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ADOPTION RATE OF THE POST HARVEST MANAGEMENT PRACTICES IN MANGO: A STUDY IN JAMMU DISTRICT, J&K, INDIA

Pratima Rana^{1*}, Poonam Parihar², Sumesh Sharma^{3*} and Sandeep Kaur⁴

¹Directorate of Extension Education, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni-Solan, Himachal Pradesh- 173230, India

²Department of Agricultural Extension Education, SKUAST, Jammu; Chatha, Jammu & Kashmir, India

³Department of Agricultural Extension and Communication, Swami Keshwanand Rajasthan Agricultural University Bikaner, Rajasthan, India, 334006

⁴National Rainfed Area Authority, MOA&FW, India, 110012

*Corresponding authors E-mail: sumesh.07sharma@gmail.com; dr.pratimarana@outlook.com
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ABSTRACT

Mango (*Mangifera indica* L.) is an economically important and highly perishable subtropical fruit widely grown in the Jammu region. Proper post-harvest management plays an important role in maintaining fruit quality, extending shelf-life and improving marketability. However, there is limited information on the extent to which mango growers in the region follow recommended post-harvest practices. The study was conducted among 80 mango growers in Jammu district, selected through proportionate random sampling from five major mango-growing blocks. Data were collected using a structured interview schedule. The adoption of recommended post-harvest management practices was assessed and presented in terms of frequency and percentage. All respondents (100%) grew the Dasherri variety, while the majority (95.00%) followed grading based on size and colour. More than half of the growers (57.50%) harvested mangoes by hand, whereas 43.00 per cent used the recommended picking pole. Only 25.00 per cent harvested at the recommended time. For artificial ripening, 48.75 per cent of growers used ethylene, while 51.25 per cent continued to use traditional ripening methods. Most growers (62.50%) transported their produce by matador, and about 90.00 per cent used chemicals for controlling insect-pests and diseases. The findings showed that growers were more likely to adopt simple, low-cost and familiar practices, while practices requiring more technical knowledge or greater attention, such as harvesting at the recommended time, were less commonly followed. This indicates a need for focused extension efforts, practical demonstrations and training to improve the overall adoption of recommended post-harvest technologies among mango growers.

Key words: Post-harvest management, Adoption, Perishable fruit, Grading, post-harvest technology.

Introduction

With diverse soil and climate types comprising several agro-ecological regions, India provides ample opportunity to grow a variety of crops. Horticulture is a science and also an art of production, utilisation and improvement of horticultural crops, such as fruits and vegetables, spices and condiments, ornamental, plantation, medicinal and various aromatic plants. Horticultural crops require intense care in planting, intercultural operations, manipulation of growth, harvesting, packaging, marketing,

storage and processing. India is the second largest producer of fruits and vegetables in the world after China. About 55-60 per cent of the total population depends on agriculture and allied activities. India produces around 1,62,187 thousand metric tonnes of vegetables and 81,285 thousand metric tonnes of fruits (NHB, 2013), which respectively account for nearly 11.90 and 10.90 per cent of the world's production of vegetables and fruits. Horticultural crops form a significant part of total agricultural produce in the country and become key

drivers of economic development in many of the states in the country. They contribute 30.40 per cent to Agriculture Gross domestic product (GDP) (Economic Survey 2018-19).

The horticulture crops are perishable in nature and require special attention. Post-harvest losses in mango occur at every stage of the value chain, with an estimated 10 per cent lost at the field level, 5 per cent during transportation, 2 per cent during packaging, 9 per cent during storage and 4 per cent during processing, together aggregating to nearly 30 per cent of the total produce (Economic Times, 2013). A post-harvest management practice means the handling of an agricultural product after harvest to prolong storage life, freshness and an attractive appearance and also reduces the losses. Importance of the post-harvest management practices in mango lies in the fact that it has the capability to meet requirement of growing population by elimination losses, making more nutritive items from its pulp by proper processing and fortification.

Among the major fruits of India, Mango (*Mangifera indica* L.) is known as the king of fruits. More than 85 countries across the tropical and sub-tropical world cultivate mango over an area of about 3.69 million hectares, with global production of around 35 million tonnes (Hussen and Yimer, 2013). India is the largest producer and consumer of mangoes and Indian mangoes are known for their taste and aroma throughout the world (Gopalakrishnan, 2013), contributing about 69 per cent of world mango production and harvesting 21.54 million tonnes annually (Sekhar *et al.*, 2013). Within Jammu and Kashmir, Jammu district is the leading mango-producing district (7960 MT), followed by Kathua (7620 MT), Udhampur (2466 MT) and Samba (2172 MT) (Directorate of Horticulture, Jammu and Kashmir, 2013), which underlines the crop's economic importance for the orchardists of the present study area.

