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Problems Faced by the Farmers in Post-harvest Management of Pomegranate in Western Rajasthan

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ABSTRACT

It attempted to analyse the problems faced by farmers in post-harvest management of pomegranates in Barmer district of Rajasthan in 2022. The association of technical problems was checked with the education level of farmers. The data were taken from 120 farmers. Garret's ranking method was employed to rank the problems faced by the farmers. A chi-square test was employed to check the measure of association between technical problems and the education level of farmers. The results revealed the five major categories of problems (Environmental, technical, infrastructure, financial, and market-related) faced by farmers in post-harvest management of pomegranates. The major technical problem was the lack of a processing industry at the village level ranked as I with a mean value 70.45. The market-related problem was the unavailability of market of fruits at the village level ranked as I with a mean value 63.50. The chi-square test results revealed that there was an association between the education level of farmers and technical problems.

INTRODUCTION

Pomegranate (*Punica granatum*), is an important fruit crop of arid and semi-arid region of India, belongs to the family Lythraceae (Babu et al., 2012; Mincuzzi & Ippolito, 2023). Pomegranate is a tasty, juicy and sweet fruit with nutritional properties that can be grown successfully in the dry climate areas of the country. Therefore, pomegranate is special among the fruits grown in these areas. India is the world's seventh-largest producer of pomegranates, with about 2,75,500 hectares underneath production (APEDA, 2023). It is mainly cultivated in Maharashtra, Gujarat, Rajasthan, Karnataka, Andhra Pradesh, Tamil Nadu and Uttar Pradesh. Pomegranate is also extensively grown in Western Rajasthan, with an area of 13083 ha and production of 109805 MT during 2021-22. Barmer is the highest pomegranate producing district in Rajasthan with an area of 6693 ha and production of 65442 MT followed by Jalore district with an area of 4655 ha and production of 31644 MT (DOH, Rajasthan, 2022). The pomegranate varieties grown in Rajasthan are Bhagwa (Sindhuri), Super Bhagwa and Mridula. Apart from these varieties, Ganesh, Ruby, Jalore Seedless, Dholka, G-137 and Kandhari are also the main varieties in the country (DOH, Rajasthan, 2019). Pomegranate fruits become ready for harvesting within 135-175 days after they appear as per the variety. Fruit maturity is also determined by the color of the fruit, with red varieties being 75-80 per cent red. The fruits are ready about 4.5 to 6 months after flowering. Ripe fruits should be harvested in the morning or evening. In the initial stage, only 20-25 fruits are obtained from the pomegranate plant, but if a fully developed plant is properly looked after, up to 85-115 fruits can be obtained.

Because pomegranates are not climacteric fruits by nature, they must be collected when they are fully mature on the plant in order to produce the best organoleptic qualities (Artés and Villaescusa, 2000). Pomegranate fruit only lasts 10 to 15 days

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when stored at ambient temperatures (Wasker, 2011). The external variables that determine the shelf life of pomegranates are temperature, relative humidity, and the type of gases in the environment. These variables can be efficiently utilised to extend the post-harvest life by reducing respiration and losses resulting from fungal and physiologic degradation (Dhumal et al., 2022). Various species such as *Botrytis, phomopsis, rhizopus* cause decay in pomegranate. Grey mold caused by *Botrytis cineria* and rot caused by *Alternaria solani* deteriorate to the pomegramate during storage. Pomegranate fruits obtain heart rot due to Alternaria spp. infection, which starts in the orchard, specifically following rainfall through blooming and the beginning of growth of the fruit. With the exception of a little aberrant skin tone, the fungus can develop inside the fruit without causing any outward signs. The packing house sorters can identify and discard these fruits if a collection of black arils gets close to the peel, causing the region that was impacted to soften (Prasad et al., 2010). Appropriate post-harvest management techniques are required to control these losses due to organism as well as to minimise the damage during handling of pomegranate at farm level.

METHODOLOGY

The study was conducted in the Barmer district of Rajasthan during 2022. The district was selected through purposive sampling because Barmer has the highest area under pomegranate 6693 ha and the highest pomegranate producing district 65442 MT among other districts of Rajasthan during 2021-22 (DOH, Rajasthan, 2022). Two blocks (Siwana and Balotra) from Barmer district were selected through purposive sampling on the basis of production. Two villages from each block, Itwaya and Padru from Siwana block and Budiwada and Jagsa from Balotra block were selected through purposive sampling on the basis of production. From each selected village, 30 farmers were selected by purposive sampling, whose orchards were five or more than five years old. A total of 120 farmers were selected for the study.

