

KNOWLEDGE OF KINNOW GROWERS ABOUT IMPROVED KINNOW PRODUCTION TECHNOLOGY UNDER NATIONAL HORTICULTURE MISSION

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ABSTRACT

Horticulture sector is known as second revolution of agriculture which plays an important role in enhancing the socio-economic status of farmers by increasing their income, contributing to the complete eradication of poverty and increasing nutritional security. Due to the availability of all suitable agro-climatic conditions in India, citrus cover a large area & production. Among citrus crops, Kinnow occupies a distinctive place in horticulture. Recognizing the enormous importance of horticulture in Indian agriculture, the Government of India launched the National Horticulture Mission (NHM) in 2005-06 with objective to promote the complete and holistic development of the horticulture sector with the help of research, technology promotion, extension and post-harvest technology. Therefore, the present study was carried to measure the knowledge of the farmers pertaining to improved kinnow production technology under NHM. The present investigation was conducted in Sriganganagar district of Rajasthan state which was selected purposely. There were nine Panchayat Samitis in Sri Ganganagar district. Out of these; three Panchayat Samitis namely SriGanganagar, SriKaranpur and Padampur were purposely selected on the basis of highest area and production of kinnow. The proportionate random sampling method was used to select the beneficiary respondents and same numbers of respondents who were not benefitted under NHM were also selected randomly and they were called as non-beneficiary respondents. Thus, total 180 respondents i.e. 90 beneficiary and 90 non-beneficiary respondents were taken from selected Panchayat Samitis. The results of the present investigation revealed that majority of the kinnow growers had middle level of knowledge about improved kinnow production technology. The highest knowledge was on the aspect of "general information" and least knowledge was about "plant material". There was a significant association observed amongst education, occupation, mass media exposure and extension agency contact with knowledge level of the kinnow growers about improved kinnow production technology under NHM.

Keywords: knowledge, kinnow growers, improved kinnow production technology and national horticulture mission

INTRODUCTION

India, a South Asian nation, is the seventh largest country by area, the second most populated country with approximately 1.38 billion populace, and the most populous democracy in the world (Anonymous, 2021_a). In this country, agriculture is a prime source of subsistence. Currently among all the agricultural sectors, horticulture is one of the most developed and progressively growing sectors in India. According to the Business Standards, 2021, the production of horticulture crops increases over the previous year and it was recorded at 326.6 million tons as per the first advance estimates (Anonymous, 2021_b). India is one of the leading fruit and vegetable producing countries in the world.

Fruits are naturally good and they contain vitamins and minerals that can help in keeping healthy and also protect humans from diseases. Fruit cultivation enables farmers to reap many benefits like high profit, use of raw materials in agro-based industry for income generation, utilization of barren land in production of fruit crops, nutritional benefits and many others. Major fruit crops like mango, banana, citrus, apple, guava, grape, papaya, pineapple, sapota, litchi, Ber, pomegranate, jackfruit and strawberry are grown in India. According to National Horticulture Database of Second Advanced Estimates published by the National Horticulture Board during 2019-20, India produced 99.07 million metric tons of fruits and area stood at 6.66 million hectares in fruit cultivation (Anonymous, 2019-20). Among

