AN ANALYSIS OF PESTICIDE USAGE BY COTTON GROWERS: A CASE STUDY OF DISTRICT MULTAN, PUNJAB-PAKISTAN

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Pesticide chemicals are playing a fundamental, vital role in crop production generally and in cotton yield specifically. These pesticides are comprised toxic ingredients and while playing their lethal and cidal role against insects/pests and other crop damaging organisms, they also leave harmful impact on human beings and atmosphere. To avoid the pesticide related health hazards by proper handling according to parameters designed by WTO, the study was designed and conducted, obtaining a sample of 220 respondents through simple random sampling technique by selecting 11 cotton grower farmers from each of 20 villages and they were probed for multiple aspects of pesticide handling through a reliable and validated interview schedule. The data collected, were processed through statistical package for social sciences (SPSS). The results show that in spite of awareness about injurious effects of pesticide chemicals on human health and environment, 94% of cotton growers were involved in pesticides usage for handsome cotton yield. To fulfill the requirements by WTO, formal and informal training of cotton growers is required for Integrated Pest Management.
Keywords: Analysis, pesticides, knowledge, usage, cotton growers

INTRODUCTION

Pakistan is the 4th biggest cotton producing country in he world and cotton was the No.1 choice of consumers worldwide for clothing and wearing accessories. From Bermen to Beijing to Brasila, consumers worldwide overwhelmingly prefer cotton, according to the most recent Global Lifestyle Monitor survey–GLM III–the findings of which were released in 2004 by Cotton Council International and Cotton Incorporated. The survey, third time conducted since 1999, revealed that more consumers than ever considered fiber content a key factor in clothing purchases 78% of respondents, up from 75% in the previous survey in 2001. More than half 60% of those in the latest survey said they preferred clothing made of cotton to any other fiber natural or synthetic (World Report, 2005).

According to P.C.C.C the world cotton production in 2005-06 dropped by 1.5 million tons or 6.96 million bales from previous season to 24.78 million tons (113.81 millions bales of 480 lbs). While cotton production was forecasted at 24.69 million tons or 113.4 million bales in 2006 07, major increases in production were expected in China (mainland), Pakistan and India (Cotton view, 2006).

The Federal Committee on Agriculture in Pakistan (FCA) had fixed the cotton production target for 2005-06 at 12 million bales. Subsequently, it was enhanced to 15 million. National yield was thus envisaged at 786 kgs per hectare. According to available information, the weather conditions and flood in some districts of the Punjab and pest attack in Sindh had effected the cotton crop, resulting the declined production to 13.0 million bales, showing decreases of 13% in production and 4.53% in area over the targets of 2005-06 season and 8.87% and 2.88% respectively over the achievements in the last season (2004-05). The national yield in (2005-06) also declined to 713 kgs per hectare, thereby showing a decrease 9.3% over the target and 6.2% over the achievement of 2004-05 season (GOP, 2006).

Exports of textile manufactures grew by 19.2%, prominent among those were exports of bed wear (58.4%), readymade garments (31.0%), cotton yarn (21.4%), cotton cloth (16.5%) and towels (12.0%).(EPB, 2006). Cotton is the backbone of our exports and the biggest foreign exchange earning item in its multiple phases i.e. raw cotton, cotton yarn, gray cloth, bed sheets, towels, hosiery products and cloths. Cotton exported was 61.6% of total exports of Pakistan during 2006-07 (Federal Bureau of Statistics, 2006-2007). Cotton is proved scientifically to be the best fiber for human clothing and is preferred by more than 70% of individuals in the world for wearing and design (Cotton International, 2007).

To boost our cotton and cotton products, cotton growers should focus for quality and quantity of cotton crop to enhance our foreign exchange by capturing new international cotton market, adopting measures designed by GATT and WTO for Integrated Pest Management. Pesticide chemicals were imported of amount 20394 tonnes, casting Rs. 4443 millions during 2006-07 (Pakistan Economic Survey, 2007). Almost, more than 80% of these imported pesticides were consumed by cotton growers (Federal Bureau of Statistics 2006-2007).

