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ECONOMIC EVALUATION OF NON-INSECTICIDAL CONTROL OF INSECT PESTS IN FRUIT ORCHARDS OF PAKISTAN

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ABSTRACT: *Technologies always play significant role in development of integrated pest management (IPM) in modern agriculture. This technology could be applied against use of pesticide for betterment of environment and cropping system. Many fruit crops are being deteriorated by use of pesticides. Non-insecticidal control is not practically being used. The purpose of this study is to assess the economic evaluation of non-insecticidal control of insect pests in the fruit orchards of Pakistan. A standard questionnaire was used as an instrument for data collection in the target research area. Factors like demographic profiles of the respondents; resources of training and information for integrated pest management (IPM) during fruiting season and their knowledge level were used to evaluate this research idea. A systematic sample of 120 respondents was taken for analysis. More than 80% of respondents have no advisory services from public or private sectors and they are not using non-insecticidal control of insect pests. Government should encourage and facilitate fruit growers for implementing non-insecticidal control. The findings showed that fruit growers require knowledge and training for enhancing their competence level in non-insecticidal control. In addition, they have little exposure to long term training opportunities due to low education level for application of this technology. The results revealed that almost 75% respondents think that agricultural policies by Government and no access to information sources concerning non insecticidal control are main constraints. The result showed contribution by the predictors like age, experience and training/ information. These factors are playing significant role in enhancing the adaptation of non-insecticidal control particularly in fruit growing areas.*

Key words: Non insecticidal control, Insect pests, Fruit orchard.

1. INTRODUCTION

Since ages, natural enemies provided a helping hand to entomologists, IPM practitioners, proletarian naturalists, farmers and gardeners. Use of natural enemies often fails to control the pests, so use of insecticides become necessary. Dissatisfaction for the ultimate control of insect / pests by insecticides / pesticides is increasing worldwide and may include risks about animal, human health and environment directly or indirectly. These risks are due to malfunctioning of chemical control approaches and need to be resolved the problem of insect pests efficiently and cost effectively. Waage [1] described that the foundation stone for an IPM strategy is definitely the conservation of natural enemies, yet evaluation process of impact of natural enemies and also for increasing their population for improvement in crops have not been studied satisfactorily by researchers as compared to dominant approaches of expansion and conventional control.

A fruit crop in Pakistan is the second largest agricultural export of the country. [2] Reported that because of eradication of natural enemies by excessive use of pesticide, pest reappearance is the common observable fact in most of the crops. Research and extension must enable the small scale farmers for access and usage of non-insecticidal control. The study conducted by [3] described that failure to observe at management regarding pests and their solution is the reason for imperfect adaptation of IPM and non-insecticidal control of insect pests. Previously so many studies have been conducted on pests' problem of fruit growers. [4,5] stated that perhaps the research on farmers awareness, knowledge and pests control management practices is useful in emerging IPM and non-insecticidal techniques that could be implemented by farming community.

In Pakistan, fruit growers are still using conventional methods like synthetic pesticides, insecticides etc for the management of insects pests of fruits in their orchards. These methods are considered easy by means of fruits management from pests and diseases. However, on commercial level, latest and useful techniques like non-insecticidal control are being used and implemented in some areas of the country, which has significant role in positively management of various fruit orchards from notorious insect-pests. The fruits and trees itself could be saved by using non-insecticidal control of insects pests, because many sort of trees and fruits are damaged by the use of other than non-insecticidal control. This sort of technique for fruit management is best for fruit growers and keeps pest population under ETL level. It is believed that management of pests will be more vigorous when farmer's community perceptions and implementation are taken into consideration [6]. A lot of research has been conducted for the farmers perception and their knowledge regarding pests and disease of fruit crops [7, 8, 9,10,11,12], but at a halt, a much more research regarding tropical fruit crops is lacking in spite of wide-reaching economic, societal and ecological significance of the latter. [13,14] described that reduction in crop losses due to different pests is mandatory for the food security and sustainable agriculture. According to [15] uses of synthetic chemical pesticides are being carried out as an essential element of pest control and practicing to a large extent in developing world. However, excessive use of pesticides can be intimidated the user safety, atmosphere, food and agricultural products. According to [16], IPM techniques have been introduced and established as substitute to the solitary dependence on chemical pesticides. Its prime objective is to manage vicious pests population and also at the same time eradicating or limiting the use of chemical pesticides.

1.1 Objectives of the Study:

The major objectives of this study are:

1. To assess demographic profiles of respondents in the study area.
2. To evaluate the information resources for non insecticidal control of insects pests.

