, calcium oxalate, enriched CO_2, oxalates, strawberry spinach
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