

ASSESSMENT OF TRAINING NEEDS OF MANDARIN GROWERS REGARDING RECOMMENDED CULTIVATION PRACTICES

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ABSTRACT

This study assesses the training needs of mandarin growers regarding recommended cultivation practices, with a focus on identifying specific areas where training requirement, conducted in Achalpur and Anjangaon Surji talukas in Amravati district of Maharashtra following purposive and simple random sampling methods. A survey of total 120 respondents revealed that 77.50 per cent had medium training needs, while 10.00 per cent exhibited high training needs. Notably, specific practices requiring significant training included integrated pest management, control of fruit drop, irrigation techniques, and nutrient management, where respondents showed considerable knowledge gaps. Correlation analysis highlighted significant factors influencing these needs such as age, education, farming experience, annual income, training received, extension contact, social participation, risk orientation and economic motivation. Regression analysis demonstrated about the contribution of all the variables in causing the variation in the extent of training need by the margins of 57.32 per cent respectively.

Keywords: correlation, cultivation practices, fruit drop, mandarin growers, training need assessment,

INTRODUCTION

According to the USDA Citrus Trade and Marketing Report (2020), global production and consumption of mandarins have seen significant growth. Between 2010 and 2020, worldwide mandarin production rose from 22 million tons to 31.6 million tons, while consumption increased from 20 million tons to 30 million tons during the same period (USDA-FAS, 2020). Citrus L., a member of the sub-family Auarantioideae within the Rutaceae family, is one of the most commercially important fruit crops globally. Within the citrus group, mandarins account for 26.00 per cent of production, second only to sweet oranges, which make up 56.00 per cent of the world's citrus output. India ranks third in global citrus production, contributing 5.02 per cent with an annual output of 10.22 million tonnes (FAO, 2019).

In India, mandarin and sweet orange production account for 66.52 per cent of the total citrus production, with mandarins representing 40.00 per cent of the citrus cultivation area (Jagannadham et al., 2024). India's total citrus production is 12.51 million tonnes, with mandarins contributing 5.27 million metric tonnes from 0.42 million hectares, making it the most cultivated citrus fruit in the country. However, the average national productivity of mandarins in India is 12.54 tonnes per hectare, which is relatively low compared to leading mandarin-producing countries (Gosal et al., 2024).

Mandarin cultivation is favored because of high domestic demand and adaptability to different agro-climatic conditions. The ideal conditions for mandarin cultivation include 100-120 cm of annual rainfall, temperatures between 10 to 35°C, and medium to light loamy soils with well-drained subsoils and a pH of 6.0-8.0. In the Vidarbha region, mandarins are a key cash crop (Anavrat, 2015), with Amravati being the largest mandarin-growing district, covering 70,589.40 hectares (Tayade et al., 2024).

Training is a structured approach to enhancing individuals' knowledge and skills to boost their performance (Khan et al., 2021). Training Need Assessment (TNA) is a method used to determine the necessary educational programs or activities that should be provided to employees to improve work productivity (Singh et al., 2011). Assessing training requirements and evaluating training outcomes are essential for both trainers and participants to ensure effectiveness and the efficient use of resources (Patel et al., 2012). It also helps improve the professional skills needed to perform organizational tasks efficiently (Singh et al., 2016). Farmers' knowledge of mandarin production is key to agricultural productivity and sustainability. This study aims to evaluate the training requirements of mandarin farmers by finding gaps in their understanding of recommended growing methods (Issa et al., 2021). The results will reveal shortcomings in farmer training in the study area and inform the creation of

new programs. These initiatives seek to improve mandarin production systems, encourage sustainable farming, and boost mandarin farmers' economic prosperity.

OBJECTIVE

To study the training needs of mandarin growers about recommended cultivation practices of mandarin

METHODOLOGY

The study was conducted in the Amravati district of Maharashtra, focusing on two talukas, Achalpur and Anjangaon Surji, known for their substantial mandarin cultivation. Twelve villages involved in mandarin farming were randomly selected from these talukas. In each village, ten mandarin growers were intentionally chosen, resulting in a total sample size of 120 participants. This approach ensured a representative understanding of the mandarin farming practices within the region.

