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Farmers Perception about Plant Protection Skills of Field Extension Workers in Enhancing Tomato Production of District Peshawar, Khyber Pakhtunkhwa, Pakistan

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ABSTRACT

This study analyzed farmers' perception about plant protection skills of extension workers in increasing the tomato production of District Peshawar, Khyber Pakhtunkhwa Pakistan. For the present study two villages each were taken purposively from three union councils of Town 2 of District Peshawar for data collection. Well-structured interview schedule was employed for data collection and SPSS V.20 software was used for analysis. Results were presented as simple percentages while Likert scale was used for ranking purpose. Above 40 years tomato growers were 30% where 37% owned 1-2 acres of land and majority (76.9%) tomato growers were literate. About 31% tomato growers were getting Pakistani Rupees 40,000-80,000 per season and maximum (52%) tomato growers were getting production from local varieties of almost 3,001-6,000 kg/acre. Farmers' perceptions about extension workers' familiarity for selection of economical methods for pest control was ranked first with highest mean value 3.1587 with SD 1.15421 and symptoms of insect/ pest infestation disease and their causes identification was ranked 2nd with the mean value of 3.0337 and SD 1.18925, while life stages of tomato insects identification was ranked 3rd with the mean value of 2.6635 and SD 1.20875 and knowledge of adverse environmental effects of pesticides was ranked 4th with lower mean value of 2.5096 and SD 1.34412. Knowledge about biological control of pest was ranked 5th with the lowest mean value of 2.1635 and SD 1.11737. Extension worker plays a significant role in enhancing the production of tomatoes as highly significant association existed between average yield of tomato and skills of extension worker regarding plant protection skills. The study recommends that extension personnel should visit tomato growers regularly at each stage to address their plant protection issues and recommend weather suitability of tomato varieties for higher production by protecting the crop from the damage of insects. Local agriculture programs should be broadcasted on FM channel and pamphlets may be used for creating awareness regarding tomato protection point of view.

1. Introduction

Tomato (*Lycopersicon esculentum*) originated in the premises of Central America and South America. It is the 3rd- largest vegetable grown around the world and ranks after potato and onion in the area and first in processing. Its plants usually reach a height of 1-2 meters (3-6 feet) as per their weak stem (vines) that spreads which requires support while the local varieties reach to a height of 2 feet when fully matured. Uncategorized plants of tomato are permanent or lasting in nature, but they must be planted every year because determinate or bush tomato plants where growth is stopped growing reaching to certain tallness and yield a crop all at once because of minimum sugar content. Tomato is cultivated in the warm season with 25 - 29 °C optimum growing temperature but tomato is grown in winter as well (Govt. of Khyber Pakhtunkhwa, 2020).

Tomato is a fruit as well as a vegetable. It is a vegetable because it is annual and herbaceous; a vegetable will be herbaceous and annual or biannual. Because of very less sugar quantity than culinary fruit tomato is also considered as a culinary vegetable (Tomato Production Guide, 2011). Botanically every ripened ovary that contains seed is a fruit so the tomato is a fruit- a berry consisting of the ovary, together with its seeds, of a flowering plant. Tomato is used in each and every home throughout the year in diversified forms and shapes because of its important position nutritionally in all vegetables. Tomato has the richest source of vitamin A, vitamin C, Riboflavin, Thiamin and Niacin with an excessive amount of mineral salts of iron and lime which is very much important for human health (Buyukbay *et al.*, 2011).