Usage of pesticides had a long history, no dought, World Wars II and I served as a watershed for the current modern agrochemical industry. Chemicals and technologies innovated for warfare were later applied for promotion of agricultural farms. Crop dusting for cotton crop was first time used in Mississippi Delta in early 1922, later on it was used as regular pesticide in agriculture. The pesticides marketed widely after World Wars and in 1962 these chemicals were challenged for their abuse followed by movement of agrochemical regulations now called IPM (NARC, 2000).

Pesticides were used for the first time in 1950 in Pakistan to combat locust attack. In 1954, imports of chemical pesticides amounted to 254 tones and in 1980; the government controlled the imports, and subsidized the distribution of pesticides. According to the Prime Minister's Task Force on Agriculture, approximately 90% of the insecticides and pesticides are used on cotton crops. That means most of the 6.62 million acres used for cultivation of cotton crops i.e. the target of pesticide use (PAN International Website, natural collection, PANAP p.2).

Some pesticides, notably organo chlorines, persist in soil for years. Water might be polluted by dumping of extra pesticides formulation or by application of pesticides to reverse or ponds after aquatic weed control. Dumping of pesticides into water may lead to contamination of drinking water (IPEN, 2001).Khan *et al.* (2002) narrated in the study entitled "Economic Evaluation of Pesticide Use Externalities in the Cotton Zones of Punjab, Pakistan" that 83% of pesticides were used to control insect and pests. The massive cost was through production losses due to resistance development in cotton pests and damages to domestic animals, followed by damage to human health, loss of biodiversity and monitoring costs of residues in food chain, rice, sugarcane and other commodities. The health hazards to women cotton pickers showed that about 2.23 million women suffered from their exposure to pesticide used on cotton crop and huge share of income of about 105 million rupees incurred by the women due to health treatment expenditures.

MATERIALS AND METHODS

Multi stage random samples of 20 villages were selected. From each selected village, 11 cotton growers were further selected randomly. Thus 220 cotton grower respondents were selected by using Fitzgibbon *et al*. (1987) table through simple random sampling technique. Keeping in view the objectives of the study, an interview schedule was developed for data collection. The data thus collected were analyzed with the help of Statistical Package for Social Sciences (SPSS).

RESULTS AND DISCUSSION

To keep and maintain cotton crops healthy and free from damaging factors, knowledge, awareness about the causative agents and regular monitoring of crop is required by the cotton growers otherwise chances of poor yield are there. Cotton growers were assessed through questionnaire that either they were in a position to diagnose any problem to their crop in time or not and Table 1 showed their level of knowledge in this respect.

Table 1. Distribution of the cotton growers according to their knowledge about diagnosing insect/pest attack on cotton crop

Diagnosing knowledge about insect/pest attack	f.	%
Yes	156	70.9
No	64	29.1
Total	220	100.0

Table 1 shows the orientation, knowledge and observation of cotton growers about the pest attacking their cotton crops. Results of this table emphasize that almost 71% of respondents were equipped with knowledge to diagnose their crop problems i.e. they were in a position to observe the sign and symptoms of disease affecting their cotton crop. Therefore, if they were in a position of making early diagnosis, pests might be managed easily by proper usage and handling of pesticides, saving the crop and maintaining or improving the yield, otherwise late or without diagnosis, results might be lethal for their cotton crop. On the other hand 29% of respondents had no or least knowledge about the signs of disease and it was not easy for them to save or improve their cotton crop. Respondents explained their school of thought that it was the responsibility of extension department to play its role in educating and teaching the cotton growers/farmers about integrated pest management and how to save and improve their cotton crop. Table 1 shows a healthy feedback about orientation for diagnosing the species of cotton crop damaging insects and pests. Nodought to diagnose the disease is very important but to treat the disease is more important as in case of any carcinogenic disease if diagnosed in early stage, in time, chances of successful therapy and cure are bright and vice versa therefore, to diagnose the stage or phase of crop disease by pest counting practice and to decide whether the application of pesticides is required or not

and with what dosage and frequency of dosage will be the crucial factor for healthy cotton crops and better yield.