Training need is defined as the gap between the current knowledge and the desired knowledge level of trainees on a particular subject (Rejula, 2022). In this context, it is operationally defined as the identified difference between the knowledge that mandarin growers ought to have regarding recommended cultivation practices and their actual knowledge. The assessment of training needs was conducted through a structured knowledge test. Initially, respondents were queried about their familiarity with the recommended cultivation practices, as validated by citrus experts, utilizing a structured interview format. The knowledge gap for each respondent was calculated for each practice individually to pinpoint their specific training needs. To quantify these needs, a training need quotient was computed by measuring the discrepancy between the required (ideal) and existing (actual) knowledge. The raw training need scores were then transformed into a Training Need Index (TNI). This TNI was determined by dividing the total score achieved by the maximum possible score and multiplying the outcome by 100 (Bhise, 2011).

$$TNI = \frac{\text{Total Obtained Score}}{\text{“Maximum Obtainable Score”}} \times 100$$

Factors pertinent to the study were selected through an extensive literature review, complemented by consultations with experts. A structured questionnaire was developed using appropriate scales to measure the relevant factors as independent variables, which underwent a pre-testing phase followed by modifications to enhance its suitability for the target sample. Correlation analysis was performed to elucidate the existence of associations or relationships of those selected factors with the training needs,

followed by multiple linear regression analysis to assess the relative contributions of the selected factors along with their cumulative impact on training needs. The entire study was framed within an exploratory research design.

RESULTS AND DISCUSSION

The data represented in the table-1 express about the perception of training needs with respect to cultivation practices undertaken by the mandarin growers. Since 90 per cent of the respondents were unaware of twig blight management, it was noted. Then the following practices of receiving highest percentages as per the importance of training needs were found to be as ‘controlling the fungal fruit drop’ (85.00 %), ‘rejuvenation of Phytophthora-infested trees’ (76.67%), ‘thinning of fruits’ followed by ‘double-ring irrigation method’ (74.16%). So, these practices could be regarded as important ones to be considered for training as perceived by the respondents and so on the training need for other practices can be answered on a priority basis of the same importance accordingly.

Table 1: Distribution of the respondents according to their training need of recommended cultivation practices of mandarin crop (n=120)

Sr. No.	Recommended cultivation practices	Frequency	Percent
1	Selection of Planting Material		
a	Choice of Rootstock (Jumberi/ Rangpur lime)	30	25.00
b	Size of planting material	20	16.66
c	Disease & Pest free	32	26.67
2	Planting of Orchard		
a	Digging of pit (1m×1m×1m)	10	8.33
b	Optimum plant spacing (6m×6m)	13	10.83
3	Nutrition Management		
a	Macro nutrient	06	5.00
b	Micro nutrient	23	19.16
4	Use of Fertiligation	46	38.34
5	Integrated Nutrient Management (INM) & Use of Bio-fertilizers	74	61.67
6	Organic nutrients management (Azotobactor/ Azospirillum/ PSB/ Trichoderma/ Pseudomonas/ Azadirachtin)	41	34.16
7	Use of Growth Regulators (NAA, GA, 2,4-D, Ethylene, Aminoacids like N-ATCA, Folic acid, Brassinoliti)	21	17.50

Sr. No.	Recommended cultivation practices	Frequency	Percent
8	Method of preparation & time of application of Bordeaux paste	26	21.67
9	Methods of Irrigation		
a	Double Ring method	89	74.16
b	Micro irrigation	09	7.50
10	HDP (High Density Planting)	37	30.83
11	Use of Mulches		
a	Grass Mulching	35	29.16
b	Polythene Mulching	57	47.50
12	Production of optimum no. of fruits per plant as per recommendation for better quality	48	38.34
13	Choice of Bahar		
a	Ambie bahar	00	00.00
b	Mrig bahar	07	5.83
14	Control of fruit drop	84	70.00
15	Rejuvenation of old & senile orchard	21	17.50
16	Rejuvenation of Phytophthora infested trees	92	76.67
17	Measures to control Citrus Psylla (Spraying the plant with Phosphomidon @ 0.025% & Parathion @ 0.05%)	81	70.00
18	Measures to control pathological fruit drop		
a	Fungal fruit drop	102	85.00
b	Bacterial fruit drop	86	71.66
19	Pruning: Removal of dead woods	06	05.00
20	Thinning of Fruits	91	75.83
21	Measures to control fruit fly	20	16.67
22	Measures to control leaf minor	74	61.67
23	Measures to control mites	65	54.16
24	Measures to control Gummosis, Root rot & Foot rot	76	63.34
25	Measures to control Twig blight	108	90.00

