PESTICIDE USAGE AND ITS APPLICATION PATTERNS AMONG COTTON GROWERS OF THE SOUTHERN PUNJAB, PAKISTAN

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The southern part of the Punjab province is blessed with a warm climate favorable for cotton production. Most of the rural families are dependent on cotton for socio-economic survival. Therefore, they utilize huge financial resources on pesticides to get maximum cotton production for sustainable rural livelihoods. However, lack of information about safe usage of pesticides may result not only in wastage of resources but also causes harmful effects. Therefore, the present study has been designed to assess the knowledge level of farmers about safe use of pesticides. From southern part of the Punjab, district Khanewal was selected for in-depth analysis about knowledge and behavior of pesticide users. A sample of 160 respondents was selected randomly and data from them was collected through interviews. Statistical Package for Social Sciences (SPSS) was used for data analyzing. Results depict that instructions regarding safe use of pesticides application was ranked 1st due to highest weighted score with value of 581. Based on ranking of health and environmental effects of pesticides, headache (health hazard) and ground water pollution (environmental hazard) were ranked 1st as perceived by farmer respondents. There is a need for training of farming community concerning safe usage of pesticides to avoid its health and the environmental effects.
Keywords: Knowledge level, Sustainable, Health safety and environmental effects, Cotton.

INTRODUCTION

The agriculture sector contributes 18.9 % to Pakistan's GDP. The government is willing to support and encourage small farming community regarding application of innovative technologies for sustainable farm production which will ultimately pave a path for sustainable socio-economic development (Govt. of Pakistan, 2018).

Being a cash crop and an important source of raw material, cotton production is one of the leading factors for survival of textile industry in Pakistan and it has 1% share in GDP (Govt. of Pakistan, 2018). Among major crops, cotton is the most vulnerable to insect-pest attack. Globally, this crop uses 6% of the world's pesticides and 16% insecticides, more than growers of any other single crop cotton growers used pesticides to solve pest issues (UNESWA, 2013). Similarly, Pakistan t is leading consumer of pesticides and it has been estimated that a small farmer uses almost 60% of annual income in purchasing pesticide. Khan (2009) argued that the cotton crop has a vital role in Pakistan's economy and consumes huge amounts of pesticides, which is more than 80% of the total use in Pakistan. Extensive use of pesticides creates serious concerns including disastrous health, environment and economic consequences. Some researchers concluded that excessive and improper use of pesticides in

under-developed countries is associated with no training and education of pesticide usage and lack of information on related hazards (Wilson and Tisdell, 2001; Hashemi and Damalas, 2011; Khan *et al.,* 2015; Nurhidayati *et al*., 2020). Therefore, pesticides are regarded as "global killers". Although some researchers reported that farmers' perceptions about risk of pesticides were not related with concentrated pesticide usage (Khan, *et al.,* 2015; Damalas *et al.,* 2006) perceptions about pesticide use were influenced by pesticide risk (Dasgupta *et al.,* 2005; Liu and Huang, 2103; Damalas and Hashemi, 2010; Hashemi *et al.,* 2012). Every year, thousands of human causalities occur in Pakistan due to pesticide poisoning. Extensive use of pesticides in agricultural had a sever effect on human health and environment (Gupta *et al.,* 2012). In addition, several neurological disorders, cancer, reproductive problems and leukemia are also indebted to pesticides (Hashmi *et al.,* 2011). The southern part of the Punjab province of Pakistan is blessed with a warm climate favourable for cotton production. Most of the rural families are dependent on cotton for socio-economic survival. Misuse and overdose of pesticides by growers for the insect and pest management in cotton result in harmful effects on environment and human health (Dasgupta *et al.,* 2007). Families utilize huge financial resources on pesticides to get maximum cotton production in