When the reason for this gap between the knowledge about the pests and its application for diagnosis of pests affecting the crops was asked, respondents replied that they were not sure about their self-diagnosis and they thought that extensionists and agriculture experts might had this job with more accuracy.

After making the confirmed diagnosis for cotton crop disease, proper treatment by using accurate medicine i.e. required pesticide should be applied; improper dosage and frequency may be ineffective, useless, wastage of time and money (World Report, 2005). Therefore, information for level of knowledge of cotton growers about timing and dosage frequency of pesticide usage were collected and presented in Table 2.

side effects of pesticides on human health and environment was probed, almost 11% of respondents had no concept of any hazards of pesticides on human, crops or environment and 29% respondents answered in a diplomatic way. This table provided a very important information that the farmers were found of to be familiar with side effects of pesticides on crops as well as health hazards on human beings, animals and environment, so that they would try to avoid these pesticides and minimize their pesticide related health hazards as data indicate that almost 58% of cotton growing farmers were having concept of side effects of pesticides on crops, animals, and environment.

Chemicals used as toxic ingredients in pesticides to kill the pests are either harmful for human beings or not, the level of orientation of cotton growers, involved in the pesticide usage practice, was observed and the feedback was presented in Table 3.

Table 2. Distribution of the cotton growers according to their knowledge about pesticides and their usage

Response	Very occasionally		Occasionally		Frequently		NA/Never		Total	
	f.	%age	f.	%age	f.	%age	f.	%age	f.	%age
Use of pesticides	11	5.0	2	0.9	207	94.1	0	0.0	220	100.0
Consultation in the choice of pesticides	6	2.7	30	13.6	184	83.6	0	0.0	220	100.0
Availability of pure pesticides	12	5.5	23	10.5	185	84.1	0	0.0	220	100.0
Side effects of pesticides on crops and environment	25	11.4	64	29.1	128	58.2	3	1.4	220	100.0

Scale: NA/Never = 0; Very occasionally = 1; Occasionally = 2; Frequently = 3

It is depicted from the data mentioned in Table 2 that 94% of cotton growers were involved in usage of pesticides to improve their cotton yield while 5% farmers very occasionally used pesticides for their cotton crop and only approximately 1% of farmers rarely used pesticides. It was probed that whether they consulted to some competent person or agro-pharmaceutical agent for pesticides selection or it was their own choice. Reply to this quarry was yes from 84% cotton growers, very occasionally from almost 3%, occasionally from approximatly14% and never from none of cotton producing farmers. When researcher asked that either available branded pesticide were original or fake. Almost 84% of the respondents replied in favor for genuine and pure branded pesticides available in the market, 5.5% respondents showed their experience of having fake pesticides and 10.5% respondents answered for occasionally they had experience of impure pesticides. When awareness of side effects or having an idea of

Table 3. Distribution of the cotton growers according to their awareness for side effects of pesticides on human health

Side-effects of pesticides on human health	f.	%age
Yes	165	75.0
May be	38	17.3
Not at all	17	7.7
Total	220	100.0

The data mentioned in Table 3 indicate that 75% cotton grower farmers were oriented with health hazards of pesticides on human being, used to control insects and pests, almost 17% of respondents were having a little knowledge about injurious effects of pesticides while almost 8% of respondents considered them to be harmless for human health. Similar results were found by the Siddaramaiah and Srinivas (u.d.). Some respondents informed that they used to deseal the pesticide containers by using their teeth and some

times small amount of pesticide/chemical got entry in to their oral cavity, it was tasteless and nothing was serious with them and it happened multiple times with many respondents. Respondents told that they had the knowledge about the toxicity of pesticides that was why they stored it carefully away from reach of kids particularly.

To control the crop damaging factors and the pests, which proved to be the worst enemies of their crops, cotton growers who manipulated the purchase of pesticides were found to be in search and demand of genuine and original seal packed pesticides. The source for purchasing pesticides by cotton growers was asked from the respondents and their feedback is mentioned in Table 4.