Even though, numbers of post-harvest management practices are being recommended to maximize benefits, the mango growers are not adopting the recommended practices. The thorough knowledge of the post-harvest management practices by the mango growers/orchardists would help mango growers in reducing the loss and obtaining the higher yields. Thus, the study provides empirical feedback to post harvest management scientists to reorient the research priorities.

Material and Methods

Study Area

The present study was conducted in the sub-tropical area of Jammu district of Jammu and Kashmir Union

territory. Jammu district is situated between 33°44' 03 North latitude and 74°52' 03 East longitude and has an area of 3,097 km². The climate of the region varies with altitude, with hot summers, rainy monsoon and mildly cold winters in and around Jammu city. The normal annual rainfall of the Jammu region is about 1100 mm, while the average normal temperature ranges from 8.53°C to 21.54°C. The study was conducted in the major mango-growing areas of Marh, Bhalwal, Khour, Akhnoor and Dansal, which were selected purposively from the eight blocks of Jammu district on the basis of the highest number of mango growers/orchardists.

Sampling Procedure

The study employed a descriptive research design and purposive-cum-proportionate random sampling technique for the selection of respondents. A list of mango growers/orchardists was obtained from the Department of Horticulture, Government of Jammu and Kashmir. Orchardists possessing 50 or more mango plants were considered eligible for the study. The block-wise selection of respondents was carried out through proportionate random sampling and the final selection of 80 respondents was made using a random number generator. The total population of eligible mango growers in the five selected blocks was 183 which comprising fifteen growers in Marh, thirty- one in Bhalwal, twelve in Khour, 112 in Akhnoor and thirteen in Dansal. Accordingly, from the five selected blocks the sample consisted of 7, 13, 5, 49 and 6 respondents, respectively. (Fig. 1).

Measurement of Adoption

The recommended post-harvest management practices developed by the Division of Post Harvest Technology, Sher-e-Kashmir University of Agricultural Sciences and Technology-Jammu (SKUAST-J) for mango were selected for assessing the adoption status of the orchardists. The selected practices covered harvesting, pre- and post-harvest treatment, sorting and grading, storage, packing, ripening, transportation,

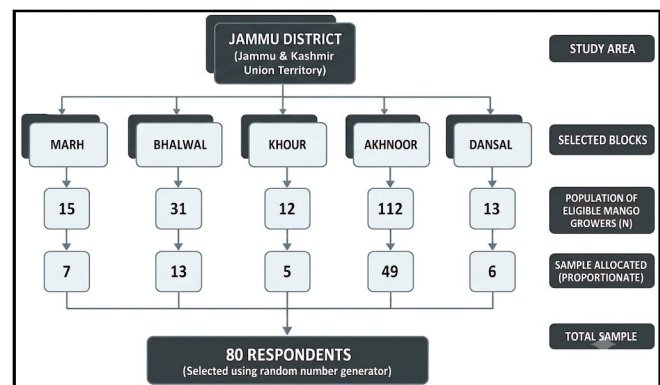


Fig. 1: Sampling Procedure of the Study.

Table 1: Adoption of the different varieties of mango fruit.

VARIETIES	MARH (n=07)	BHALWAL (n=13)	KHOUR (n=05)	AKHNOOR (n=49)	DANSAL (n=06)	TOTAL (N=80)
Dasheri	07 (100.00)	13 (100.00)	05 (100.00)	49 (100.00)	06 (100.00)	80 (100.00)
Langra	04 (57.14)	01 (7.69)	00 (0.00)	00 (0.00)	00 (0.00)	05 (6.25)
Chausa	00 (0.00)	01 (7.69)	00 (0.00)	01 (2.04)	00 (0.00)	02 (2.50)
Malda	03 (42.85)	04 (30.76)	01 (20.00)	00 (0.00)	00 (0.00)	08 (10.00)
Amarpalli	03 (42.85)	04 (30.76)	02 (40.00)	01 (2.04)	00 (0.00)	10 (12.50)
Mallika	01 (14.28)	00 (0.00)	00 (0.00)	00 (0.00)	00 (0.00)	01 (1.25)
Desi	00 (0.00)	05 (38.46)	00 (0.00)	01 (2.04)	00 (0.00)	06 (7.50)
Others	04 (57.14)	01 (7.69)	00 (0.00)	00 (0.00)	00 (0.00)	05 (6.25)
<i>Figures in the parentheses are percentages, *multiple response</i>						

processing and marketing, and control of storage pests and diseases.

