



Effects of Metal Concentration, pH, and Temperature on the Chlorophyll Derivative Content, Green Colour and Antioxidant Activity of Amaranth (*Amaranthus viridis*) Puree

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Abstract: Thermal processing of green vegetables leads to partial or complete degradation of chlorophyll pigments and loss of green colours due to the formation of chlorophyll derivatives. A process called regreening by using metal ions developed a stable green colour of metal-chlorophyll derivative complexes. The objective of this research was to investigate the effect of copper sulphate (0-240 ppm) and zinc chloride (0-1800 ppm) ions, pH (4-9), and temperatures (60-100°C) with a constant time of 15 minutes on the stabilization of chlorophyll derivative, antioxidant activity, and colour of green amaranth puree. Amaranth with tapered leaves was chosen among the two varieties investigated due to higher content of chlorophyll *a* (0.33 mg/g), chlorophyll *b* (0.34 mg/g) and total chlorophyll (0.68 mg/g) than amaranth with round leaves (0.28, 0.29, and 0.58 mg/g). A higher chlorophyll derivative content (0.62 mg/g), DPPH scavenging activity (93 mM TE/g) and FRAP values (54 mM TE/g) of Cu-amaranth puree were achieved when the puree was treated with 210 ppm of copper sulphate after heating at pH 6 and 80°C. The formation of Zn-amaranth puree was achieved with 1500 ppm of zinc chloride at pH 8 and 90°C for 15 min with 0.39 mg/g of chlorophyll derivative content, DPPH scavenging activity of 79 mM TE/g and FRAP of 57 mM TE/g. The absorption maxima for Cu-amaranth puree were at 424.93 and 656.85 nm, and for Zn-amaranth puree, their extracts showed absorption maxima at 413.28 and 667.48 nm. HPLC-chromatograms revealed the presence of two major peaks identified as chlorophyll *a* and chlorophyll *b* in fresh amaranth, but these two peaks disappeared in Cu- and Zn-amaranth purees presumably due to the formation of metallo-chlorophyll derivatives.

Keywords: amaranth, chlorophyll, metal, copper sulfate, zinc chloride