the citrus fruits, Kinnow is successfully grown in the major states of India namely Haryana, Punjab, Uttar Pradesh and Himanchal Pradesh. According to Second Advanced Estimates, the area of kinnow in India is 4.79 lakh hectares and the production is 63.97 lakh tons (Anonymous, 2020). Recognizing the enormous importance of horticulture in stimulating the growth of Indian agriculture, the Government of India launched the National Horticulture Mission in 2005-06 for the growth and development of this sector. The state of Rajasthan had great potential for National Horticulture Mission and Sri Ganganagar district of Rajasthan had a lot of area and production under kinnow cultivation. Sri Ganganagar district is well known for kinnow cultivation because of suitable agro-climatic conditions. Kinnow has successfully replaced the traditional citrus fruits such as sweet orange and local mandarin. Despite having good area and production in kinnow cultivation in Sri Ganganagar, there are some problems faced by the kinnow growers with respect to kinnow cultivation which reduces its productivity. The problems are large number of unproductive orchards, poor orchards management, severe insect-pest infestation, high post-harvest losses, expensive drip installation, lack of machinery and equipments etc. This may be due to lack of awareness about better practices at the farm level. Through improved technology such as establishment of kinnow orchards, technical management of plant protection measures, nutrient management & post-harvest technology and improved production practices, farmers can increase their production at low cost inputs. The National Horticulture Mission has been successful in capturing a large area devoted to kinnow cultivation in the district. Hence, there is a need to create more possibilities for kinnow cultivation, so that the income and production of kinnow growers can be increased. Keeping in view the importance of kinnow cultivation, National Horticulture Mission (NHM) has paid great attention to the development of kinnow cultivation in Sri Ganganagar district of Rajasthan state. So that along with quantity of the kinnow crop, the quality can also be ensured.

OBJECTIVE

To measure the knowledge level of kinnow growers about improved kinnow production technology under National Horticulture Mission

METHODOLOGY

The present study was carried out in Sri Ganganagar region of Rajasthan state, which was selected purposely on the basis of highest area and production of kinnow. Sri Ganganagar region comprises two districts viz. Sri Ganganagar and Hanumangarh. Out of these two districts, Sri Ganganagar district was purposely selected for the present

investigation because of the highest area and production under kinnow cultivation as compared to Hanumangarh district. Three *Panchayat Samitis* namely Sriganganagar, Sri Karanpur and Padampur were also selected purposely on the basis of highest area and production of kinnow in comparison to other kinnow growing panchayat samitis of Sri Ganganagar district. In order to select the respondents, a comprehensive *Panchayat Samiti*-wise list of kinnow growers who were benefitted under NHM was procured from the Department of Horticulture, Sriganganagar, Rajasthan. The proportionate random sampling method was used to constitute the respondents of the study who were benefitted under NHM and they were called as beneficiary respondents. To form the other half of the sample size, same number of kinnow growers who were not benefitted under NHM were also selected randomly from the same *Panchayat Samitis* and they were designated as non-beneficiary respondents. Thus, a total of 180 respondents constituting 90 beneficiary as well as 90 non-beneficiary respondents were selected from the selected *Panchayat Samitis*. Here, the total sample size from selected panchayat samitis was 180 respondents. An interview schedule was prepared for collection of data from the respondents. The pre-testing of the interview schedule was conducted with the help of 25 non-sampled respondents who were not included in the study. The personal interview method was used for the collection of the data. The data were analysed critically with the help of different statistical tools like frequency, percentage, standard deviation, arithmetic mean, mean percent score, 't' test, 'Z' test and spearman's rank correlation (r_s).

RESULTS AND DISCUSSION

Knowledge is described as a theoretical and practical understanding, as well as individual's behaviour and test situations that emphasizes the remembering ideas, material or phenomena either through reorganization and recall. Keeping this in mind, an endeavor was made to examine the knowledge level of beneficiary and non-beneficiary kinnow growers regarding improved kinnow production technology under National Horticulture Mission. In order to examine the knowledge level of kinnow growers', four aspects *i.e.* general information, plant material, fund management and advantages of National Horticulture Mission were included in the knowledge test. On the basis of mean (48.17) and standard deviation (10.21), kinnow growers were classified into three categories. The data related to the knowledge level of kinnow farmers regarding improved kinnow production technology under NHM are presented in the Table 1.

