Stability of polyphenols and vitamin C in selected Sri Lankan fruits and leafy vegetables under varying processing and storage conditions

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Polyphenols and vitamin C are natural antioxidants in fruits and vegetables, which act synergistically to neutralize free radicals and promote wellbeing. Their stability is highly influenced by processing, cooking, additives, and storage. Although Sri Lanka is rich in antioxidant-containing produce, little research has explored how these factors influence phytochemical stability. This study evaluates the stability of polyphenols and vitamin C in Sri Lankan fruits: Passion fruit (*Passiflora edulis*), Heen Naran (*Citrus crenatifolia*), Kiwi (*Actinida deliciosa*), and Papaya (*Carica papaya*)—and leafy vegetables: Gotukola (*Centella asiatica*), Moringa (*Moringa oleifera*), and Coriander (*Coriandrum sativum*). For Total Phenolic Content (TPC) analysis, three leafy vegetables were subjected to three cooking methods (boiling, steaming, stir-frying), oven-dried, powdered, and extracted using Ultrasound-Assisted Extraction (UAE) with methanol to obtain crude extracts. Three fruits were crushed, extracted via UAE with distilled water, and freeze-dried to obtain powders. The extracts were analyzed for TPC using the Folin–Ciocalteu method, with results expressed as mg Gallic Acid Equivalents (GAE) per gram of extract. Vitamin C stability was determined in diluted fresh fruit juices stored under different conditions, using iodometric titration. All experiments were conducted in triplicate. The findings revealed that sugar addition improved vitamin C retention, while refrigeration at 4°C significantly reduced degradation. Steaming was the most effective cooking method for preserving phenolic compounds, whereas boiling and stir-frying generally reduced TPC, except in coriander where boiling yielded notably high values (71.562±3.626 mg GAE/g), as boiling breaks down cell wall components, releasing bound phenolics and increasing their extractability. Furthermore, fruit peels contained higher phenolic levels than pulps, particularly in Heen Naran (3.14± 0.4 mg GAE/g). Vitamin C stability is higher in colder temperatures (Kiwi: 35% loss at room temperature vs. 23% under refrigeration). Overall, the study demonstrates that processing, cooking, and storage strongly impact antioxidant stability, highlighting minimal processing, cooler storage, and steaming as optimal strategies to preserve nutritional and therapeutic benefits.

Keywords: *Total Phenolic Content*, *Vitamin C stability*, *Green leafy vegetables*, *Fresh fruits*, *Methanolic extract*