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Training Need Assessment of sugarcane farmers regarding application of insect pest management practices in District Faisalabad

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Abstract

Agriculture is considered the main pillar of Pakistan's economy, which is highly dependent upon its major crops. Sugarcane is an important cash and sugar crop cultivated in Pakistan. It is cultivated in an area of 1.31 million hectares. It is grown in more than 120 countries in the world. Sugarcane growers face different problems including insect pest management and poor plant protection measures. Farmers don't have sufficient training to deal with the insect and pest attack. The main pests which damage the sugarcane crop are gurdaspur borer, root borer, sugarcane pyrilla and sugarcane mite. These pests are difficult to control since the farming community of Pakistan doesn't have been equated with proper training. The present study aims to assess the training need of sugarcane growers regarding insect pest management. The present study was conducted in district Faisalabad. Faisalabad consists of 6 tehsils. Tehsil Jaranwala was selected through convenient sampling. There are 57 union councils in tehsil Jaranwala. Out of which 5 union councils were selected randomly. From each selected union council, 2 villages were selected. From each village, 12 respondents were selected randomly. A sample size of 120 respondents was selected in this order to conduct the research. Interview schedules were used to collect data from respondents. The results indicated that the majority of the respondents have not adopted recommended protection measures against sugarcane pests and diseases. It also indicates that the majority (49.2%) of the respondents gave responses that experience is the best way to require insect pest management practices. There is a dire need to provide the transportation facilities and incentives to the extension field staff for the effectiveness of training programs regarding the application of insect pest management practices

Keywords: Sugarcane Pest, Disease, Protection Measure, Training Need Assessment, Sugarcane Farmers

Introduction

Agriculture is the main source of income in Pakistan which is providing its share of 18.9 percent to GDP and absorb 42.3 percent of the labor force. The five major crops of Pakistan are Wheat, rice, cotton, sugarcane, and maize which are the main contributor in the gross domestic product of the economy. Among the five major crop sugarcane is the 4th largest cash crop in Pakistan. The sugarcane production is 81.102 million tones as compared to last year's production of 75.482 million tones. Sugarcane crop was cultivated on an area of 1.31 million hectares (Govt. of Pakistan 2017-18).It is mainly cultivated for making sugar and it played an important role in decreasing the poverty rate, develop the economy, and livelihood. Sugarcane is grown in more than 100 countries worldwide with a total production averaging 170 million tons of sugar, Brazil being the first producer. According to statistics from the International Sugar Organization (ISO), sugar consumption per capita (world average) stood at 23.3 kilos/year or 63.9 grams/day in 2014. Harvesting of sugarcane by hand is preferred by the farmers over machine harvesting since it lowers the risk of impurities (Xiao et al., 2011).In Pakistan sugarcane is an important socioeconomic development factor because it has direct and indirect impact on the development (Thomsan and Hofimann, 2011) and growth of the people living in rural areas (Girei and Giroh 2012). Sugarcane is an important crops , but the yield of sugarcane is very low in comparison with other countries due to a number of factors especially the most devastating factor is the pests of sugarcane. More than 100 insect pest species attack on sugarcane crop in subcontinent and majority of the species are found to cause the losses in Pakistan and 49 pest species have been classified as the major pests of sugarcane (Talpur*et al., 2002*). Insect pests depict a major threat to agricultural economics of sugar production and representing substantial reductions in sugar production produced from sugarcane, sorghum and sweet potato due to attack of sugarcane stem borer, sugarcane top borer, Gurdaspur borer, sugarcane plant hoppers, sugarcane pyrilla and sugarcane whitefly. Injury from these pests is related to decrease in sucrose content and biomass (Vanweelden*et al*., 2015). A number of the controlling methods are applied to control the pests of sugarcane. The methods include integrated pest management, biological control, physical control and mechanical control. Sugarcane is main source of people living in rural areas. It is significantly important crop due to its agricultural and economic contribution in economy. In term of gross value sugarcane is the second largest crop in term of gross value, succeeded only by maize (Wilson *et al*., 2017). Despite positive effects of agricultural practices if well applied, there are cases of mismanagement of these practices and techniques that are normally supposed to improve sugarcane yield and productivity. Some of them can lead to dramatic change in pest pressure .Since the widespread use of synthetic pesticides against plant pests from the middle of last century, the crop protection community has been searching for guiding principles, capable of responding both to the needs of agricultural production and the constraints imposed by a sustainable development of the planet. Chemical control rapidly revealed its limitations, as well as its possibilities, and alternative solutions to pest management problems have been recommended since at least the 1960s. A new strategy was developed under the rubric 'integrated control', envisaging the employment of a range of different control measures, constrained by their compatibility and the requirement for minimizing noxious effects on the wider environment. Experience has shown that putting in place effective biological control procedures has required a significant reduction in chemical treatments, a condition which producers have found difficult to accept. In their defense, it must be said that the alternative solutions proposed have often been difficult to put into practice and frequently insufficiently or unreliably effective. These problems arise in large part from our still inadequate understanding of the mechanisms which determine the dynamics of pest populations in their agro-ecosystems (Goebel and Sallam, 2011). Since that time, a number of significant stages in the thinking on crop protection have been passed through, of which the first, under the term integrated Pest Management' or IPM, abandoned the idea of comprehensive pest control and replaced it with the concept of the management of pest populations. In retrospect, this realization of the importance of the interactions between populations within agro-ecosystems came late. It is now considered as a necessary precursor to the true management of pest populations within the global functioning of ecosystems (Altieri and Nicholls, 1999).