The role of Agriculture extension worker is not only educate and aware the rural community of agriculture for following the suitable pattern of crops by preparing their seed beds for crops along with dissemination and motivation for improving their socio economic status for the prosperous life of rural masses engaged in agriculture. Enhancing the yield of tomato is the responsibility of agriculture Extension workers to educate them in protection of tomato from various insects and diseases. Low production of tomato is due to insect pest attack and various disease and lack of tomato growers' awareness by agricultural extension workers to properly address the particular issues on proper time by advising suitable pesticide for prevention of pests along with proper seeds, reasonable prices of inputs. Nederlof *et al.*, (2004) described that National Research Institute trained Agricultural extension personnel to facilitate the Farmers Field School (FFS) especially in plant protection along with other field work. Many other studies on this aspect in the study area found the lack of communication between agricultural extension workers and rural masses who were involved in agricultural practices. Zafarullah (2003) revealed in his research article that transfer of improved technology was enhanced with the help of Farmers' Interest Group (FIGs) initiated by PATA irrigation project in district Swat sponsored by Netherland Govt. and farming practices patterns were changed and agricultural practices like seed bed preparation (93%), adoption of new varieties (88%) while weed and insect pest control was adopted by 100%. Therefore, the current study was initiated regarding farmers' perception about plant protection skills of extension workers in increasing the tomato production in District Peshawar for recommending and suggesting tomato protection in the future. Furthermore, this research will help planners and policymakers to make better decisions in the future for the enhancement of tomato productivity in the study area. The study was initiated with the objectives: 1. To examine the tomato growers' perception about extension workers' capabilities regarding plant protection skills in the research area. 2. To find out the association of yield of tomato with the plant protection skills of extension agents in the research area.

2. Methods

This study was carried about the farmers' perception about skills of extension workers regarding plant protection measures in enhancing tomato production in district Peshawar. Two villages each were taken purposively from each of the three union council of Town 2 of District Peshawar where majority of the farmers were cultivating tomato. Therefore, making a total of six villages from which a sample of 208 tomato growers were selected out of total population of 1040 tomato growers. The data collected through

interview schedule was analyzed using Statistical Package for Social Sciences (SPSS v.20). The relationship between two variables is subjected to Chi-square test and the association between variables was examined. Likert scale was also used to rank the skills of extension worker in plant protection capabilities. The Chi-Square formula used is listed below:

$$\chi^2 = \sum_{i=1}^r \sum_{j=1}^c \frac{(O_{ij} - e_{ij})^2}{e_{ij}}$$

χ^2 = Chi-square value

O= observed frequency while, e=expected frequency

3. Results and dicussion

3.1 Demographic features of the tomato growers

Important demographic features considered regarding plant protection skills of extension workers from farmers' point of view were household size, land size, literacy status, age, education, family structure, land size, tenancy, and source of income for this research study. These features are extremely beneficial for gathering data and acquiring vital information from respondents. Demographic characteristics always have an influence on other variables, which is why gathering data in these areas is critical. Research studies by [Tologbonse et al. \(2010\)](#), [Khan. \(2012\)](#), [Sanaullah et al., \(2020a\)](#), [Füssel. \(2010\)](#) and [Tol et al. \(2004\)](#) are some examples. The demographic data were obtained and presented in light of the importance of these attributes.

3.1.1 Age of the tomato growers

For getting and realizing new information abilities, age is important element along with solving agricultural and other life problems. More experience will be obtained with increase in age accompanied by loss in physical strength in comparison to the energetic physical condition of young people. Twenty years age is considered best for acceptance of new ideas. Age and adoption relationship is found strong revealed by many researchers ([Afsar & Idrees, 2019](#)). The data regarding age of the tomato growers is shown in Table 1.

Table1. Age of tomato growers

Village Names	Age in Years				
	Below 20	21-30	31-40	Above 40	Total
GariSohbaat Khan	4(2)	6(3)	14(7)	16(7)	40
Mandrakhail	2(1)	14(7)	14(7)	6(3)	36
Maqudabad	4(2)	16(8)	6(3)	10(5)	36
Esaakhail	2(1)	14(7)	10(5)	6(3)	32
Dag Saipun	4(2)	10(5)	8(4)	10(5)	32
TerayBaala	6(3)	2(1)	8(4)	16(8)	32

Total	22(11)	62(30)	60(29)	64(30)	208
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Source: Field data 2021

Table 1 show that 30 % of the respondents in the study area were above 40 years of age, while 11% were below the age of 20 years. Moreover 30% of the tomato farmers were from 21-30 years of age and 29% respondents were between the ages of 31 to 40 years. The data show that maximum farmers involved in tomato farming in the study area were above 40 years. Old people take more time in adopting new technologies while young people are said to be more adopting and embrace new things more rapidly (Agwu *et al.*, 2008). The same is true for new farming technologies. Young farmers quickly absorb and utilize new technologies than elders. According to Zavale *et al.* (2005) older farmers in Mozambique (a republic on the southeastern coast of Africa) are less likely to adopt improved maize variety than younger farmers.