The problems faced by farmers in post-harvest management of fruits were analysed in five categories. For each variable has six problem statements were recorded. The farmers were asked to rank them I to VI according to their severity in each category of variables. The Garrett ranking method was used to analyse the problems faced by the farmers and traders in the post-harvest management of fruits. Through this, major problems were identified and ranked accordingly. The statistics provided by Garrett and Woodworth (1969) were used to translate the percent position into scores. The following formula was used to convert these orders of merit into units of scoring (Singh et al., 2023):

$$\text{Percent position} = \frac{100(R_{ij}-0.50)}{N_j}$$

Where, R_{ij} = rank given for the i^{th} constraint (i=1.2.3... n) by the j^{th} respondent (j= 1, 2, 3....n)

N_j = number of constraints ranked by the j^{th} individual respondents.

The measure of association between education level of farmers and technical problems was executed by Chi-square test, a statistical test to determine the association between two categorical variables.

RESULTS AND DISCUSSION

Problems faced by the farmers in PHM of pomegranate

Table 1 revealed that in environmental problems, most severe issues identified in post-harvest management of pomegranate were cracking of fruits due to imbalance of moisture in the environment and soil during fruit development ranked as I with mean value 71.45 followed by problem of temperature fluctuation affects the fruits and plants ranked as II with mean value 65.42 (Table 1). During the study periods, at that times the flower drops due to rainfall results of which less fruit sets on plants. In technical problems, the major issues faced by farmers in PHM of pomegranate were lack of processing industry at village level ranked as I with mean value 70.45 followed by lack of knowledge about post-harvest management of fruits ranked as II with mean value 63.78. The problems of rank V and VI were not as critical as some of the other technical problems. In financial problems, the major problems identified were distress sale of produce due to immediate requirement of cash ranked as I with mean value 72.8 followed by high cost of skilled labours ranked as II with mean value 60.3.

In infrastructure related problems, the major issues faced by farmers in PHM of pomegranate were lack of proper roads and infrastructure ranked as I with mean value 68.87 followed by lack of proper packaging facilities at fam level ranked as II with mean value 66.45. In Barmer region there was unavailability of cold chain and there was long distance for transportation.

In market related problems, the major issues identified in PHM of pomegranate were unavailability of market of fruits at village level ranked as I with mean value 63.50 followed by high cost of transportation ranked as II with mean value 58.82. The similar results were observed in the study of Alaria, 2023. In the study, the marketing problems faced by the farmers were analysed through Garret ranking method.

Association between education of farmers and technical problems

The association of education level was tested with six statements of technical problems. The association of education level of farmers and lack of knowledge about post-harvest management of fruits was found significant. The results of cross tabulation (Chi-square test) were presented in Table 2 & 3.

Table 2 reflected the results of chi-square test, a statistical test to determine the association between two categorical variables. The value of Pearson Chi-Square is 81.142 with 25 degree of freedom is found significant with associated p-value (0.000) as $p<0.001$. it was interpreted that there is association between education level of farmers and lack of knowledge about post-harvest management of fruits. The descriptive explanation of association was given in the Table 3. For each cell in the table signifies the number of farmers falling into particular categories based on both their education level and the level of their knowledge about post-harvest management of fruits. Table 3 revealed that farmers with lower education levels, particularly those who are illiterate or have literate to primary education and primary education to secondary education found higher levels of critical and very high lack of knowledge about

Table 1. Constraints faced by the farmers in PHM of Pomegranate

S.No.	Constraints	Garret Score	Mean	Rank
	Environmental constraints			
1.	Cracking of fruits due to imbalance of moisture in the environment and soil during fruit development	77	71.45	I
2.	Attack of various insects on fruits	63	40.77	V
3.	Improper management of Bahar in pomegranate	54	45.95	III
4.	Temperature fluctuation affects plants and fruits	46	65.42	II
5.	Flowers drop due to rainfall	36	29.42	VI
6.	Fruits damaged by animals and birds	23	45.22	IV
	Technical constraints			
1.	Lack of knowledge about post-harvest management of fruits	77	63.78	II
2.	Lack of processing industry at village level	63	70.45	I
3.	No/less training of farmers on post-harvest aspects	54	54.48	III
4.	Harvesting equipment's are not appropriate	46	45.70	IV
5.	Lack of proper knowledge about proper harvesting time	36	30.48	VI
6.	Lack of guidance by agriculture staff about post-harvest management of fruits	23	34.13	V
	Infrastructure related constraints			
1.	Unavailability of skilled labour during harvesting season	77	49.12	IV
2.	Lack of proper grading facilities at farm	63	53.07	III
3.	Lack of proper packaging facilities at farm	54	66.45	II
4.	Lack of proper roads and infrastructure	46	68.87	I
5.	Lack of cold chain management and long distance transportation	36	30.02	VI
6.	Poor infrastructure for storage	23	31.45	V
	Financial constraints			
1.	High cost of skilled labours	77	60.37	II
2.	Lack of MSP/price policy by government on fruits	63	51.80	IV
3.	High cost of inputs	54	55.02	III
4.	Distress sale of produce due to immediate requirement of cash	46	72.80	I
5.	Less price of fruits in market	36	28.85	VI
6.	Lack of finance	23	30.15	V
	Market related constraints			
1.	High cost of transportation to the market	77	63.50	II
2.	Uncertainty and Price risk in market	63	56.62	III
3.	Unspecified place for selling of fruits at village level	54	27.15	VI
4.	Unavailability of cold storage van for transportation	46	48.42	IV
5.	Competition in market due to less price of apple	36	58.82	I
6.	Number of middlemen	23	44.47	V

