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Ankita Choudhary
Division of Post Harvest Management, SKUAST-Jammu, Jammu and Kashmir, India

Anju Bhat
Division of Post Harvest Management, SKUAST-Jammu, Jammu and Kashmir, India

Neeraj Gupta
Division of Post Harvest Management, SKUAST-Jammu, Jammu and Kashmir, India

Monica Reshi
Division of Post Harvest Management, SKUAST-Jammu, Jammu and Kashmir, India

Kamakshi Sharma
Division of Post Harvest Management, SKUAST-Jammu, Jammu and Kashmir, India

Rhythm Gupta
Division of Post Harvest Management, SKUAST-Jammu, Jammu and Kashmir, India

Corresponding Author:
Ankita Choudhary
Division of Post Harvest Management, SKUAST-Jammu, Jammu and Kashmir, India

Development of shelf-stable intermediate moisture mango slices

Ankita Choudhary, Anju Bhat, Neeraj Gupta, Monica Reshi, Kamakshi Sharma and Rhythm Gupta

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Abstract
Intermediate moisture foods (IMFs) have emerged as a viable solution to reduce post-harvest losses of perishable fruits like mangoes and extend their shelf life while retaining desirable organoleptic properties. This study explores the development of intermediate moisture mango slices through osmotic dehydration, utilizing a 60% sucrose solution with a dipping time of 24 hours followed by cabinet drying. The developed Intermediate Moisture (IM) Mango Slices was the slices were analyzed for essential quality attributes: moisture content, water activity, total soluble solids (TSS), total sugars, titratable acidity, crude fiber, and ash content. The shelf life of the product was monitored for a period of six months. Microbiological studies were also satisfactory during six months of storage.

Keywords: Intermediate moisture foods (IMFs), cabinet drying, mango slices, quality attributes

Introduction
Mango (*Mangifera indica* L.) is a climacteric tropical fruit widely esteemed for its distinctive flavor, aroma, and nutritional value, including high levels of vitamins and antioxidants. Despite its commercial importance and consumer demand, the highly perishable nature of mangoes, characterized by rapid ripening and susceptibility to microbial spoilage, significantly constrains its postharvest shelf life and impedes market. Consequently, efforts to develop value-added products that extend shelf stability while preserving sensory and nutritional qualities have gathered considerable research interest.
Intermediate moisture (IM) fruit products have emerged as a promising preservation approach, defined by their moisture content and water activity (a_w) levels that inhibit microbial growth, yet retain desirable fresh-like texture and flavor attributes. Osmotic dehydration is a widely accepted method for producing IM fruits, wherein fruit slices are immersed in concentrated osmotic solutions, facilitating controlled water removal and simultaneous solute uptake. This technique operates at relatively low temperatures, thereby minimizing thermal damage to color, flavor, and heat-sensitive nutrients (Lech *et al.*, 2017) [4].
Previous studies have demonstrated that osmotic dehydration of mango slices in high-sugar solutions can successfully reduce moisture content while enhancing shelf life and maintaining organoleptic acceptability (Kamran *et al.*, 2008) [3]. However, achieving optimal process parameters, including osmotic agent concentration and immersion duration, remains critical to balancing effective dehydration with quality retention. Immersion in 60% (w/w) sucrose solution for prolonged durations, such as 24 hours, has been reported to facilitate adequate water loss and solid gain conducive to IM fruit production, leading to products suitable for ambient storage with minimal microbial proliferation (Yadav *et al.*, 2014) [9].
The present study aims to develop shelf-stable intermediate moisture mango slices through osmotic dehydration in a 60 percent sucrose solution for 24 hours, followed by controlled drying and packaging. The research focuses on evaluating the physicochemical, microbiological, and sensory characteristics to establish an optimized process protocol for commercial application and extended usability of mango slices as ready-to-eat snacks.

