

Growth temperature and plant age influence on nutritional quality of *Amaranthus* leaves and seed germination capacity[#]

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Abstract

As a leafy vegetable, *Amaranthus* can be harvested at different stages of plant growth, ranging from young seedlings to the late juvenile stage, but data on the changes in leaf nutritional value with plant age are scanty. The objective of this study was to determine the effect of growth temperature on *Amaranthus* leaf yield and nutritional quality at different stages of plant growth. Five species, *A. hybridus* var. *cruentus*, *A. hypochondriacus*, *A. tricolor*, *A. thunbergii* and *A. hybridus* were compared for their response to hot (33/27°C), warm (27/21°C) and cool (21/15°C) temperature regimes (day/night) in separate glass-houses. Plants were harvested at 20, 40 and 60 d after sowing and leaf yield, minerals (Ca, P and Fe), total protein content, amino acid (methionine and lysine) content and antioxidant activity (inhibition of linoleic acid oxidation) were determined. Seed yield and germination capacity, during two years of after-ripening, were also determined. Results showed that leaf protein content differed significantly ($P < 0.01$) between species. It was also significantly ($P < 0.01$) influenced by the growth temperature and stage of plant growth. The pattern of changes in the amounts of lysine and methionine was comparable to that of protein content, but *A. thunbergii* showed significantly higher amino acid content than the other species. *Amaranthus* leaves also contained significantly ($P < 0.01$) more lysine than methionine, regardless of the species and growth temperature. The phosphorus content of leaves was not significantly affected by temperature and stage of plant development, and there were also no significant differences between species. However, the amounts of both calcium and iron changed significantly ($P < 0.05$) with stages of plant development and with increasing temperatures for all species. The antioxidant activity of *Amaranthus* leaves increased consistently with plant age and there were significant ($P < 0.01$) differences between stages of plant development and growth temperature. Warm temperature regimes were most favourable ($P < 0.01$) for biomass accumulation in all species. Seed production under cool and hot temperatures significantly ($P < 0.01$) decreased seed germination capacity for all species, but germination improved in response to after-ripening. It is recommended that for greater nutritional benefit, *Amaranthus* should be grown under warm conditions and younger leaves are preferable.

Keywords: *Amaranthus*, leaf nutrients, plant age, temperature