Source: Researcher's own computation from primary data

Table 2. Chi-square tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	81.142[a]	25	.000
Likelihood Ratio	90.918	25	.000
Linear-by-Linear Association	19.073	1	.000
N of Valid Cases	120		

[a].30 cells (83.3%) have expected count less than 5. The minimum expected count is .67.

Source: Researcher's own computation from primary data

post-harvest management. As education levels increase, the stated lack of knowledge generally decreases, with the lowest levels detected in farmers with higher education levels (senior secondary to graduation and graduation to post-graduation).

DISCUSSION

The problems faced by farmers were due to various reasons. Due to excessive imbalances of moisture in the environment and soil, the problem of cracking in fruits increases and their quality was adversely affected which can lead to significant fruit losses. Temperature fluctuations affects may not be as acute as the water availability problem. Due to unavailability of processing industry at village level those fruits go in post-harvest losses. The lack of knowledge of farmers leads to post-harvest losses of pomegranate. Due to unavailability of trainings on post-harvest aspects to farmers, the farmers were not aware about practices of post-harvest management. Similar nature of constraints were recorder by Das et al., (2014). The inadequacy of harvesting equipment was a prominent challenge faced by pomegranate growing farmers. There was a need for improved guidance from agriculture staff regarding

Table 3. Crosstab between education of farmers' lack of knowledge about post-harvest management of fruits

	Lack of knowledge about post-harvest management of fruits						Total
	Critical	Very high	High	Moderate	Low	Very low	
Education of farmers							
Illiterate	0	14	0	0	3	0	17
Literate to primary	5	5	8	4	8	1	31
Primary to high school	6	13	2	0	13	0	34
High school to senior secondary	3	0	1	2	7	4	17
Senior secondary to graduation	0	0	0	1	8	2	11
Graduation to Post-graduation	0	0	0	1	4	5	10
Total	16	32	11	8	43	10	120

post-harvest management practices. The farmers need immediate cash for his requirements and balance payment due to which farmer distress sale of their produce. Skilled labour was very costly for farmers due to which small and marginal farmers faced the problems due to which the proper harvesting of their fruits not takes place which results to post-harvest losses. High cost on inputs was also a problem to farmers in PHM of pomegranate. Lack of MSP and no proper policy on price lead to fluctuation of fruit price in market which depends on demand and supply condition. The roads facilities were not so good and well established in Barmer region due to which farmers faced severe transportation problems. There was lack of proper packaging and grading facilities at farm level, they directly fills the fruits in trolleys or pickup and bring to market and they depends on the private fruit mandis for grading practice which was not available at farm level. In Barmer region there was no proper government APMC was established for selling of fruits, there were only private mandis existed and major mandi in that area was Jeewana Mandi which was far away from the reachability of farmers at high end. There was unavailability of cold storage van for transportation due to which problems of moisture loss in pomegranate due to high temperature existed, Das et al., (2015) also suggested local processing units . The farmers were getting the good price of their produce in Barmer district so there was not so much problem of price. But sometime due to supply and demand relationships the prices fluctuate in the market. The findings presented in the study disclose a significant association between the education level of farmers and their knowledge about post-harvest management of fruits. This observation aligns with preceding researches conducted by Raina et al., (2011); Ghanghas et al., (2017); Gupta et al., (2020) and Pramod et al., (2022) emphasizing the constraints, marketing behaviour and role of education in enhancing farmers' technical knowledge and capabilities.

CONCLUSION

It may be concluded that post-harvest management of pomegranates dictates a range of problems through environmental, technical, financial, infrastructure, and market-related constraints. Environmental problems such as moisture imbalance and temperature fluctuations influence fruit quality and yield considerably. Technical problems hinder efficient management, including the lack of processing infrastructure and farmer education. Financial problems such as distressed sales and high labor costs impair these problems. Infrastructure problems in transportation and storage further complicate the problem. Market-related problems, such as limited access and high transportation costs, augment the load. Addressing these complex problems requires an all-inclusive approach concerning improved infrastructure, directed financial support, inclusive training programs, and market access edges. By addressing these problems collaboratively, farmers can enhance the resilience and sustainability of pomegranate production, ensuring better outcomes for farmers. The cross-tabulation results conclude that farmers with higher education levels understand post-harvest management of pomegranate compared to those with lower education levels.

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