Table 1: Distribution of kinnow growers according to their knowledge level about improved kinnow production technology under NHM

Sr. No.	Categories	Beneficiary respondents (n=90)		Non-beneficiary respondents (n=90)		Overall respondents (n=180)	
		F	%	F	%	F	%
1	Low (<37.96 Score)	04	04.44	39	43.33	43	23.89
2	Medium (37.9 to 58.38 Score)	52	57.78	45	50.00	97	53.89
3	High (>58.38 Score)	34	37.78	06	06.67	40	22.22

Mean: 48.17

S.D: 10.21

The data depicted in the Table 1 illustrates out that more than fifty-seven per cent of beneficiary 57.78 per cent kinnow growers had middle level of knowledge about improved kinnow production technology, followed by high 37.78 per cent and low 04.44 per cent, respectively. In case of non-beneficiary kinnow growers, half of the kinnow growers 50.00 per cent had medium level of knowledge regarding improved kinnow production technology, followed by low 43.33 per cent and high 06.67 per cent, respectively. The data presented in Table 1 also indicates that 53.89 per cent of the overall kinnow growers acquired medium level of knowledge, followed by low 23.89 per cent and high 22.22 per cent level of knowledge, respectively. Thus, comparative concerning to the beneficiary and non-beneficiary kinnow growers clearly unveil that there was high level of knowledge among beneficiary kinnow growers. That means there had been positive change in the farmer's knowledge after obtaining the advantages of improved kinnow production technology under National Horticulture Mission. The findings are supported by the findings of Kadu (2016), Damor *et al.* (2017), Jain (2019), Kungumaselvan *et al.* (2020), Chaudhary *et al.* (2024), Patel

et al. (2024), Chaudhary *et al.* (2024) and Pokar *et al.* (2023) who found that most of the farmers had medium level of knowledge regarding orange cultivation and recommended practices of horticultural crops.

Furthermore, the various aspect-wise knowledge level of improved kinnow production technology under NHM of beneficiary and non-beneficiary kinnow growers was also measured separately. The relative importance of each of the four knowledge aspects *viz.* general information, plant material, fund management and advantages of National Horticulture Mission was illuminated by ranking them in descending order on the basis of their Mean Percent Score (MPS) of knowledge level. The data have been presented in the Table 2. The data in the Table 2 indicates that beneficiary kinnow growers' possessed highest knowledge regarding general information (61.30 MPS) as this aspect was ranked first. Information regarding fund management (51.69 MPS) was ranked second by the beneficiary respondents, followed by advantages of National Horticulture Mission (35.81 MPS) and plant material (14.91 MPS) which were ranked third & fourth, respectively.

Table 2: Aspect-wise knowledge level of kinnow growers about improved kinnow production technology under NHM

Sr. No.	Knowledge aspects	Beneficiary respondents (n=90)		Non-beneficiary respondents (n=90)		Overall respondents (n =180)	
		MPS	Rank	MPS	Rank	MPS	Rank
1	General information	61.30	I	47.44	I	54.47	I
2	Plant material	14.91	IV	10.93	III	12.92	IV
3	Fund management	51.69	II	04.31	IV	27.00	III
4	Advantages of National Horticulture Mission	35.81	III	24.06	II	29.93	II
5	Pooled	40.92		21.68		31.08	

 r_s = Rank Correlation $r_s = 0.41$

MPS = Mean Percent Score

 $t = 0.62^{NS}$

NS= Non-Significant

The data in Table 2 also explicates that the non-beneficiary kinnow growers had optimal level of knowledge regarding general information with 47.44 MPS. The non-beneficiary kinnow growers had comparatively less knowledge

regarding advantages of National Horticulture Mission (24.06 MPS), plant material (10.93 MPS) and fund management (04.31 MPS). If we take a look at the Table 2 irrespective of beneficiary and non-beneficiary kinnow growers, data clearly

shows that overall kinnow growers had good knowledge about general information with 54.47 MPS, followed by advantages of National Horticulture Mission (29.93 MPS) and fund management (27.00 MPS), respectively. The overall kinnow growers had least knowledge about plant material with 12.92 MPS.

An effort was also made to determine the relationship between the ranks assigned by beneficiary and non-beneficiary kinnow growers by applying the rank correlation test. The value of rank correlation (r_s) was 0.41 which shows positive correlation. The significance of r_s was tested by 't' test and it was observed that calculated 't' value *i.e.* 0.62 was lower than its tabulated value thus it was found non-significant. There was similarity in the rank assignment pattern of knowledge gained by the beneficiary and non-beneficiary kinnow growers about improved kinnow production technology under NHM, though there was difference in magnitude of mean percent score of beneficiary and non-beneficiary farmers. The findings are supported by the findings of Balakrishna (2016) who reported that beneficiary farmers enhanced their fruit production after obtaining the benefits of National Horticulture Mission. The findings are contradictory with the findings of Ghadge (2016) who observed that orange growers had high level of knowledge regarding plant material in orange cultivation.