Table 4. Distribution of the cotton growers according to the source of purchasing pesticides

Source of purchasing pesticides	f.	%age
Pharmaceutical dealer/agent	205	93.2
Shop keeper	15	6.8
Total	220	100.0

Results of this table show that almost 93% of respondents purchased pesticides from official company dealers while almost 7% of respondents purchased pesticides from open market. Cotton growing farmers expressed their thinking that why they prefer to purchase the pesticides from company dealer, because of least chances of fake, or ingenuine pesticide from an official branded company dealer in addition to the lowest retail price available in the market. Moreover company dealers were responsible for any change or return of extra pesticide container if required. They also used to give bonus or prize as an incentive for purchasing pesticides in bulk, which proved to be an attractive incentive for respondents in addition to their psychological satisfaction. Moreover guiding materials for pesticide handling and consultation for better cotton yield were freely available from company dealers in addition to some price discount as informed by respondents.

In case of pest affected cotton crops, after confirmation of the species of causative agents, selection and purchase of pesticides is manipulated. The respondents were requested to inform the criteria they considered at the time of selection and purchase of the chemical pesticides and their responses were presented in Table 5.

Table 5. Distribution of the cotton growers according to their considerations while purchasing the insecticides/pesticides

Consideration while purchasing the insecticides/pesticides	f.	%age
Previous experience	44	20.0
Price	13	5.9
Efficacy of insecticides/pesticides	5	2.3
New research	2	0.9
Expert opinion	156	70.9
Total	220	100.0

It is concluded from the data presented in Table 5 that approximately 71% of respondents made the selection of pesticides according to the advice for cotton crop pest management experts. While 20% of cotton growers selected pesticides for spray for their cotton crop according to their own previous experience. About 6% of respondents considered the cost and economical factors as they were in search of cheaper but effective pesticide due to limited resources and lack of funds. Most of respondents relied on cotton crop experts and agriculture research officers as the respondents thought that the expert extensionists who were in touch with new and latest research for cotton pest management and in a better position for pest management strategies.

Table 6. Distribution of the cotton growers according to the practice of mixing two or more than two types of pesticides

Mixing two or more than two pesticides	f.	%age
Never	2	0.9
Occasionally	124	56.4
Frequently	86	39.1
Not applicable	8	3.7
Total	220	100.0

From the data mentioned in Table 6, it is concluded that respondents also used the pesticides in a combination of two pesticides to have a broader targets of killing multiple pests at a time and it was required when multiple species of pests were involved in damaging the cotton crop at the same time. Therefore, more than one pesticide i.e. a mixture or combination of two pesticides at the same time in the same spraying instrument showed better results in controlling the multiple attacking pests. Results showed that approximately 39% of respondent used a mixture of two pesticides for pest management at the same time frequently; almost 56% of respondents used a cocktail pesticide occasionally while 1% of

respondents never made this practice and always used single pesticide. Respondents informed that mostly it was a self designed strategy as they experienced that a mixture of two pesticides proved to be more lethal for cotton crop pests with better pest management results. Rochester (2001) mentioned that Organo-phosphates with combination of Pyrethroids pesticide chemicals was proved to be the most effective and lethal weapon against Bollworm insect/pest species but the health hazards as a results of such mixtures may be lethal for respondents.

CONCLUSIONS

Pakistan imported 20394 tonnes of pesticide chemicals during 2006-2007; cotton growers consumed more than 80% of these pesticides. Majority of cotton growers was having enough knowledge to diagnose the pests, attacking their cotton crop and almost 94% of cotton growers used pesticide chemicals to secure their cotton crop. Most of the cotton growers did consult to experts for usage of genuine pesticides. More than half of the cotton growers were having awareness for side effects of pesticide chemicals on human health in addition to environment. More than 90% of cotton growers used to purchase the pesticides from official dealers and they were found to be involved in practice of mixing of two different types of pesticides at the time of spray. Training and non-formal teaching of cotton growers is required for proper handling of pesticides according to Integrated Pest Management requirements.

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