Insect pest species that feed directly on sugarcane leaves are mainly Lepidopterans and Orthopterans. Populations of these pests are unpredictable in nature and certain species can have intermittent outbreaks Recently, outbreaks of armyworms, which are night-feeding pests, have occurred following the intensive use of mechanical harvesting. This infestation seems also linked to the presence of trash blankets (a refuge for the armyworms) used for weed control and

preservation of soil humidity in sugarcane interrows. The locusts can occasionally damage sugarcane, particularly in Africa, in sub-Saharan regions. In South Africa, the species commonly cited in sugarcane are *Nomadacris septemfasciata* and *Petamella prosternalis* (a grasshopper). Chemical control is generally used to combat these insect pests but biocontrol using parasitoids and entopathogens are in progress (Vreysen *et al.*,2007). Sap feeders include Hemipteran species, scale insects, whiteflies, mealybugs and plant hoppers. Some of them are viral vectors transmit the viruses and cause Sugarcane Mosaic Virus and Yellow leaf Virus. Other potentially destructive viruses are Fiji disease, transmitted by *Perkinsiella saccharicida* (Homoptera, Delphacidae). However, there are many countries where this insect is present but not the disease. These pest species have a world-wide distribution hence maintenance of strict quarantine procedures is needed to ensure protection against these major diseases. *Fulmekiola serrata*(Homoptera: Thripidae) is not a major pest in African and South-Asian countries but in South Africa, its introduction in 2004 and rapid spread took the sugar industry by surprise, particularly in the province of Kwa-Zulu-Natal, where most of sugarcane is grown. The outbreak of this pest was associated with a severe drought and the South African Sugarcane Institute (SASRI) is currently working on control strategies. Other occasional pests are: the sugarcane whitefly, *Neomaskellia andropogonis* Corbett (Hemiptera: Aleyrodidae), is one of new emerging pests and damage from this pest seems to be expanding in recent years (Allister *et al.*, 2008).

