INTRODUCTION

Moringa oleifera is an economically significant multipurpose tree cultivated extensively in tropical and semi-arid regions. The seeds contain 30–40 percent high-quality oil rich in oleic acid, which has applications in edible oil production, cosmetics, pharmaceuticals, and water treatment. Despite its commercial importance, significant quantitative and qualitative losses occur due to improper harvesting, drying, and storage practices. Scientific post-harvest management is therefore essential to preserve seed quality, prevent deterioration, and maximize oil recovery and market value.

Harvesting and Maturity Considerations

The stage of maturity at harvest plays a decisive role in determining seed quality and storage stability. Pods intended for seed extraction must be harvested at full physiological maturity, which is indicated by a change in pod colour from green to brown, drying of the outer surface, and partial longitudinal splitting. At this stage, seed moisture content generally ranges between 18 and 22 percent. Harvesting immature pods results in underdeveloped seeds with reduced oil content, lower test weight, and poor storage behaviour. Harvesting during dry weather conditions minimizes surface moisture and reduces the risk of fungal contamination.

Moisture Management and Drying

Moisture control is the most critical factor influencing post-harvest stability of moringa seeds. Immediately after harvest, pods must undergo primary drying to reduce moisture content below 12 percent prior to decortication. Following seed separation, further drying is required to bring moisture levels down to 8–10 percent for safe storage. If moisture remains above safe limits, the seeds become susceptible to fungal growth, particularly Aspergillus species, which may produce aflatoxins under high humidity conditions.

Drying may be carried out through controlled sun drying, solar tunnel drying, or mechanical hot air drying at temperatures between 45 and 55°C. Excessive temperatures above 60°C should be avoided, as they may reduce germination potential and accelerate lipid oxidation, leading to deterioration in oil quality. Uniform drying is important to prevent moisture gradients that can cause localized spoilage during storage.

Decortication and Mechanical Handling

Decortication involves separation of seeds from the fibrous pod husk. While manual methods are commonly used at small scale, mechanical decorticators significantly improve efficiency and reduce labour requirements. However, improper machine settings can cause mechanical damage to seeds. Excessive cylinder speed or inadequate concave clearance increases seed breakage, which in turn enhances susceptibility to oxidation and reduces oil extraction efficiency. Therefore, machine calibration and optimization of operational parameters are essential to maintain seed integrity and processing efficiency.

Cleaning, Grading and Quality Evaluation

Following decortication, seeds should be thoroughly cleaned to remove husk fragments, dust, broken seeds, and immature kernels. Grading improves uniformity and enhances processing efficiency during oil extraction. Quality evaluation parameters include moisture content, oil percentage, free fatty acid (FFA) level, peroxide value, seed colour uniformity, and germination percentage for planting material. Acceptable free fatty acid content for good quality oil is generally below 2 percent. Elevated FFA and peroxide values indicate lipid degradation and poor storage conditions.

क्रमांक: COOP/2023/KOTA/201080/26/42

एग्रीकल्चर फ़ोरम फॉर टेक्निकल एजुकेशन ऑफ़ फार्मिंग सोसायटी

कोटा, राजस्थान

Post-harvest Management of Moringa Pods and Seeds

संकलन

Ramappa[1], Sachin Channappa Hallad[2] and Sourabh Ajit Chougala[3]

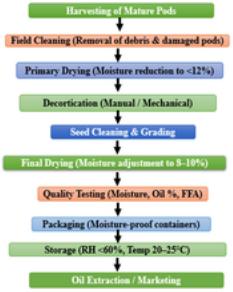
[1]Ph.D. scholar, Department of Processing and Food Engineering, College of Technology and Engineering, MPUAT, Udaipur, Rajasthan- 313001
[2]Ph.D. Scholar, Department of Renewable Energy Engineering, College of Technology and Engineering, MPUAT, Udaipur, Rajasthan- 313001
[3]Ph.D. Scholar, Department of Processing and Food Engineering, College of Agricultural Engineering, UAS, Raichur-584101

Storage Requirements and Shelf Life

Moringa seeds are hygroscopic in nature and readily absorb atmospheric moisture. Safe storage therefore requires moisture-proof packaging materials such as laminated pouches or high-density polyethylene-lined bags. Storage environments should maintain relative humidity below 60 percent and temperatures between 20 and 25°C. Under optimal conditions, properly dried seeds can be stored for 8–12 months without significant deterioration in oil quality. High temperature and humidity accelerate hydrolytic and oxidative rancidity, resulting in increased peroxide value and reduced shelf life.

Processing Flow

The post-harvest management sequence typically involves harvesting of mature pods, cleaning, primary drying to safe moisture levels, decortication, seed cleaning and grading, final drying, packaging, and storage or oil extraction. A systematic and sequential approach minimizes quantitative losses and ensures better quality control throughout the processing chain.

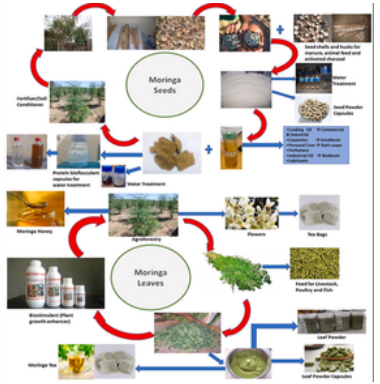


Comparative Performance of Practices

Improved scientific management offers clear advantages over traditional open sun methods. Controlled drying reduces contamination, improves moisture uniformity, extends storage life from approximately 4–6 months to 8–12 months, and enhances oil recovery efficiency. Adoption of improved drying and mechanical decortication technologies can increase oil yield by 5–10 percent while maintaining superior quality standards.

Utilization and Value Chain of Moringa Seeds and Leaves

The above schematic illustrates the diversified utilization pathways of Moringa oleifera seeds and leaves across food, nutraceutical, agricultural, and industrial sectors. Moringa seeds are primarily processed for edible oil extraction, protein-based water purification agents, seed powder capsules, and organic manure, while the seed cake serves as animal feed and soil conditioner. The leaves are widely utilized for preparation of leaf powder, capsules, tea, bio stimulants, livestock feed, and functional food products. This integrated value chain highlights the economic potential of moringa as a multipurpose crop capable of generating income through multiple downstream applications



Source: https://www.sciencedirect.com/

CONCLUSION

Scientific post-harvest management of moringa pods and seeds is fundamental to preserving quality, preventing fungal contamination, and maximizing oil recovery. Controlled drying, optimized mechanical decortication, systematic grading, and appropriate storage conditions significantly enhance shelf life and market value. Adoption of improved post-harvest technologies strengthens the moringa value chain and contributes to higher economic returns for farmers and processors.