An overwhelming requirement for training in 'managing twig blight' as a critical area of concern. Since crop loss due to twig blight has been minimal, fewer training programs have been organized for it in recent years. The next important issue found to be the controlling of fungal fruit drop since it has been causing the significant loss in the mandarin produce. Training programs should focus on the identification of causal pathogens, environmental conditions that favour

disease development, and effective management strategies. Topics such as orchard hygiene, proper irrigation management, and timely fungicidal applications should be included to equip growers with practical solutions. Furthermore, the role of resistant varieties and organic treatment methods should be explored to promote sustainable disease management. Since soil-borne disease is major constraint in mandarin crops, this indicates the necessity for training on the rejuvenation of Phytophthora-infested trees. Training initiatives should educate growers on recognizing early symptoms, including root rot and canopy decline, and the importance of adopting preventive measures such as improving drainage and soil aeration. The use of resistant rootstocks, bio-control agents, and chemical treatments should be demonstrated in training sessions. Additionally, emphasis should be placed on orchard sanitation and crop rotation practices to minimize disease recurrence. Training programmes should also address the issue regarding the thinning practices since it is implemented at the cost of reducing crop load which helps in optimizing fruit size and improve the fruit color, shape and quality, thus aiding in maintaining tree growth and structure with maximizing crop value and promoting early blooming (Shafqat et al., 2023). A need for training in the double ring irrigation method, this figure may not necessarily reflect a complete lack of knowledge but rather a desire to optimize irrigation efficiency. Training programs should not only cover the mechanics and benefits of the double ring irrigation system but also introduce alternative water-saving techniques such as drip irrigation and mulching. Proper scheduling and water management strategies should be highlighted to ensure the sustainable use of water resources in mandarin orchards.

Citrus growers exhibit varying degrees of training needs, highlighting the necessity for tailored educational interventions. The majority of respondents demonstrate a moderate need for training, suggesting that while they possess some knowledge of citrus cultivation, significant gaps exist. Targeted training programs should address these gaps by encompassing a wide array of topics, such as integrated pest management, nutrient management, irrigation techniques, and disease control. Workshops and practical demonstrations can effectively enhance the practical skills of this group (Naruka et al., 2016). A smaller segment of respondents indicated low training needs, implying a solid understanding of current citrus cultivation practices. These individuals could benefit from specialized sessions focusing on advanced techniques or emerging trends like precision agriculture or organic farming. Networking opportunities with experts can also foster innovation and provide valuable insights. Conversely, a small portion reported high training needs, suggesting considerable challenges or a lack of essential knowledge. Immediate and intensive training sessions are

necessary to address these specific gaps and improve overall cultivation practices. These findings are nearly similar to results of Pujari (2016) and Gawai (2020); Abhishe et al. (2023); Asiwai et al. (2023); Ansari and Bose (2023); Bhat et al. (2022); Mahammad et al. (2021).

Extent of overall training need

The results of table 2 depicts about distribution of respondents according to their extent of overall training needs about all the recommended practice. Around three-fourth (77.50%) of the respondents reported to express their training need to be in moderate extent followed by lower (12.50%) and higher (10.00%) extent. The findings suggest that the overall training needs of the surveyed respondents are at a low-to-moderate level. This indicates a significant opportunity for improvement through targeted interventions aimed at addressing the specific requirements of mandarin growers in the region, thereby enhancing their cultivation practices and outcomes.

Table 2: Distribution of respondents according to their overall training need level about all recommended cultivation practices (n=120)

Sr. No.	Training need level	Respondent	
		Frequency	Percent
1	Low (Upto 33.33)	15	12.50
2	Medium (33.34 to 66.66)	93	77.50
3	High (Above 66.66)	12	10.00

The training needs of mandarin growers are inversely related to factors such as age, education, income, and prior training experience. Younger, less-educated, and lower-income farmers require more training, as do those with less prior exposure to agricultural training (Victor et al., 2017; Mazhar et al., 2022; Wonde et al., 2022). Conversely, experience, extension contact, social participation, economic motivation, market orientation, and risk-taking show a direct relationship with training needs. Experienced farmers recognize knowledge gaps, while extension services enhance access to technological advancements (Ahmed et al., 2024; Sarnaik et al., 2020). Additionally, risk-oriented farmers require training to adopt efficient practices confidently (Sharma & Gupta, 2023). Aligning training programs with these factors ensures effective capacity building and improved agricultural productivity.

Endowment of factors towards the training needs of mandarin growers

Multiple regression analysis was performed to assess the relative contribution of all the variables as factors to the training need of the mandarin growers. A regression equation was fit into the context where the calculated index values of the extent of training need of all the participants as dependent variable whereas the selected factors taken up as independent variables.

