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Effect of biodegradable modified film packaging on the quality and safety aspects of African nightshade

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Abstract

African indigenous vegetables (AIVs) are of significant potential in achieving the UN SDG 1 (no poverty), SDG 2 (zero hunger) and SDG 3 (good health and well-being). While the production and commercialisation of AIVs provide income generating opportunities, their consumption has been linked to health benefits due to their high contents in micronutrients and health-promoting secondary plant metabolites. However, due to high perishability, inadequacies in postharvest handling has persistently led to higher qualitative and quantitative losses in AIVs along the vegetable value chain. As a result, AIVs storability which determines their distribution, marketability and consumption is adversely impacted. In the present study, the effect of biodegradable modified film packaging and storage conditions on microbiological quality and micronutrient/secondary plant metabolite contents of African nightshade (*Solanum nigrum*) leaves were investigated. African nightshade cultivated in greenhouse conditions was harvested eleven weeks after sowing, followed by storage in biodegradable film packaging bags at 6°C and 20°C for up to seven days. Quality evaluations of all treatments were conducted at the time of harvest (control), and on days 3 and 7 of storage. Leaf colour was evaluated using a chromameter, while total phenolic acids, flavonoids and ascorbic acid contents were evaluated using high-performance liquid chromatography. Microbial loads were determined using standard colony count protocols. Results indicated the use of biodegradable film packaging significantly reduced fresh weight losses compared to unpacked samples between days 3 and 7 of storage, with significantly higher losses in samples stored at 20°C. Leaf colour was better retained in biodegradable than unpacked samples, with the exception of biodegradable samples at 20°C (day 7) which showed increased leaf yellowing. Total phenolic acids and flavonoids content were maintained irrespective of the packaging conditions. However, the ascorbic acid content declined by at least 60% in both biodegradable and unpacked samples during storage. With respect to food safety aspects, the use of biodegradable modified film packaging did not reduce microbial counts, except the total bacterial and mould counts at 6°C storage. The present study indicates prospective utilisation of biodegradable film packaging to improve storability and minimise qualitative losses in African nightshade.

Keywords: African indigenous vegetables, bioactive compounds, biodegradable film packaging, food safety