3.1.2 Literacy Status

Education is regarded as the most important pillar in the growth of nations. Literacy rates in all industrialized nations exceed 90%. Illiterates are now seen as paralyzed and unsound individuals. In comparison to illiterate growers, literate growers readily adopt the notion of contemporary techniques (Sanaullah *et al.*, 2020). Education can effect an individual's attitude toward the adoption of improved farming techniques (Tologbonse *et al.*, 2010).

Table 2. Distribution of the Respondents Regarding Literacy Status

Village Names	Literacy Status of the respondents					Total
	Illiterate	Primary	Middle	Matric	Intermediate and above	
Mandrakhail	8(3.8)	8(3.8)	12(5.8)	8(3.8)	4(1.9)	40
Maqudabad	6(2.9)	8(3.8)	14(6.7)	6(2.9)	2(1)	36
Esaakhail	11(5.3)	9(4.3)	8(3.8)	7(3.4)	1(0.5)	36
Dag Saipun	5(2.4)	2(1)	16(7.7)	4(1.9)	5(2.4)	32
TerayBaala	7(3.4)	8(3.8)	7(3.4)	7(3.4)	3(1.4)	32
Mandrakhail	11(5.3)	5(2.4)	12(5.8)	4(1.9)	0(0)	32
Total	48(23.1)	40(19.2)	69(33.2)	36(17.3)	15(7.2)	208

Source: Field data 2021. Note: Values in parenthesis are percentages

Table 2 shows that 23.1% of the respondents in the study area were found illiterate and remaining 76.9% were literate in which 33.2% respondents were educated up to middle, while 7.2% respondents got their education intermediate and above, 17.3% were educated up to matric and 19.2% were educated primarily. These results are consistent with Ahmad (2005) findings that the majority of literate farmers have completed their middle education. According to Ali (1999), more than half of the respondents were literate, and it was discovered that literate farmers and landlords were more open to new techniques, whereas illiterate farmers were hostile to change.

3.2 Response of Tomato growers regarding their Average Yield of Tomato

Commonly grown vegetable of district Peshawar is tomato and considered as the major source of income by the tomato growing community. The data regarding production of Tomato crop is available in Table 3 showing the average yield of tomato crop as per 4 groupings of the tomato growers; i.e. up to 3000, 3001-6000, 6000-9000 and above 9000 kg/acre. The results showed that 52% of them belong to the group of 3001-6000 and only 9% of tomato growers were found in above 9000 kg/acre. About 10.6% of the tomato growers were receiving up to 3000 kg/acre and 28.4% of the tomato growers were those getting 6000-9000 kg/acre.

Table 3. Distribution of respondents regarding average yield of tomato

Villages Names	Average yield of Tomato (Kg/Acre)				Total
	Up to 3000	3001-6000	6000-9000	Above 9000	
Mandrakhail	4(1.9)	26(12.5)	10(4.8)	0(0)	40
Maqudabad	0(0)	20(9.6)	14(6.7)	2(1)	36
Esaakhail	7(3.4)	18(8.7)	9(4.3)	2(1)	36
Dag Saipun	2(1)	14(6.7)	8(3.8)	8(3.8)	32
TerayBaala	7(3.4)	10(4.8)	11(5.3)	4(1.9)	32
Mandrakhail	2(1)	20(9.6)	7(3.4)	3(1.4)	32
Total	22(10.6)	108(51.9)	59(28.4)	19(9.1)	208

Source: Field Survey data 2021. Note: Values in parenthesis are percentages

3.3. Increase in Average Yield after Technological Application from Extension Department

Technology is the basic criteria in today's era of development. The data regarding increase in average yield after technological application is presented in Table 4.