Table 3: Correlation coefficients of selected characteristics of the respondents with their training needs (n=120)

Sr. No.	Variable	'r' value
X ₁	Age	-0.209*
X ₂	Education	-0.185*
X ₃	Land holding	0.076 ^{NS}
X ₄	Farming Experience	0.211*
X ₅	Area under mandarin cultivation	0.101 ^{NS}
X ₆	Irrigation facility	-0.056 ^{NS}
X ₇	Annual income	-0.325**
X ₈	Training received	-0.281**
X ₉	Extension contacts	-0.235**
X ₁₀	Social participation	0.627**
X ₁₁	Risk orientation	0.229*
X ₁₂	Market orientation	0.203*
X ₁₃	Economic motivation	0.257**
X ₁₄	Innovativeness	0.066 ^{NS}

* - Significant at 0.05 level of probability ** - Significant at 0.01 level of probability

^{NS} – Non-significant

In Table 3 data related to factors affecting effectiveness of training has been presented. The R² value of 0.5732 concurs to the point that all the selected variables accounted for 57.32 per cent of variation caused in the levels of training need of the respondents. A few of those variables comprising the likes of 'age', 'training received', 'extension contact' and 'risk orientation' have managed to be the significant contributors in causing the variation in the levels of training need as dependent variable.

Table 4 Contribution of independent variables towards the extent of training need of respondents (n=120)

Sr. No.	Variable	Regression coefficient (b)	Standard error	t-value
X ₁	Age	2.427	1.015	2.391*
X ₂	Education	47.914	33.46	1.432 ^{NS}
X ₃	Land holding	0.504	2.358	0.214 ^{NS}
X ₄	Farming Experience	-5.546	4.904	-1.131 ^{NS}
X ₅	Area under mandarin cultivation	484.270	244.211	1.983 ^{NS}
X ₆	Irrigation facility	21.938	23.413	-0.937 ^{NS}
X ₇	Annual income	0.0517	0.623	0.823 ^{NS}
X ₈	Training received	301.380	144.547	2.085*
X ₉	Extension contact	173.339	61.381	2.824**
X ₁₀	Social participation	2.052	5.316	-0.386 ^{NS}
X ₁₁	Risk orientation	1504.541	412.316	3.649**
X ₁₂	Market orientation	24.245	167.213	0.145 ^{NS}
X ₁₃	Economic motivation	25.217	43.328	-0.582 ^{NS}
X ₁₄	Innovativeness	1.154	5.887	-0.196 ^{NS}

R²= 0.5732^{NS} – Non-significant

* - Significant at 0.05 level of probability ** - Significant at 0.01 level of probability

Age significantly influences farmers' training needs, with younger farmers requiring more training to bridge knowledge gaps and adopt modern techniques. Older farmers, leveraging experience and traditional knowledge, often have lower training demands. However, they may still need training to integrate new technologies, enhancing productivity and adapting to evolving agricultural practices. Training received by farmers significantly influences their future training needs. Those who have undergone prior training often require less additional training, as they acquire essential knowledge and skills. However, exposure to training may also increase awareness of advanced techniques, prompting further learning needs (Wonde et al., 2022). Extension contact significantly influences farmers' training needs by providing access to updated agricultural knowledge, innovative techniques, and problem-solving support. Farmers with frequent extension interactions often have lower training needs due to continuous learning opportunities. However, increased exposure may also create awareness of advanced practices, generating further training demand. Risk orientation impacts farmers' training needs. Risk-taking farmers pursue training for innovative techniques and uncertainty mitigation while risk-averse farmers need training to build confidence in new methods and informed decisions.

CONCLUSION

This study offers an in-depth evaluation of the training needs of mandarin growers regarding recommended cultivation practices, identifying key factors that influence these needs and highlighting areas requiring targeted educational support. Correlation analysis reveals that demographic, socio-economic, and experiential factors

significantly shape farmers' demand for training. Younger, educated, financially stable farmers with prior training and frequent extension contact tend to have lower training needs. However, experienced and socially active farmers recognize gaps in their knowledge, particularly in integrated pest management, irrigation, and nutrient management. The findings emphasize the importance of a customized approach to agricultural extension services. Although agricultural universities and Krishi Vigyan Kendras (KVKs) have organized effective training programs in Amravati district, some remote areas remain underserved. A uniform training strategy is inadequate; instead, specialized interventions are necessary. Future research should assess the effectiveness of various training methodologies and their long-term impact on adopting recommended cultivation practices.

CONFLICT OF INTEREST

All authors declare that they have no conflict of interest.

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