The data related to the level of knowledge of beneficiary and non-beneficiary kinnow growers presented in the Table 3 also depicts that calculated 'Z' value was higher than the tabulated value in all the four aspects such as general information, plant material, fund management and

advantages of National Horticulture Mission which showed significant association at one per cent level of significance. This shows that there was a significant difference in level of knowledge of beneficiary and non-beneficiary kinnow growers in all four aspects regarding improved kinnow production technology under National Horticulture Mission. It means that beneficiary farmers possessed more level of knowledge as compared to non-beneficiary kinnow growers in the above mentioned four aspects of improved kinnow production technology under National Horticulture Mission. The high knowledge level among the beneficiary kinnow growers in comparison to the non-beneficiary kinnow growers might be due to the reason that beneficiary kinnow growers were aware about the information sources and had strong extension networks with agricultural universities and state agriculture department. Also, the beneficiary kinnow growers had active participation in various extension activities *viz.* trainings regarding seed and pest management organized by State Department of Agriculture with the support of state agricultural universities which helped them in getting more technical know-how related to improved kinnow production technology under National Horticulture Mission. The beneficiary kinnow growers used this technical knowledge on improved practices at the farm which ultimately led to the increase in production. The trainings were not imparted to the non-beneficiary kinnow growers and thus got deprived of necessary guidance and technical knowledge regarding improved kinnow production technology under National Horticulture Mission. This might have resulted in high level of knowledge of beneficiary farmers than that of the non-beneficiary farmers.

Table 3: Aspect-wise comparison of knowledge level of respondents regarding improved kinnow production technology under NHM (n=180)

Sr. No.	Knowledge aspects	Beneficiary respondents (n=90)		Non-beneficiary respondents (n=90)		'Z' Value
		Mean	SD	Mean	SD	
1	General information	40.54	03.02	31.34	03.80	35.66**
2	Plant material	06.40	01.17	04.72	01.59	42.77**
3	Fund management	08.28	00.95	00.70	00.89	42.15**
4	Advantages of National Horticulture Mission	03.24	00.87	02.20	01.12	52.53**
5	Pooled	14.61	01.50	09.74	01.85	43.27**

**=Significant at 0.01 level of probability

SD=Standard deviation

The findings are in line with the findings of Ramesh *et al.* (2017) and Dhruw (2018) who reported that there had been a significant difference found between knowledge level of beneficiary and non-beneficiary farmers' regarding various aspects of National Horticulture Mission. Raghuraja *et al.* (2019) also concluded that there had been a positive impact of National Horticulture Mission on the living standards of

beneficiary farmers.

Association between the knowledge level of beneficiary and non-beneficiary farmers of NHM with selected independent variables

In order to find-out the association between selected personal characteristics (independent variables)

with knowledge level of kinnow growers about improved kinnow production technology under National Horticulture Mission, correlation analysis and multiple liner regression analysis were done. Correlation analysis (r) determines the degree of relationship between dependent and independent variables. On the contrary, the partial regression coefficient (b) determines the degree of prediction of dependent variable from independent variables.

Correlation analysis between independent variables with knowledge of kinnow growers regarding improved kinnow production technology under national horticulture mission

As per the correlation coefficient (r) analysis, the data conferred in the Table 4 showed that correlation association of dependent variable which is knowledge on twelve antecedent variables concerning to the kinnow growers. Through correlation coefficient, data were critically examined to work with the separates as well as combined relative effect of the selected independent variables on the knowledge level of kinnow growers regarding improved kinnow production technology under National Horticulture Mission. All the twelve selected independent variables such as age, caste, education, social participation, annual income, occupation, land holding, source of irrigation, mass media exposure, extension agency contact, information seeking and information sharing behaviour used with knowledge level of kinnow growers in correlation coefficient equation. The findings had been presented in Table 4.