Table 4. Distribution of respondents regarding increase in average yield after technological application from extension department

Villages Names	Increase in average yield after Technological Application (kg/acre)				Total
	Up to 400	401-800	800-1200	Above 1200	
Mandrakhail	7(3)	15(7)	16(8)	2(1)	40
Maqudabad	4(2)	18(9)	12(6)	2(1)	36
Esaakhail	8(4)	11(5)	13(6)	4(2)	36
Dag Saipun	6(3)	12(6)	11(5)	3(1)	32
TerayBaala	6(3)	12(6)	10(5)	4(2)	32
Mandrakhail	2(1)	16(8)	14(7)	0(0)	32
Total	33(15)	84(40)	76(36)	15(7)	208

Source: Field data 2021. Note: Values in parenthesis are percentages

Many farmers in the present study area of Peshawar produce tomato and consider it as the main source of their income. For better production agriculture extension department introduced the better technologies for tomato productivity enhancement. Because of suitable technologies the result shows that majority of farmers 40% reported that their average yield increased from 401-800 kg/acre while only 7% of the respondents reported that their yield increased above 1200 kg/acre. Apart from that 36% of the respondents reported that yield increased from 800-1200 kg/acre and 15% of the respondents reported increase in yield up to 400 kg/acre.

3.4 Frequency of Extension Worker visits

The agricultural extension department is extremely important in the farming community. The primary goal of extension staff is to educate farmers about various types of difficulties that they may encounter in their farms. Farmers were asked how often extension workers visited their fields. Table 5 summarizes data on the frequency of extension workers' visits to farmers' fields.

Table 5. Distribution of respondents regarding extension workers visit to farmers' fields

Villages Names	Frequency of Extension Worker visits						Total
	Yes	No	Frequency of Visits				
			Weekly	Monthly	Annually	Upon request	
GarhiSohbat Khan	16(7.7)	24(11.5)	0(0)	8(3.8)	8(3.8)	0(0)	40
Mandrakhel	20(9.6)	16(7.7)	0(0)	4(1.9)	8(3.8)	8(3.8)	36
Maqsoodabad	20(9.6)	16(7.7)	2(1)	4(1.9)	8(3.8)	6(2.9)	36
Esakhel	16(7.7)	16(7.7)	2(1)	0(0)	10(4.8)	4(1.9)	32
Dag Sepan	20(9.6)	12(5.8)	0(0)	4(1.9)	10(4.8)	6(2.9)	32
TeraiBala	18(8.7)	14(6.7)	4(1.9)	8(3.8)	2(1)	4(1.9)	32
Total	110(52.9)	98(47.1)	8(3.8)	28(13.5)	46(22.1)	28(13.5)	208

Source: Field Survey data 2021. Note: Values in parenthesis are percentages

Table 5 highlights the data regarding visits of agricultural extension workers to farming community for assistance. According to the collected data out of total, 52.9% tomato growers told that extension workers visit their fields in which maximum (22.1%) replied that extension workers visit them annually, and least number of respondents (3.8%) replied the visits of their field weekly. About 13.5% each of the respondents revealed extension workers visits monthly and upon personal requests which show not a good sign for agricultural development particularly for tomato cultivation in the study area. Our data is in similarity with [Ali et al. \(2011\)](#) where majority of the respondents replied that mostly extension personnel visited their fields on yearly basis.

3.5 Farmers' Perception regarding extension workers' skills in plant protection

Plant protection means of controlling diseases, pests, and weeds of crops and trees, as well as a set of measures used in agriculture to prevent and eliminate the damage done to plants by harmful organisms. The plant protection included cultural practices that must be done before and after cultivation of crops to prevent disorders appearance. Another thing is that the crop protection requires knowledge acquisition mode about the tools to protect the crops against certain diseases. Knowledge about the pest, diseases and insect identification task is also necessary ([Rafea, 2010](#)).