order to earn a sustainable rural livelihood. However, due to improper information about safe use of pesticides, they are unable to avoid harmful effects. These harmful effects can be minimized by educating the cotton growers and creating an understanding of storing, applying and dumping of pesticides (Karunamoorthi *et al.,* 2012). A major hazard to the human health and environment is caused by unsafe and unselective usage of pesticides in agriculture (Mutapha *et al.,* 2017; Rehman *et al.,* 2020). The residual effect of pesticides was found in some vegetable growers in Kuwait (Saeed *et al.,* 2001, 2005; Hajjar, 2012). Farmers' knowledge about handling and safe use of pesticides, as well as its disastrous effects on environment and health, are promoted by social participation and effective extension programmed (Nagenthirarajah and Thirchelvam, 2008). Egyptian farmers' higher level of education was associated with enhanced knowledge and harmless use of pesticides (Gaber and Abdel-Latif, 2012). Pesticide overuse is also positively associated with the lack of extension support (Sarker and Itohara, 2009). Therefore, the present study has been designed to investigate farmer's knowledge level and perception of safe use of pesticides in cotton production.

MATERIALS AND METHODS

Punjab province is a leading contributor in agricultural production of the country. Its diversified climatic conditions are favorable for major crops, vegetables, and fruits. The southern part of the province bears a harsh and warm climate. Therefore, it is famous for cotton and mango production. From the southern part of the Punjab, district Khanewal was selected for in-depth analysis about knowledge and behavior of pesticide users in cotton production. The nature of study is descriptive. Selection of one district as study area was done due to low budget and resources at the expense of the researcher. A sample frame of 160 respondents was selected randomly. A well-structured interview schedule was checked by some experts of our Institute of Agri. Ext., Education and Rural Development. The Linkert scale was used to determine the response. Data were collected by conducting face to face interview of cotton growers. The pre-testing of data was done to check the validity and reliability of interview schedule. After getting satisfactory response of farmers, final data were collected. The collected data were analyzed by using Statistical Package for Social Sciences (SPSS) for drawing conclusions and making recommendations. The descriptive statistical analysis was done i.e. mean value, percentage and weighted score. The weighted score was found by researcher manually through multiplying the number of frequencies with scale value.

RESULTS AND DISCUSSION

***Demographic Attributes of Cotton growers*:** A Socio-

economic characteristic means a complex of attitude that is interrelated but does not from a single dimension.

Table 1. Distribution of the respondents according to their age

Age (years)	F	%
Young (Up to 35)	81	50.6
Middle (36-50)	59	36.8
Old (Above 50)	20	12.6
Total	160	100.0

Age is a process of gaining maturity in all fields of life i.e., observation, understanding and analysis etc. Individual performance is proportional to the age. It plays significant role in adoption of new idea (Siddiqui *et al.,* 2007).
The data regarding the age of the respondents were presented in Table 1 revealed that the respondents were ranging from up to 35 years were half 50.6%, 36-50 years of respondents 36.8% and above 50 years of respondents were only 12.6%.

Table 2. Distribution of the respondents according to their education.

Education level	*F*	%
Illiterate	38	23.8
Primary	43	26.8
Matriculation	52	32.6
Above Matriculation	27	16.8
Total	160	100.0

The data recorded in this Table 2 depicts that less than one-fourth (23.8%) of the respondents were illiterate, while 26.8% of them were primary. About a good number (32.6%) of the respondents were matriculation and only 16.8% of the respondents were above matriculation. Education is a vital factor for bringing about desirable changes in the human behavior. It is a very useful tool for the development of any nation. Education brings changes in attitude. Those farmer's education level is high then he will able to give satisfactory yield (Abuzar, 2003).

Table 3. Distribution of the respondents according to their size of land holding.

Size of land holding	No.	Percentage
Small (12)	79	49.3
Medium (12-25)	69	43.3
Large (above 25)	12	7.5
Total	128	100.0

The data recorded in Table 3 reveals that slightly less than half 49.8% of the respondents had 12 acres land, while most (43.3%) of them had 12-25 acres of land and only few (7.5%) of the respondents had above 25 acres land.