The r-values in Table 4 shows that education (0.301**), occupation (0.423**), mass media exposure (0.459**) and extension agency contact (0.289**) of beneficiary kinnow growers were positively related with knowledge level of kinnow growers about improved kinnow production technology under National Horticulture Mission and association was found significant at one per cent level of significance. On the other side, annual income (0.248*) was found significant at five per cent level of significance. Other variables such as age, social participation, land holding, caste, and source of irrigation, information seeking and information sharing behaviour showed non-significant relationship with knowledge level of beneficiary kinnow growers concerning improved kinnow production technology under National Horticulture Mission.

Similarly, education (0.225*), occupation (0.229*), annual income (0.210*), mass media exposure (0.228*) and extension agency contact (0.227*) of non-beneficiary kinnow growers were positively related to the knowledge of kinnow growers regarding improved kinnow production technology under National Horticulture Mission and association was significant at five per cent level of significance. The r-values of age, social participation, caste, source of irrigation, land holding, information seeking behaviour and information sharing behaviour of non-beneficiary kinnow growers showed non-significant relationship with knowledge of kinnow growers regarding improved kinnow production technology under National Horticulture Mission.

Table 4: Correlation analysis between independent variables with knowledge of kinnow growers about improved kinnow production technology under NHM

Sr. No.	Variables	Correlation coefficient (r)		
		Beneficiary respondents (n=90)	Non-beneficiary respondents (n =90)	Pooled (n =180)
A	Socio-personal Variables			
X ₁	Age	0.108 ^{NS}	0.122 ^{NS}	0.113 ^{NS}
X ₂	Caste	0.098 ^{NS}	0.120 ^{NS}	0.102 ^{NS}
X ₃	Education	0.301**	0.225*	0.270**
X ₄	Social Participation	0.136 ^{NS}	0.137 ^{NS}	0.133 ^{NS}
B	Socio-economic Variables			
X ₅	Occupation	0.423**	0.229*	0.352**
X ₆	Annual Income	0.248*	0.210*	0.180*
X ₇	Land Holding	0.156 ^{NS}	0.128 ^{NS}	0.137 ^{NS}
X ₈	Source of Irrigation	0.103 ^{NS}	0.112 ^{NS}	0.102 ^{NS}
C	Communication Pattern			
X ₉	Mass Media Exposure	0.459**	0.228*	0.361**
X ₁₀	Information Seeking Behavior	0.179 ^{NS}	0.171 ^{NS}	0.137 ^{NS}
X ₁₁	Information Sharing Behavior	0.167 ^{NS}	0.153 ^{NS}	0.121 ^{NS}
X ₁₂	Extension Agency Contact	0.289**	0.227*	0.236**

** =Significant at 0.01 level of probability

*= Significance at 0.05 level of probability

NS= Non-Significant

Further analysis of Table 4 to know the association between independent variables with knowledge of overall kinnow growers regarding improved kinnow production technology under National Horticulture Mission indicated that education (0.270**), occupation (0.352**), mass media exposure (0.361**) and extension agency contact (0.236**) were found positively related with the knowledge of overall kinnow growers regarding improved kinnow production technology under National Horticulture Mission and the significant association was found at one per cent level of significance. Whereas, annual income (0.180*) was found significant at five per cent level of significance. The findings are in conformity with the findings of Kumar (2012) and Tala *et al.* (2020) who reported that mass media exposure/participation and extension agency contact were found positively and significantly associated with the knowledge of farmers regarding kinnow cultivation & mango production technology. Jayasankar *et al.* (2020) also concluded that age was found non-significant and mass media exposure had significant association with knowledge level of grape growers regarding grape cultivation. The findings are contradictory with the findings of Shivaji (2017) who reported that land holding and social participation were found significantly

associated with the knowledge level of farmers regarding sweet orange cultivation practices.