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3. To determine current knowledge level of respondents regarding non-insecticidal control from various aspects.
4. To assess how the training/ information, pests management and demographic profiles of the respondents enlighten the discrepancy in the knowledge level of respondents.
5. To determine the utilization of non-insecticidal control of insects pests.

2. MATERIAL AND METHODS:

In this study, a questionnaire was used as instrument for the economic evaluation of non-insecticidal control of insect pests practiced by fruit growers in Pakistan. The instrument contained 36-items to be assessed on 5-point Likert-type scale ranging from none to very high was included in the training and information level of respondents regarding non-insecticidal use of insect-pests (15 items) and farmers knowledge level regarding IPM (15 items). 6 items were included in demographic characteristics. The instrument's content and face validity was checked.

Following the recommendations of the panel of experts, the instrument was revised. The revised instrument was tested in a pilot study by a group of 30 respondents in the specific geographical area.

2.1 Sample size, Data collection and Analysis:

A sample size of 120 farmers (fruit growers) (land holding ranging from19.50 acres to 48.00 acres) using systematic sampling technique were selected. The data were collected by face-to-face interviews with the respondents. Therefore, the response rate for data collection was 100%. Finally the data were analyzed using latest version of Special Package for Social Sciences (SPSS).

3. RESULT AND DISCUSSION:

According to the first objective of the study, demographic profiles of the respondents in the study area were assessed. The profiles that observed and evaluated were age, experience, education, landholding, commodities grown and advisory services. By examining data; average age of the respondents was 43.81 years in the study area. Thirty nine per cent of the respondents were from the age group of 40-44 years. The most critical profile of the respondents was education. 4.2% of the respondents were completely uneducated. 17.5% educated up to grade 5. However, only 24.2 per cent respondents had education above grade 10.

The results revealed that average farming experience of the farmers was 20 years. More than half of the respondents (53%) had about 15 to 19 years of experience. While 22% of the respondents had 20 to 24 years of vast farming experience. This shows that respondents were quite experienced and fully aware of the field situations in dealing fruit crops in Pakistan. Experience always plays a significant role in adaptation of any technology. The progressive farmers in Pakistan are more likely to adopt any new technology because of available resources.

The data also indicated that average landholding of the fruit growers in Pakistan was 41 acres. About 32 % of the respondents were having 30-34 acres of land, while 20% had 35 to 39 acres of land. This shows that respondents were mostly progressive farmers. Moreover, beside fruit crops, most of the respondents were engaged in wheat cultivation, while maize and sugarcane were also major crops grown in the area. The data shows that majority (about 57%) of respondents had received medium level of information from extension department. While only 5 % respondents had received very high level of information from the extension services department regarding IPM. The results depict that only 16 % were engaged in private and 18 % were obtained little advice from extension services department. Only 9% had access to the bulletin regarding non insecticidal control and IPM.

The sources of training and information accessible by the respondents for non insecticidal control were assessed during the study. Quantitative analysis of training and information level of respondents regarding IPM was conducted including mean and standard deviation. Information received through radio had lowest mean value i.e. 2.18. It might be due to the fact that radio has been replaced by the improved and latest media tools. Information received through newspaper had got lowest mean value i.e.(2.20). It is due to reason that rural people do not have access to print media because they are far from urban areas and secondly literacy rate of rural areas is much lower than urban. Appearance month of insect pests also had lower mean value between low to moderate (2.60) information received from extension department was received lower mean value between low to moderate (2.75).

The conclusion from table-1 implies that most of the respondents have low level of access for training and information regarding IPM techniques. Farmers may save fruit crops and other valuable and perishable commodities from loss by providing them timely and appropriate training and information regarding particular techniques like IPM/ non insecticidal control of insect pests.

The results from table-2 described that the highest mean sore is 4.33 was "prevention is better than cure" which depict that farmers understand the negative impact of not using the prevention measures. However, due to some hurdles, they are bound to use the other methods like pesticides that are lat option for controlling the insect's pests and had the lowest mean value of 2.29. Secondly, "knowledge about bio insecticides" that had moderate mean score which implies that farmers have encouraged awareness regarding IPM and also for non insecticidal control, but due to the deficiency in accessibility and proper technical advises, they are unable to use IPM/ non insecticidal control. It is also found that lowest mean score 16.7 was for" knowledge about bio-control agent" which shows that respondents required knowledge regarding bio-control agents used for control of insects pests.

The correlation analysis of the data showed a positive strong correlation between age and experience which depict that as an individual grows older he/she gets more experience. A normal negative correlation exists between training and education which depict that if a person is well educated then he doesn't need much training. The correlation table also displays the negative correlation between knowledge and constraints which shows that increases in the knowledge level of an individual shows decline in constraints in adoption of IPM/ non insecticidal techniques.