Table 4. Ranking of practices adopted by respondents during storage of pesticides

Practices for storage of pesticides	Mean Value	Standard Devi.	Weighted Score	Ranking
Follow the instruction regarding safe storage	3.63	0.55	581	1
Storage with consumable items	0.18	0.33	30	2
Storage at home	0.15	0.98	25	3

Scale 1= Very low, 2= Low, 3= Medium, 4= High, 5= Very high

The ranking of practices adopted during storage of pesticides as perceived by farmer respondents is represented in Table 4 which show that farmers ranked 1st follow the instruction heading towards high category. Moreover, storage with consumable items and storage at home were ranked at the end of table with low category. Please show all of the questions in the survey at the end.

Table 5. Ranking of practices adopted during pesticide application

Practices adopted during pesticide application	Mean Value	Standard Devi.	Weighted Score	Ranking
Observe wind direction	3.73	0.46	597	1
Read the label	3.30	0.40	528	2
Use clean water	2.90	0.48	464	3
Cover head	2.63	0.43	422	4
Wear mask	2.15	0.50	345	5
Use glasses	1.88	0.48	301	6
Use gloves	1.40	0.49	255	7
Wear long shoes	1.30	0.40	209	8

Scale 1= Very rare, 2= Rare, 3= Sometimes, 4= Often, 5= Always

The ranking of practices adopted during pesticide application as reported by farmer is presented in Table 5 which shows that observing the wind direction was observed often adopted and ranked 1st. Reading label on pesticides was ranked sometimes adopted. Furthermore, use of clean water and covering head were also observed sometimes by farmers and the least ranked factors are use gloves and wearing of long shoes and belonged to very rare category.

Table 6. Ranking of practices adopted after application of pesticide

Practices adopted after pesticides application	Mean value	Standard Devi.	Weighted Score	Ranking
Wash contaminated clothes	3.61	0.25	578	1
Take bath	3.30	0.30	523	2
Wash the hands properly	3.23	0.25	518	3
Dump the empty bottles	2.76	0.61	442	4

Scale 1= Very rare, 2= Rare, 3= Sometimes, 4= Often, 5= Always

The ranking of practices adopted after application of pesticide as reported by farmer is presented in Table 6 which shows that washing the contaminated clothes was often done. Taking bath and washing the hands sometimes properly. Dumping the empty bottles was ranked at the bottom of table.

Table 7. Ranking of health effects of pesticides as perceived by respondents

Health effects	Mean value	Standard Devi.	Weighted Score	Ranking
Headache	2.21	1.73	354	1
Insomnia	2.18	0.71	349	2
Fatigue	2.09	0.68	335	3
Dizziness	1.93	0.74	310	4
Skin disorders	1.70	0.80	273	5
Asthma	1.66	0.71	266	6
Hand tremors	1.52	0.24	244	7

Scale 1=Low, 2= Medium, 3= High

The ranking of health effects of pesticides as perceived by farmer respondents is presented in Table 7 which show that headache and insomnia seemed to medium response. However, fatigue was ranked 3rd and dizziness, skin disorders, asthma and hand tremors were seemed to low response from farmers of cotton growers.

Table 8. Ranking of environmental effects of pesticides as perceived by respondents

Environmental Effects	Mean Value	Standard Devi.	Weighted Score	Ranking
Ground water pollution	2.10	0.69	337	1
Soil biodiversity	1.90	0.76	304	2
Food contamination	1.79	0.74	287	3
Water pollution	1.69	0.76	271	4
Harmful for non-target organisms	1.51	0.64	243	5
Air pollution	1.29	0.54	207	6

Scale 1= Low, 2= Medium, 3= High

The ranking of environmental effects of pesticides as perceived by famer respondents is presented in Table 8 which shows that ground water pollution was fall in medium category effectiveness. Furthermore, soil biodiversity, food contamination, water pollution and harmful for non-target organisms were also seemed in above mentioned category. Air pollution was ranked at bottom of table with low response.

Conclusion: Findings indicated that rare adoption of practices regarding safe use of pesticides was found among farmers for insect/pest control. The public sector should strengthen their EFS (extension filed staff) to educate farming community. Furthermore, public sector should focus the frequent practice of conducting follow up visits and fortnightly campaign to monitor the awareness and adoption level among cotton growers. in this scenario private sector should also contribute by providing safety kits to farmers for usage of pesticides. All

these efforts will help to decrease harmful effects of pesticides on health as well as environmental.

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