Regression analysis between socio-personal, socio-economic, communication pattern characteristics with knowledge level of kinnow growers about improved kinnow production technology under NHM

By the help of multiple regression analysis, the data showed in Table 5 reveals the regression relationship of dependent variable such as knowledge on 12 independent variables (selected characteristics) concerning to the kinnow growers. With the help of multiple regression analysis, data were critically examined to work with separate as well as integrated relative effect of selected independent variables on the knowledge level of the kinnow growers regarding improved kinnow production technology under NHM. All the selected independent variables *viz.* age, education, caste, occupation, land holding, annual income, source of irrigation, mass media exposure, social participation, extension agency contact, information seeking behaviour and information sharing behaviour linked with the knowledge of the kinnow growers in multiple regression equation.

Table 5: Regression analysis between socio-personal, socio-economic, and communication pattern characteristics with knowledge level of kinnow growers about improved kinnow production technology under NHM

Sr. No.	Variables	Beneficiary respondents (n=90)			Non-beneficiary respondents (n=90)			Pooled (n=180)		
		b value	Standard error	t value	b value	Standard error	t value	b value	Standard error	t value
A	Socio-Personal Variables									
X ₁	Age	0.087	0.220	0.314 ^{NS}	0.338	0.227	1.321 ^{NS}	0.183	0.204	0.895 ^{NS}
X ₂	Caste	1.457	0.983	1.421 ^{NS}	0.917	0.739	1.204 ^{NS}	1.305	0.892	1.363 ^{NS}
X ₃	Education	4.369	0.986	4.361**	2.867	1.368	2.075*	3.931	0.728	5.299**
X ₄	Social participation	0.521	0.348	1.397 ^{NS}	0.730	0.720	1.012 ^{NS}	0.698	0.509	1.271 ^{NS}
B	Socio-Economic Variables									
X ₅	Occupation	3.658	0.982	3.623**	1.877	0.909	2.039*	2.979	0.693	4.128**
X ₆	Annual income	2.531	1.202	2.002*	0.662	0.428	1.992*	1.774	0.821	2.137*
X ₇	Land holding	0.923	0.761	1.280 ^{NS}	0.326	0.298	1.049 ^{NS}	0.635	0.429	1.420 ^{NS}
X ₈	Source of irrigation	0.753	0.533	1.361 ^{NS}	0.500	0.434	1.131 ^{NS}	0.569	0.353	1.611 ^{NS}
C	Communication Pattern									
X ₉	Mass media exposure	0.847	0.239	3.502**	0.735	0.334	2.210*	0.788	0.291	2.717**
X ₁₀	Information seeking behaviour	1.223	0.781	1.465 ^{NS}	0.398	0.268	1.475 ^{NS}	1.271	0.629	1.744 ^{NS}
X ₁₁	Information sharing behaviour	0.987	0.568	1.673 ^{NS}	0.675	0.428	1.477 ^{NS}	0.784	0.469	1.631 ^{NS}
X ₁₂	Extension agency contact	0.539	0.236	2.283**	0.409	0.190	2.153*	0.469	0.158	2.963**
		R ² =0. 73			R ² = 0.71			R ² =0. 66		

R²= Coefficient of multiple regression

NS= Non Significant

**=Significant at 0.01 level of probability

*=Significant at 0.05 level of probability

The value of coefficient of determination (R^2) in case of beneficiary kinnow growers had been found as 0.73. The value of R^2 showed that 73 per cent of the total variation in the dependent variable (knowledge) was because of the twelve antecedent variables chosen for the undertaken study and the remaining 27 per cent of the variation in knowledge was due to other factors exterior to the periphery of this investigation. Thus, the dependency relationship of knowledge with each and every selected characteristics *i.e.* independent variables was studied with the help of 't' value. In case of beneficiary kinnow growers, the data in Table 5 reveals that knowledge had a positive and significant relation with education (4.361**), occupation (3.623**), mass media exposure (3.502**) and extension agency contact (2.283**) at one per cent level of significance. While, annual income (2.002*) was found significantly associated with knowledge of the beneficiary kinnow growers about improved kinnow production technology at five per cent level of significance. Thus, the regression analysis in Table 5 shows that education, occupation, mass media exposure and extension agency contact were the most important predictors of knowledge level of the beneficiary kinnow growers regarding improved kinnow production technology under NHM. It was also important to note that socio-personal, socio-economic and communication pattern characteristics like age, caste, social participation, source of irrigation, land holding, information seeking and information sharing behaviour did not show any significant contribution to the multiple regression analysis and were non-significantly associated with the knowledge level of beneficiary kinnow growers. This shows that there was no significant association found between knowledge of the beneficiary kinnow growers regarding improved kinnow production technology under NHM with these selected characteristics.