In both developing and developed countries, IPM research programs can only be successful with involvement of farmers and other stakeholders. Defining the appropriate nature of that involvement, however, is not a simple task because research, training, and extension interactions require financial and human resources and because both farmers and scientists have comparative advantages in particular aspects of the knowledge generation process. There are differences in ease of technology transfer that depend on environmental sensitivity of the technologies and environmental diversity within countries. With limited resources, scientists or extension workers cannot interact directly with all farmers. Therefore, it is essential that farmers generate many of their own IPM technologies and that they learn from each other. Farmers know a lot about their pest problems, but not everything. Misdiagnosis of pest problems by farmers is common because some pests, for example nematodes, are difficult to see. Therefore, interactions among farmers, researchers, and extension workers can be helpful in identifying the principle causes of and potential solutions to pest damage observed by farmers (Bentley et al., 1994).Sugarcane pests include leaf feeder, stalk feeders and root feeders. Leaf feeders include Army worm and locusts. These pests cause sporadic losses and patterns of their outbreak are difficult to predict (Sallam, 2006, Goebel *et al.*, 2010). Mechanical harvesting and use of thrash blankest have been identified as causes for armyworm outbreaks (Beuzelin 2011).Moth borers are stalk feeders and they are counted as the top borers stem feeders and shoot feeders. The attack of borers majorly occur during the larval stage and bore into stem and roots reduce the sugar content and biomass (Kafer*et al*., 2002). Cultural control is considered the first step of defense against pests including stalk borers, and includes techniques such as destruction of crop residues, crop rotation, manipulation of planting dates, early harvesting, collecting dead shoots, decreased fertilizers use, field monitoring, avoiding “stand-ove” cane (cane growing longer than the recommended time) whenever possible; cutting the cane at or below ground level so as to prevent larvae in the stools re-infesting ratoon crops; after cutting, removing all residue stalk and leaf material; covering exposed residue of cane with soil (this kills eggs and young larvae in the stalk stumps); and avoiding the use of broad-spectrum or persistent insecticides (Leslie, 2004).

Agronomic practices such as good plant growth management through appropriate fertilization and irrigation schedules are an obvious advantage towards improved stem borer management. Removing dry cane leaves from the stem or pre-trashing also suppress stalk borers numbers, by reducing the number of eggs already in the field and reduces the preferred, dry-leaf oviposition sites. Also removing the leaves slow down the penetration time for larvae, thus expose them to natural enemies. In the USA, to reduce the number of overwintering larvae, stubble in fallow fields should be plowed out as quickly as possible (LSU AgCenter, 2010). Planting stem borer-free sugarcane seed pieces is also an elementary recommended management tactic to reduce overwintering populations of stalk borer. In the context of new plantations, pieces of sugarcane stalks “seed cane” are placed horizontally into the soil, and they may contain eggs or larvae of stalk borers, which could re-infest neighboring crops. These can be killed by immersing the seed cane in

water at 50°C for two hours, or dipping it in pesticide mixtures. Planting and harvesting dates cause various sugarcane phenological conditions potentially influencing stem borer population dynamics (Beuzelin*et al.*, 2011).Regular irrigation has a positive effect in reducing borers' infestations in the field. showed that irrigation significantly reduced the amount of occurrence of a bored internodes by 2.5-fold and moth borer exit holes/stalk by 2.5-fold in two commercial sugarcane cultivars. They indicated that irrigation reduced the probability of occurrence of bored internodes and moth borer exit holes (Reay-Jones et al., 2005). Biodiversity is severely affected by the burning practice before harvest thus disturbing the entire biological equilibrium (fields and hedges). In Reunion, the ban of cane burning in high infested areas has reduced Borer damage by 50%. Some surveys have proved that borer larvae can survive in the internodes. On the basis on these results, and for environmental considerations (pollution by flying ashes), this island has stopped this practice at the beginning of 2000s. Many producing countries have also decided to stop burning at harvest and implemented green harvesting. This has also been pushed by the growing demand of cane trashes to use for field blanketing or today for energy use and bioplastics. However, in some countries in Africa, Asia and South America, cane burning is still employed and has a devastating effect on biodiversity (Goebel *et al* 2010).