Materials and Methods

Raw Material Collection and Experimental Site

The experiment was conducted in the Division of Postharvest Management, SKUAST-Jammu, Chatha, J&K UT in the year 2023-24. Firm, ripe mangoes cv. Dashehari, obtained from the local market in Jammu was selected for the osmotic dehydration experiment using food grade sucrose as osmotic agent.

Raw Material Preparation

Mango fruits were first weighed to record their initial mass. The mangoes were then thoroughly washed under running water to eliminate surface impurities and potential contaminants. After washing, the mangoes were peeled using a sterile stainless-steel knife without damaging the pulp. The peeled mangoes were subsequently sliced manually into pieces approximately 5mm in thickness.

Preparation of osmotic agent

Sucrose was added to water and mixed thoroughly for preparation of osmotic solution and the fruit: solution ratio of 1:2 was maintained.

Osmo dehydration of Mango Slices

Fresh mango slices were subjected to osmotic dehydration by immersing them in a 60% (w/w) sucrose solution for 24 hours at room temperature to facilitate effective osmosis. Following the osmotic treatment, the sugar syrup was drained, and the fruit slices were evenly arranged on blotting sheets for draining of excess water and then spread on trays for drying. The mango slices were then dried in a cabinet dryer maintained at a temperature range of 50-55 °C until constant weight was achieved. After drying the product was cooled and packed in polyethylene terephthalate (PET) bottles, and stored at ambient conditions for subsequent shelf-life analysis.

Experimental Analysis

Moisture content, water activity, total soluble solids (TSS), total sugars, titratable acidity, crude fiber and ash content were analyzed using standard methods AOAC, 2007 [2]. Nutritional, microbial, and sensory qualities were assessed at regular intervals i.e., 0, 2, 4 and 6 months throughout the storage period. The total plate count was determined using the serial dilution and plating methods as described by Pelczar and Chan, (1991) [5]. The osmo-dried fruit slices were evaluated for color, texture, flavor, taste, and overall acceptability by a panel of semi-trained panelists. Sensory assessment was conducted using the nine-point hedonic scale (Watts *et al.*, 1989) [7], where 1 represented "dislike extremely" and 9 "like extremely."

Results and Discussion

The results of the IM mango slices are shown in Table 1, illustrating changes observed in the nutrient content over a six-month storage period. It could be inferred that the initial moisture content of IM mango slices remained with the range of standard moisture content of intermediate moisture foods (IMF's) i.e., 15-40 percent. Initial moisture content, water activity, and total sugars of 16.14, 68.31 and 64.81 percent respectively were recorded. The TSS of IM mango slices decreased significantly from after 6 months of storage. The moisture content declined from a value of 16.14-11.67 percent during storage period of 6 months. These changes might be attributed to ongoing evaporation and moisture redistribution within the dried tissue until equilibrium was achieved (Sogi *et al.*, 2013) [6].

Water activity and total sugars also reduced from initial values of 0.76 to 0.69 ºBrix and 66.07 to 64.41 percent respectively. The increase is likely due to enzymatic conversion of polysaccharides into simple sugars and mild moisture redistribution, which enhances extractable sugar content over time (Ampah *et al.*, 2022) [1]. No microbial activity was observed in mango slices through 6 months of storage period.

Table 1: Quality Characteristics of IM mango slices during storage

Storage (months)	Moisture content (%)	TSS (ºB)	Water activity (a_w)	Total sugars (%)
0	16.14	68.31	0.76	66.07
2	15.08	67.95	0.73	65.13
4	13.80	67.28	0.71	64.81
6	11.67	66.51	0.69	64.41
Mean	14.17	67.51	0.72	65.13
$CD^{0.05}$	0.06	0.04	N/A	0.05

The mean organoleptic scores of the IM mango slices are given in Figure 1. The mean value of the product declined during storage period of 6 months with overall acceptability declining from an initial score of 8.25 to 7.92 after 6 months. It could be due to overheating, decomposition of carotenoids and occurrence of Maillard reaction (Wojdyło *et al.*, 2014) [8].