In case of non-beneficiary respondents, the calculated value of coefficient of determination (R^2) was 0.71 which means that 71 per cent of the total variation in the dependent variable was due to twelve independent variables which were chosen for the present investigation; remaining 29 per cent of the total variation in the knowledge level was due to other factors outer to the purview of this investigation. The data in Table 5 reveals that a significant association was found between the knowledge level of non-beneficiary kinnow growers with education (2.075*), occupation (2.039*), annual income (1.992*), mass media exposure (2.210*) and extension agency contact (2.153*) at five per cent level of significance. Therefore, regression analysis indicated that dependent variable which was knowledge level of non-beneficiary kinnow growers was mainly contributed by elements like education, occupation, annual income, mass media exposure and extension agency

contact whereas some other factors like age, caste, land holding, social participation, source of irrigation, information seeking and information sharing behaviour did not show any significant relationship with the knowledge level of non-beneficiary kinnow growers regarding improved kinnow production technology under National Horticulture Mission.

In case of overall kinnow growers, coefficient of determination (R^2) was computed as 0.66 which means sixty-six per cent variations because of these 12 independent variables selected for the present study and remaining 34 per cent variation in the knowledge was due to other outside factors. Table 5 further reveals that there was significant association between the overall kinnow growers knowledge level about improved kinnow production technology with education (5.299**), occupation (4.128**), mass media exposure (2.717**) and extension agency contact (2.963**) at one per cent level of significance. Whereas, annual income (2.137*) was pointed as significant at five per cent level of significance. The variables like age, caste, social participation, source of irrigation, land holding, information seeking behaviour and information sharing behaviour had non-significant relationship with the overall kinnow growers knowledge regarding improved kinnow production technology under National Horticulture Mission. Therefore, from the above conclusions it is discernible that education, occupation, mass media exposure and extension agency contact were the important factors of knowledge level of the beneficiaries, non-beneficiaries and overall kinnow growers. The findings are in line with the findings of Kumar (2015), Sulehri *et al.* (2021) and Jangir *et al.* (2023) who observed that education, extension agency contact and mass media exposure had positive significant association with the knowledge level of farmers regarding citrus cultivation & improved production technology of Ajwain. Kumbhani *et al.* (2023) and Mallappa *et al.* (2023) also reported that a significant positive association was found between occupation and annual income with the knowledge of farmers about crisis & its management practices in crops.

CONCLUSION

Based on the major findings of the investigation, it is concluded that majority of the kinnow growers in the study area had medium level of knowledge about improved kinnow production technology under National Horticulture Mission. They had high knowledge for the aspect of "general information" and minimal knowledge about "plant material". There was significant relationship found between education, occupation, annual income, mass media exposure and extension agency contact with knowledge level of kinnow growers about improved kinnow production technology under National Horticulture Mission. The characteristics

such as age, social participation, caste, land holding, source of irrigation, information seeking behaviour and information sharing behaviour did not show any significant contribution in the multiple regression analysis and were non-significantly associated with the knowledge level of overall kinnow growers. So, in order to convert medium level of knowledge into high level of knowledge, periodical trainings should be organized and imparted to the kinnow growers to acquire more knowledge about new techniques or improved practices of kinnow cultivation. Agricultural fairs like 'Kinnow-Kheti Protsahan Mela' and awareness campaigns like 'Baghani Shivir' should also be organized for the farmers in collaboration with the central government which will attract and motivate them for their active participation in kinnow cultivation. Inputs should be made available to the farmers at subsidized rates with the help of central and state governments.

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CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest.

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