Biocontrol and conservation biological control

- Releases of Hymenoptera parasitoids to control Lepidopteran stem borers
- Biocontrol and predation by ants
- Biocontrol of white grubs and other pests using entomb pathogenic fungi

Classical biological control, which is the introduction and establishment of exotic natural enemies against introduced pest species, is a well-known technology and an essential component in sugarcane pest management. It has been developed for more than 50 years in most sugarcane producing countries, particularly for controlling stemborers which are difficult to reach once the larvae is inside the sugarcane stalk. In addition sugarcane is a very dense crop which sometimes reduces the efficacy of the pesticide treatments when air sprayed. In this context, sugarcane is much less treated with chemicals for insect control than for instance other cropping systems such as cotton or horticulture. Biocontrol in sugarcane includes the use of parasitoids and entomopathogenic fungi. While parasitoids are mainly used on Lepidoptera, entomopathogens are rather employed for the control of coleopteran and heteropteran species following (Robène*et al.*, 2015).

Chemical control of insect pests: not so used in sugarcane fields

Pesticides are used in sugarcane to control some pests as white grubs, armyworms and sap feeders. However, a much bigger use of chemicals is for weed management with herbicides. As we said earlier, stemborer control remains difficult due to the internal development of larvae in the stalk and the density of the crop. Eggs and young larvae before penetrating into the stalks can be easily killed by insecticides such as pyrethrins but the applications have to be precisely scheduled to coincide with this period (Lewis *et al.*, 2009).

Remote Sensing and GIS: new tools to optimize IPM in sugarcane

Studies in Australia using satellite images to survey the damage of the greyback cane beetle *D.albohirtum* already mentioned earlier have revealed interesting results and allowed to establish risk maps of infestation in the Mulgrave area. Finally, remote sensing is a very useful tool to help growers concentrate their control strategy on specific areas based on risk maps. These maps can include an additional component using the presence or absence of vegetation natural vegetation in the damage occurrence (Zellner *et al.*, 2014).

Restoring natural vegetation and planting companion plants in and around sugarcane fields

It is well known that agricultural intensification and large-scale monocultures such as sugarcane lead to considerable losses in habitat and biodiversity at multiple spatial and temporal scales. Changes to a simpler landscape structure and reduction of native vegetation/trees alter movements of pests and natural enemies and increases infestation levels and the likelihood of pest outbreaks in agriculture. In surveys conducted in South Africa, small scale sugarcane farms (< 2 ha) had 2-3 times lower damage levels of *E.*saccharina than in larger commercial farms/monocultures. In Small farms, a high diversification of crops interspersed with mixed marginal and natural vegetation is generally observed

and pests are therefore naturally suppressed. Such landscapes are better at supporting natural enemy diversity (Conlong and Rutherford, 2009).

Methodology

District Faisalabad consist of 6 tehsils and Tehsil Jaranwala was selected as population sugarcane growers to conduct this research. Tehsil Jaranwala is the core area of sugarcane crop in Pakistan. It produces a large quantity of sugarcane and sugarcane products. Thus the present study was designed and conducted in Tehsil Jaranwala District Faisalabad. Purposively selected the areas with special focus on availability of sugarcane growers. Respondent's list was collected from office of Assistant director agriculture Jaranwala. After this the collected list was processed through the systematic sampling formulae. 2 villages were selected from each 5 selected union councils and 12 respondents from each village were selected for selection of sample. Selected sample comprises of 120 respondents from sugarcane growers.

Sample size 120 = 10 villages × 12 respondents

For data collection questionnaires were filled personally at their homes and fields. During this process informal and friendly atmosphere was maintained in order to obtain the data from the respondents. The gathered information was measurably investigated with the assistance of SPSS (Statistical Package for Social Sciences). Accurate measures such as standard deviation, mean and frequencies were ascertained to interpret exchange, reach conclusion and to figure recommendations.