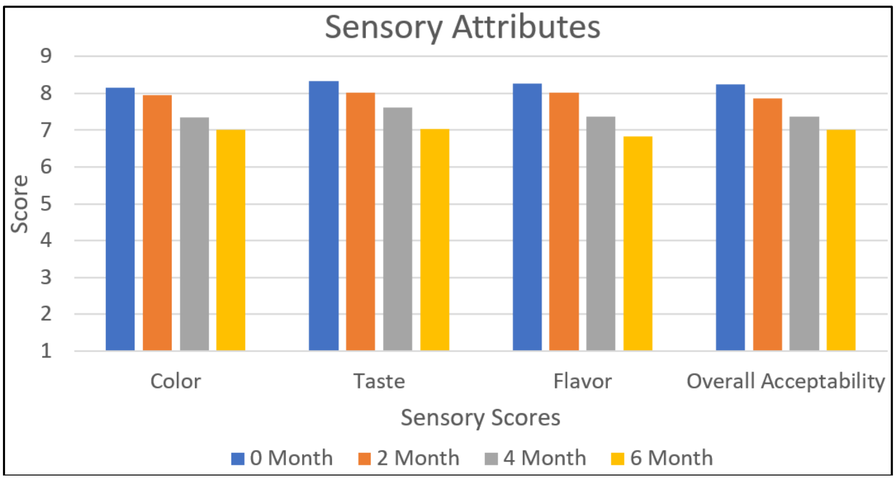

Fig 1: Effect of storage on sensory attributes of IM mango slices during storage

Conclusion
Development of intermediate-moisture mango slices represents a promising approach for preserving the overall quality attributes of the fruit. Packaging the slices in polyethylene-laminated aluminium pouches was found to be an effective method for maintaining product quality during storage. The applied technique successfully preserved key physical attributes, including moisture content, water activity, and colour stability. Furthermore, the process was effective in retaining bioactive compounds, thereby enhancing the nutritional value of the product. Microbiological analysis confirmed the safety of the processed mango slices, while sensory evaluation indicated superior organoleptic properties compared to conventional preservation methods.

References
1. Ampah J, Dzisi KA, Addo A, Bart-Plange A. Drying kinetics and chemical properties of mango. International Journal of Food Science. 2022;2022:6243228.
2. AOAC. Official Methods of Analysis. 18th ed. Washington (DC): Association of Official Analytical Chemists; 2007.
3. Kamran M, Rauf M, Jamil K, Saleem N, Umar ZN, Tarar OM. Processing and shelf-life studies of intermediate moisture mango slices. Pakistan Journal of Food Sciences. 2008;18(1-4):50-54.
4. Lech K, Michalska A, Wojdylo A, Nowicka P, Figiel A. The influence of the osmotic dehydration process on physicochemical properties of osmotic solution. Molecules. 2017;22(12):2246.
5. Pelczar MJ, Chan ECS. Laboratory Exercise in Microbiology. New York: McGraw-Hill; 1991. p. 178.
6. Sogi DS, Siddiq M, Greiby I, Dolan KD. Total phenolics, antioxidant activity, and functional properties of ‘Tommy Atkins’ mango peel and kernel as affected by drying methods. Food Chemistry. 2013;141(3):2649-2655.
7. Watts BM, Ylimabi GL, Jeffery LE, Elias LG. Basic Sensory Methods for Food Evaluation. Ottawa (Canada): International Development Research Centre; 1989. p. 58-65.
8. Wojdyło A, Figiel A, Lech K, Nowicka P, Oszmiański J. Effect of convective and vacuum-microwave drying on the bioactive compounds, color and antioxidant capacity of sour cherries. Food and Bioprocess Technology. 2014;7(3):829-841.
9. Yadav AK, Singh SV. Osmotic dehydration of fruits and vegetables: A review. Journal of Food Science and Technology. 2014;51(9):1654-1673.