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Table 1: Training and information

Question	N	Mean	SD
Appearance month of insect/ pests in the field	120	2.60	1.23
Infestation mode of major insect/ pests	120	2.99	0.75
Infestation intensity of the insect pests	120	2.75	0.78
Economic Threshold Level	120	3.21	0.74
Economic Injury Level	120	3.30	0.78
Ever applied these ETLs in field	120	3.07	0.82
Control measures applied in routine	120	3.67	0.72
Any idea about bio-control	120	3.32	0.91
Information received from extension department	120	2.75	0.90
Information received from other farmers	120	3.40	0.56
Information received through radio	120	2.19	0.89
Information received from newspaper	120	2.20	0.78
Access to bulletin	120	2.93	0.91
Participation in training related to IPM	120	2.80	1.06
Participation in short courses	120	2.90	1.14
Utilization of IPM related information in the field	120	3.35	0.80
Interaction with research personnel	120	3.40	0.89
Acquisition of any bio-control agent	120	3.44	0.99
Way of installing traps	120	2.99	1.23
Other control methods	120	3.43	1.35
Information about inorganic farming	120	3.61	0.80

Scale: none=1, Low=2, Medium=3, High=4, V.High=5

Variable	N	Mean	SD
Knowledge level about bio-control agents	120	2.51	1.03
Important bio-control agents	120	3.15	0.88
Controlling insects using bio-control agents	120	3.30	0.81
Profit/ loss assessment	120	3.77	1.40
Improvement of crop by using non-insecticidal/ IPM control	120	2.99	1.02
Environmental hazards of insecticides	120	3.02	0.70
Merits of non-insecticidal control	120	3.30	0.97
Demerits of non-insecticidal control	120	3.54	1.20
How much control is possible through non insecticidal/ IPM control	120	3.67	0.64
Selective biological agents control insects pests	120	3.18	0.95
Options available other than biological control	120	3.30	1.12
Bio-insecticides	120	2.88	0.99
Last options for controlling insects/pests	120	2.23	1.09
Prevention is better than cure	120	4.33	0.91

Table-2: Knowledge level

Correlation:

	Age	Edu.	Exp.	L.H.	Trg.	Con.
Age	1.00					
Edu.	0.0801					
Exp.	**0.8861**	0.1322				
L.H.	**0.7843**	0.2127	**0.7895**			
Trg.	-0.1501	-0.4843	-0.0692	-0.1215		
Con.	-0.1580	-0.0449	-0.0091	-0.0254	0.0113	
Knowl.	-0.0661	-0.2425	-0.0961	-0.1388	**0.4024**	-0.3851

(Edu.=Education, Exp.=Experience, L.H.=Land Holding, Trg.=Training, Con.=Constraints, Knowl.=Knowledge)

Table-3 Table of frequency and percentage for Constraints

Constraints	Frequency	Percentage
Immediate effect of pesticides	21	17.5
Finance	52	43.3
Input cost	35	29.2
Modern technology access	78	65
Social constraints	12	10
Government policies	45	37.5

The table-3 shows the reason of not using non-insecticidal control/ IPM techniques. According to 65% respondents, modern technology access is major constraint. Finance was considered as second most imperative constraints towards this with 43.3% of respondents response considering it as a major constraint.

4. CONCLUSION AND RECOMMENDATIONS

The concept of non-insecticidal control of insect's pests is very unique for the profession of agriculture. The fruit crop growers in Pakistan are still using the chemical / pesticides control and owning bearing huge loss in production and as well as economic point of view. This is definitely a great threat to Pakistan's economy. So, it is necessary to give awareness to the growers of both scale (small and progressive) for adaptation and implementation like IPM and non-insecticidal techniques at mass level. In this perspective, Entomologist with Extension field staff can play significant role for transfer IPM/ non-insecticidal control at commercial as well as home level. Study conducted by Ashraf et al. (2012) described that extension educationists should have required competency level regarding the dissemination of technology to the users.

Following are the some recommendations for future researchers and policy makers.

- Firstly, researchers may carry out the research about changing the state of mind of farmers for the adaptation of non-insecticidal/ IPM techniques at mass level.

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- Secondly, follow up in-service training must be arranged for entomologists to overcome losses and extension field staff for dissemination of technology.
- Lastly, for the implementation of non-insecticidal/ IPM techniques for fruit crops, Pakistan Government should publicize and broadcast a comprehensive agricultural policy.

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