Results and Discussion

Demographic distribution of the respondents

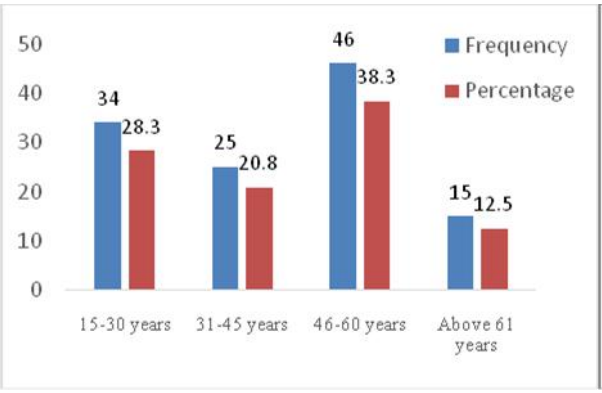

Figure 1 Graphical representation of respondents according to their age

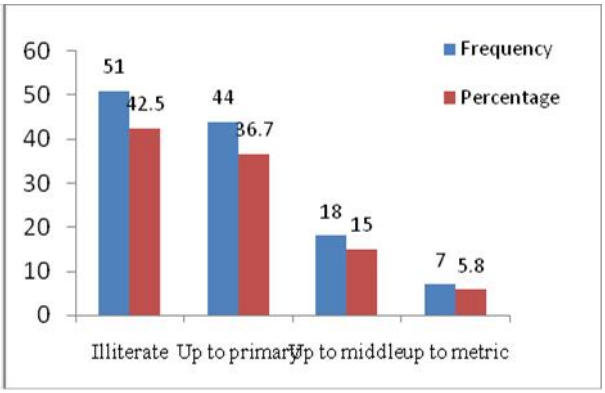

Figure 2 Graphical representations of respondents according to their education level

The data in the given figure 1 revealed that more than 1/3rd (38.3%) of the respondents belonged to the age group of 46-60 years, less than thirty (28.3%) belonged to the age group 15-30 years, about 1/5 th(20.8%) were belonged to age group of 31-45 years and small number 12.5% of respondents were above 61 years of old.

Education

Education is essential for bringing a positive behavioral change in any person. Through ways of formal schooling, it builds knowledge and other qualities of mind and universal competence, especially. It is an exceptional way to upgrading and betterment. In other words educate is a fundamental part of development. People of rural areas are living in darkness because they are not educating their children. Therefore, it is considered as a significant in rural development. Keeping in view of these aspects, respondents were asked about their year of schooling.

Figure 2 indicates the education level of the respondents. In this study less than half 42.5% of the respondents were illiterate, about 1/3rd 36.7% were up to primary, 15.0% were up to middle and only few 5.8% of the respondents were up to metric.