The extent of adoption was measured in terms of the percentage of farmers adopting a particular mango post-harvest management practice. The adoption of individual practices was assessed through the responses of the growers and expressed as frequency and percentage. The variable, adoption of recommended post-harvest management technologies, was coded as 0 for non-adoption and 1 for adoption. The adoption assessment covered different operations including the variety of mango grown, harvesting method and time, maturity indices, washing, grading, storage, storage facilities, packaging and cushioning materials, artificial ripening, transportation and the use of chemicals for controlling diseases and insect-pests.

Data Collection

Primary data were collected through personal interviews using a structured interview schedule. The interview schedule was developed after consultation with specialists from Extension Education and Fruit Science and included items related to the socio-economic profile of the respondents, knowledge of post-harvest management practices, adoption of recommended post-harvest management practices and constraints faced by mango growers. The schedule was pre-tested on ten non-sampled mango growers of Bhalwal block, who were not included in the final sample of 80 respondents. Necessary modifications were made following the pre-testing to improve the workability of the schedule and remove ambiguity. The respondents were interviewed at their homes, community places or farms, and the responses were recorded on the spot. In addition to face-to-face interaction, photographs/pictures of insect-pests, diseases and physiological disorders of mango fruit were used to obtain relevant information from the respondents.

Statistical Analysis

The data collected from the respondents were coded, tabulated and analysed using frequency and percentage.

The adoption of different post-harvest management practices was assessed by calculating the frequency and percentage of mango growers adopting each practice. The results were presented in tabular form for different blocks as well as for the overall sample of 80 mango growers. In case of practices involving multiple responses, the results were analysed and presented using the multiple-response approach. The data were analysed using Microsoft Excel.

Results and Discussion

Adoption of different varieties of mango fruit

Table 1 showed the adoption of different varieties of mango by the orchardist in the study area. Varieties of mango were Dasheri, Langra, Chausa, Malda, Amarpalli, Mallika, Desi and others. In Jammu district, overall 100.00 per cent of the respondents adopted Dasheri variety of mango followed by 12.50 per cent, 10.00 per cent, 7.50 per cent, 6.25 per cent, 2.50 per cent and 1.25 per cent under Amarpalli, Malda, Desi, Langra and others, Chausa and Mallika respectively.

The predominance of Dasheri might be attributed to its greater suitability, familiarity among growers and easy availability of planting material, which might have facilitated its cultivation over a larger area. The preference for an established variety may also have discouraged diversification towards other varieties. These findings are in accordance with the findings of Deshmukh *et al.*, (1998), Palande *et al.*, (2001) and Modi *et al.*, (2010a).

Adoption of the method of harvesting and maturity indices of mango fruit

The Table 2 indicated that overall 46 (57.50%) respondents of Jammu area adopted hand picking as the method of harvesting while 34 (42.50%) had adopted fruit picker as the method of harvesting respectively. In case of harvesting time 48.75 per cent of the harvest their produce any time they wanted, followed by 26.25 per cent harvest their produce in evening according to

[illegible]

operation without requiring specialised equipment. The recommended harvesting time may have received less attention due to labour availability and growers' convenience. These findings are relatable with the findings of Deshmukh *et al.*, (1998), Palande *et al.*, (2001) and Modi *et al.*, (2010a).

Adoption of the method of washing and grading of the fruit after harvest

The Table 3 showed that there is no adoption in case of method of fruit washing. In Jammu 17.50 per cent had

[illegible][illegible]

Table 7: Adoption of the chemicals to control diseases and insect-pest of mango fruit.

Chemicals	MARH (n=07)	BHALWAL (n=13)	KHOUR (n=05)	AKHNOOR (n=49)	DANSAL (n=06)	TOTAL (N=80)
Calcimine	03 (42.85)	02 (15.38)	00 (0.00)	05 (10.20)	00 (0.00)	10 (12.50)
Copper oxychloride	00 (0.00)	02 (15.38)	00 (0.00)	05 (10.20)	00 (0.00)	07 (8.75)
Dimethioate	00 (0.00)	01 (7.69)	00 (0.00)	02 (4.08)	00 (0.00)	03 (3.75)
Monocrotophos	00 (0.00)	01 (7.69)	03 (60.00)	20 (40.82)	06 (100.00)	30 (37.50)
Nuvan	00 (0.00)	10 (76.92)	05 (100.00)	02 (4.08)	06 (100.00)	23 (28.75)
Malathion	00 (0.00)	02 (15.38)	00 (0.00)	03 (6.12)	02 (33.33)	07 (8.75)
Chloropyriphos	00 (0.00)	07 (53.84)	04 (80.00)	37 (75.51)	02 (33.33)	50 (62.50)
Planofix	03 (42.85)	00 (0.00)	00 (0.00)	02 (4.08)	00 (0.00)	05 (6.25)
Cypermethrin	00 (0.00)	02 (15.38)	00 (0.00)	00 (0.00)	00 (0.00)	02 (2.50)
Aldrin	03 (42.85)	02 (15.38)	00 (0.00)	00 (0.00)	00 (0.00)	05 (6.25)