Table 6. Farmers' Perception regarding extension workers' skills in plant protection

Skills regarding plant protection of tomato	1	2	3	4	5	Mean	S.D	Ranks
Selections of economical methods for pest control	22(10.6)	32(15.4)	71(34.1)	57(27.4)	26(12.5)	3.1587	1.15421	I
Identify symptoms of insect/ pest infestation disease and their causes	29(13.9)	34(16.3)	68(32.7)	55(26.4)	22(10.6)	3.0337	1.18925	II
Identify different life stages of insects of tomato	44(21.2)	51(24.5)	59(28.4)	39(18.8)	15(7.2)	2.6635	1.20875	III

Knowledge about adverse environmental effects of pesticides	65(31.3)	48(23.1)	39(18.8)	36(17.3)	20(9.6)	2.5096	1.34412	IV
Knowledge about biological control of pest	72(34.6)	65(31.3)	44(21.2)	19(9.1)	8(3.8)	2.1635	1.11737	V

Scale: 1= Very Low 2= Low 3= Medium 4= High 5= Very High S.D= Standard Deviation

Agricultural Sciences that plans means and ways for directing diseases, pests along with weeds of crops and plants by setting measures for agriculture and forestry prevention and elimination the damages to crops and plants by harmful organisms. Table 6 depicts ranking of skills regarding plant protection of Agricultural extension workers from tomato growers' point of view on the basis of mean and standard deviation. Selections of economical methods for pest control was ranked first with highest mean value 3.1587 and SD 1.15421 and symptoms of insect/ pest infestation disease and their causes identification was ranked 2nd with the mean value of 3.0337 and SD 1.18925. Also different life stages of tomato insects identification was ranked 3rd with the mean value of 2.6635 and SD 1.20875 and adverse environmental effects of pesticides effects' knowledge was ranked 4th with lower mean value of 2.5906 and SD 1.34412. While biological control of pest knowledge was ranked V with the lowest mean value of 2.1635 and SD 1.11737. Our results are at par with [Khattam \(2011\)](#) who revealed in his Doctoral study that insect pest identification was ranked first with a total score of 77 while insect pests controlled by local economical recipes was ranked 2nd with a score of 65. The results are also supported by [Ahmad et al. \(2008\)](#) who revealed that more importance was made on plant protection measures.

3.6. Association between Average Yield of Tomato and Skills of Extension Workers Regarding Plant Protection

Table 7 shows association among average yield of tomato with skills of extension workers regarding plant protection in the study area. Chi-square test was used to find out this association. Study findings shows that there is highly significant association ($p=0.000$) between average yield of tomato with skills of extension worker regarding plant protection. Therefore, the research finding indicates that skills of extension worker play a significant role in the production of tomato.

Table 7. Association between average yield of tomato and skills of extension workers regarding plant protection.

Average yield of tomato (kg/acre)	Skills of extension workers regarding plant protection					
	Very low	Low	Medium	High	Very high	Total
Up to 3000	1(0.5)	7(3.4)	10(4.8)	2(1)	2(1)	22
3001-6000	1(0.5)	9(4.3)	71(34.1)	25(12)	2(1)	108
6001-9000	0(0)	4(1.9)	5(2.4)	42(20.2)	8(3.8)	59
Above 9000	0(0)	0(0)	0(0)	15(7.2)	4(1.9)	19
Total	2(1)	20(9.6)	86(41.3)	84(40.4)	16(7.7)	208
	$\chi^2=102.41$ P-value=0.000***					

Data source: Calculated by Author

Note: Values in parenthesis are percentages, Chi-square value =102.41 and P-value = 0.000

4. Conclusions and Recommendations

It was concluded that maximum tomato growers were cultivating tomato for their income, majority of farmers were literate and had small piece of land holdings from 1 to 2 acre in the study area. Extension workers mostly paid visits to farmers' fields on annual basis which is unsatisfactory; however, agriculture extension department introduced improved technologies for tomato productivity enhancement which increased the yield of all the farmers to some extent. It was further revealed that farmers perceived differently the plant protection skills of extension workers and ranked selections of economical methods for pest control as first, followed by identify symptoms of insect/ pest infestation disease and their causes, identify different life stages of insects of tomato, knowledge about adverse environmental effects of pesticides and the last is knowledge about biological control of pest which is ranked at 5th. Highly significant association ($p=0.000$) existed between average yield of tomato with skills of extension worker regarding plant protection. It is recommended that extension workers should visit tomato producers' fields on a regular basis to give basic knowledge about plant protection and new profitable tomato production practices along with compatible varieties.

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