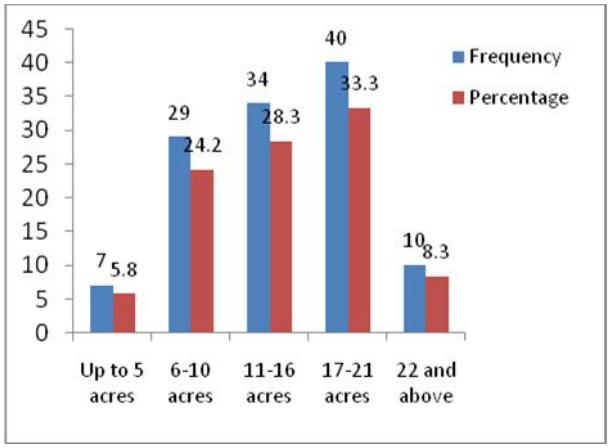

Figure 3 Graphical representation of respondents according to their farm size

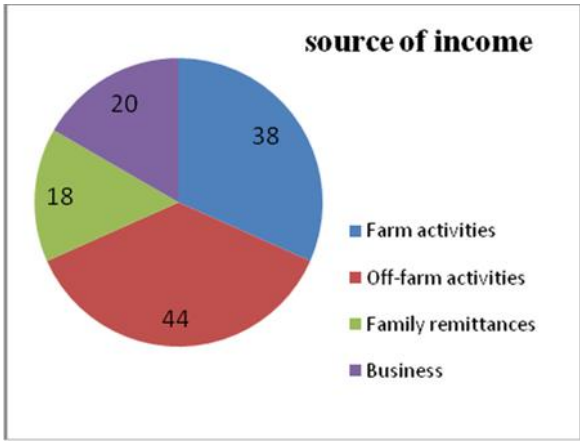

Figure 4 Graphical representations of respondents according to their source of Income

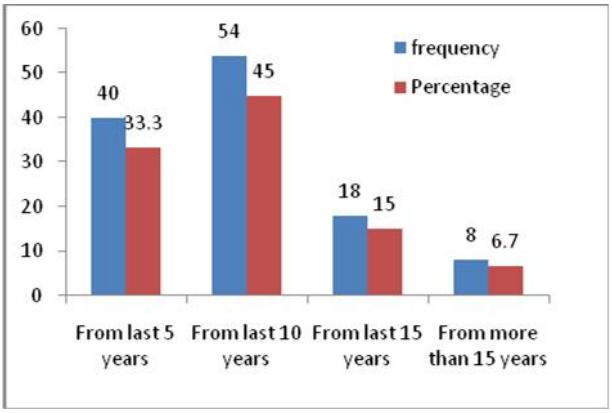

Figure 5 Graphical representations of respondents according to their experience

Figure 3 revealed that one third (33.3%) of the respondents were 17-21 acres of farm size, (28.3%) of the respondents were 11-16 acres of farm size, about $1/5^{th}$ (24.2%) of the respondents were 6-10 acres of farm size, (8.3%) 0f the respondents were above 22 acres of farm size and only a few number (5.8%) of respondents were up to 5 acres of farm size.

Regarding various sources of income, the respondents were divided into the four categories (i) Farm activities (ii) Off-farm activities (iii) Family remittances (iv) Business indicates

Regarding source of income result demonstrate that the majority (36.6%) of the respondents was used to earn from only off- farm activities,(31.7%) of the respondents were used to earn from farm activities (15.0%) of the respondents were used to earn from family remittances and (15.0%) of respondents were used to earn from business.

Figure 5 indicates that less than half 45.0% of the respondents had from last 10 years of experience, 33.3% of the respondents had from last 5 years of experience, 15.0% of the respondents had from last 15 years of experience and only a few 6.7% of the respondents had from more than 15 years of experience.

Table 1: Distribution of the respondents according to awareness about recommended sugarcane protection practices for insect/pest control

Insect/pest	Recommended chemical	Awareness			
		yes		No	
		f	*%*	*f*	*%*
Mites	Spiromerifen 240SC100ml/acre	73	60.83	47	39.16
Gurdaspur borer	Fipronil 0.3% granular 8kg/acre	81	67.5	39	32.5
Root borer	Fipronil8kg/acre	111	92.5	9	7.5
Stem borer	Fipronil8kg/acre	91	75.83	29	24.16
Top borer	Carbofuran8kg/acre	87	72.5	33	27.5
Termites	Chrlorpyriphos8KG/acre	95	79.16	25	20.83
Black bug	Materin300ml/acre	79	65.83	41	34.16
Sugarcane pyrilla	Karate+ Talstar	107	89.16	13	10.83
Sugarcane whitefly	Fluinicamide120gm/acre	106	88.33	14	11.66
Diseases					
Rust	Propiconazole250gm/acre	117	97.5	3	2.5
Red Rot	Benomyl 50% WP500gm/acre	120	100	0	0