Adoption of the ethylene for the artificial ripening and transportation of mango fruit

The Table 6 shows that majority of the respondents 51.25 per cent had adopted the traditional method for the ripening of the fruit followed by 48.75 per cent respondent use chemical for the artificial ripening of the fruit. In Jammu district, overall 62.50 per cent respondents had adopted metadoor as transportation medium, 30.00 per cent respondents had adopted the auto as the transportation medium, 27.00 per cent respondents had adopted tempo as a transportation medium, and 21.25 per cent respondents had adopted any vehicle available for the transportation.

The adoption of traditional and chemical ripening methods might be influenced by the availability of inputs in the local market, growers' familiarity with traditional practices and the prevailing trend towards organic farming. The choice of transportation medium might be influenced by the availability and convenience of locally accessible transport facilities, while lack of collective marketing efforts and knowledge of profitable marketing may have restricted the use of more organised transportation and marketing channels.

Adoption of the chemicals to control diseases and insect-pest in mango fruit

Table 7 showed that in Jammu district 10 respondents i.e. 12.50 per cent respondents had adopted the calcimine and 07 respondents i.e. 8.75 per cent had adopted the copper oxychloride as the chemicals to control the diseases which occurs in mango like powdery mildew, fungus, anthracnose, malformation and fruit dropping respectively. In case of insect pest of mango fruit, to control the various insect pest like termite, mango mealy bug, mango hopper, mango fruit fly, mango borer and red ants, majority of the respondents 62.50 per cent had adopted chloropyriphos followed by 37.50 per cent, 28.75 per cent, 8.75 per cent, 3.75 per cent, 2.50 per cent had adopted the

monocrotophos, nevan, malathion, dimethioate and cypermethrin and 6.25 per cent had adopted the planofix and aldrin to control fruit dropping and termite respectively.

The higher adoption of chemicals for insect-pest control may be because pest damage is more visible to growers and they are more familiar with chemical control methods. In contrast, the lower adoption of chemicals for disease control may be due to limited knowledge about identifying diseases, choosing the right chemicals, and applying them at the proper time and in the correct way. This highlights the need for better technical guidance and practical demonstrations on disease and insect-pest management for mango growers.

Conclusion

The study found that mango growers in Jammu district mainly relied on one established variety and continued to use traditional, low-cost methods for harvesting, ripening and transportation instead of following the recommended scientific practices. Grading was widely adopted because it is simple, inexpensive and helps growers get better returns. However, practices such as fruit washing, harvesting at the right time and weight-based grading were less commonly followed because they require additional labour, cost or technical knowledge. Storage and packaging practices were also influenced more by convenience, cost and the need to transport the highly perishable fruit quickly than by recommended practices. Growers were more likely to use chemical measures for insect-pest control, while disease-management practices received less attention. Overall, adoption of post-harvest management practices among mango growers in Jammu district was moderate. The main gaps were seen in practices that require additional effort, resources or technical knowledge, while simple and low-cost practices were more commonly adopted. This shows the need for stronger extension support, with greater emphasis on practical training and demonstrations to help growers

adopt the complete set of recommended post-harvest management practices.

Recommendations:

- **Strengthen skill-based training:** Krishi Vigyan Kendras and the Department of Horticulture should organise practical training and frontline demonstrations on fruit washing, weight-based grading and potassium permanganate treatment. These practices are still not widely followed and growers need clear, hands-on guidance on how to use them.

- **Promote scientific harvesting practices:** Extension workers should demonstrate the use of picking poles and explain the importance of harvesting fruit at the right stage of maturity and at the appropriate time of day. This can help reduce fruit bruising and extend shelf life, while gradually reducing dependence on hand-picking and convenience-based harvesting.

- **Improve access to storage and ripening facilities:** Government schemes should support growers in accessing suitable storage structures, crates and ethylene-based ripening chambers at subsidised rates. This would encourage a shift from heap storage and traditional ripening methods towards practices that help maintain fruit quality.

- **Balance plant-protection practices and strengthen market linkages:** Growers should receive need-based training on disease identification and integrated pest and disease management so that they do not rely mainly on chemical control. At the same time, farmer-collective marketing and organised transport should be encouraged to help growers obtain more consistent returns from their produce.

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