Effect of Nitrogen Source, Crop Maturity Stage and Storage Conditions on Phenolics and Oxalate Contents in Vegetable Amaranth (Amaranthus hypochondriacus)

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Abstract

This study was designed to assess the effect of Diammonium Phosphate (DAP) fertilizer and cattle manure on the accumulation of total phenolics, quercetin and oxalates during growth and storage of vegetable amaranth (var.Amaranthus hypochondriacus L). Field trials were set up at the University of Nairobi Field Station-Upper Kabete Campus, Kenya during the long (March – May) rains of 2007 and 2008. Trials were laid out in a randomized complete block design with four fertilization treatments: 20, 40, and 60kg N.ha-1 supplied by DAP (18:46:0), cattle manure (40 kg Nha-1) and an unfertilized control variant. The vegetables were harvested at 6, 7, and 8 weeks after planting and either refrigerated (4+1oC) or stored at ambient temperature (20+3oC) for a period of 4 days. The vegetables were then analyzed for total phenolic, quercetin, total and soluble oxalates content before and after storage. The total phenolic content decreased with increasing N, the extent of decrease depended on the level and source of N. DAP at 20kg Nha-1 had the same effect on the phenolic content as that of cattle manure at 40kg Nha-1. The levels of phenolics and quercetin increased with crop maturity while the converse was true for the oxalate content. During refrigeration, levels of phenolics increased whereas those of oxalates did not change appreciably. There was a decrease in phenolics content during storage at ambient temperatures. The vegetable amaranth accumulates higher levels of total phenolic and quercetin when grown with manure than with DAP for similar levels of N. Total phenolics and quercetin levels increased, while that of oxalates decreased, with maturity of the vegetables. The accumulation of oxalates during the periods considered normal for growth are low enough to maintain their levels within safe limits for human consumption. Storage of the fresh vegetables at 4oC for limited periods improves their quality by increasing total phenolics and quercetin contents that also fulfill beneficial health functions in the human body.