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Comparative Study on the Effect of Natural and Artificial Ripening on Nutritional Quality and Cytotoxicity of Mango Fruits (*Mangifera indica L.*)

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Background: Commercial fruit ripening has grown in significance within the fruit industry and agriculture sector of Sri Lanka. Consuming fruits exposed to chemicals is an emerging concern with regard to public health. Liquid ethephon, commonly recognized as Ethrel, stands out as a widely utilized ripening agent in developing countries like Sri Lanka.

Objective: To investigate and compare the effect of natural and artificial fruit ripening on the nutritional quality and cytotoxicity of mangoes (*Mangifera indica L.*)

Methods: Unripen matured mangoes were collected from trees cultivated in a uniform environment and ripened naturally and artificially; administering artificially generated ethylene gas and ethephon aqueous solution (480 ppm). Physicochemical properties (color, texture, weight loss, pulp-to-peel ratio, pH, vitamin C, and titratable acidity), antioxidant activity (1,1-diphenyl-2-picrylhydrazyl (DPPH) free radical scavenging assay, Ferric reducing antioxidant power (FRAP) assay) and cytotoxicity (Brine Shrimp Assay) were analyzed.

Results: The physical appearance of artificially ripened mangoes was comparatively better with a significantly higher weight loss ($p < 0.05$). Naturally ripened mangoes had significantly higher ($p < 0.05$) pulp-to-peel ratio, pH, and vitamin C content, while artificially ripened mangoes had significantly higher ($p < 0.05$) titratable acidity. DPPH scavenging activity results for mangoes naturally ripened, treated with ethylene gas and ethephon solution were 133.95 $\mu\text{gAAE/mL}$, 131.68 $\mu\text{gAAE/mL}$, and 130.56 $\mu\text{gAAE/mL}$ respectively. FRAP results were 197.6 $\mu\text{gAAE/mL}$, 187.46 $\mu\text{gAAE/mL}$, and 184.63 $\mu\text{gAAE/mL}$, for mangoes naturally ripened, treated with ethylene gas, and with ethephon solution respectively. Hence naturally ripened mangoes exhibited a significantly higher antioxidant activity with both assays ($p < 0.05$). Mangoes treated with ethephon solution indicated an LC_{50} value of 925.88 $\mu\text{g/mL}$ displaying low toxicity while mangoes treated with artificially generated ethylene gas indicated non-toxicity with an LC_{50} value of 1441.15 $\mu\text{g/mL}$ according to Clarkson's toxicity criterion.

Conclusions: Both artificial ripening methods have a negative impact on the nutritional quality of the fruits in all parameters tested while displaying potential cytotoxicity in fruits treated with ethephon solution. Thus, consuming artificially ripened fruits could have adverse effects on health.

Keywords: Antioxidant, Cytotoxicity, DPPH, FRAP, Ripening

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