Table.1 is about the awareness about the insects, pests and diseases of sugarcane crop which indicates that 60.83% respondents have the awareness about the mites of sugarcane and 39.16% respondents have no awareness about the sugarcane mites which damage the crop very badly. 67.5% respondents have the awareness about gurdaspur borer and 32.5% farmer have no awareness about the borer. 92.5% respondents have the awareness about root borer which attacks on the roots of sugarcane crop and damage it hard and 7.5% respondents have no awareness about the root borer. About 75.83% respondents have the awareness about the stem borer which attack on the stem of the sugarcane crop and destroy it. 24.16% respondents have no awareness about the stem borer. 72.5% respondents have the awareness about top borer which attack on the top of the sugarcane crop and destroy it and 27.5% farmer have no awareness about the top borer of sugarcane. 79.16% respondents have the awareness about termites and 20.83% farmer have no awareness about the termites of sugarcane. 65.83% respondents have the awareness about the black bug and 34.16% respondents have no awareness about the black bug of sugarcane crop. 89.16% respondents have the awareness about sugarcane pyrilla and 10.83% respondents have no awareness about it. About 88.33% respondents have the awareness about sugarcane whitefly which damage the crop very badly and 11.66% respondents have no awareness about the whitefly of sugarcane. Out of 120 respondents 117 which are 97.5% of respondents have the awareness about rust which is very fatal disease of sugarcane and 2.5% respondents are not aware of this disease. Out of total 120 respondents 100% respondents have the awareness about the reed rot disease of sugarcane crop and there is no single one respondent who have no awareness about this harmonic disease of sugarcane.

Table 2. Distribution of the respondents according to adoption of recommended chemicals for insect/pest control

Recommended chemical	Adoption			
	Yes		No	
	f	%	*f*	%
Spiromerifen 240SC100ml/acre	**53**	**44.16**	**67**	**55.84**
Fipronil 0.3% granular 8kg/acre	**89**	**74.17**	**31**	**25.82**
Fipronil8kg/acre	**83**	**69.16**	**37**	**30.83**
Fipronil8kg/acre	**83**	**69.16**	**37**	**30.83**
Carbofuran8kg/acre	**71**	**59.15**	**49**	**40.85**
Chrlorpyriphos8kg/acre	**78**	**65**	**42**	**35**
Materin300ml/acre	**62**	**51.66**	**58**	**48.33**
Karate+ Talstar	**95**	**79.16**	**25**	**20.83**
Fluinicamide120gm/acre	**103**	**85.83**	**17**	**16**
Propiconazole250gm/acre	**113**	**94.16**	**7**	**5.83**
Benomyl 50% WP500gm/acre	**117**	**97.5**	**3**	**2.5**

Table2. is about the adoption of recommended chemicals for the insects, pests and diseases of sugarcane crop which indicates that 44.16% respondents adopt the Spiromerifen 240SC chemical and about 55.84% respondents do not adopt this chemical. According to data 74.17% respondents adopt the Fipronil 0.3% granular chemical which is best for the remedy of gurdaspur bore and 25.82% respondents do not adopt it. According to table 69.16% respondents adopt the Fipronil chemical for the betterment and good production of sugarcane crop and 30.83% respondents do not adopt this chemical. About 69.16% respondents adopt the Fipronil chemical and 30.83% respondents do not adopt this chemical. Carbofuran chemical is best for the remedy of top borer 59.15% respondents adopt this chemical and 40.85% do not adopt it. 65% respondents adopt Chrlorpyriphos chemical which best for killing of termites and 35% respondents do not adopt it. 51.66% respondents adopt the Materin chemical for black bug and 48.33% people do not adopt it. 79.16% respondents adopt the Karate+ Talstar chemical and 20.83% respondents are not ready to adopt it. Table shows that 85.83% respondents use the Fluinicamide chemical for the killing of sugarcane whitefly and 14.16% respondents do not adopt it. According to research 94.16% respondents are using the Propiconazole chemical to get remedy of rust disease which spoil the crop and 5.83% respondents are not using it. Table indicates that 97.5% respondents are adopting the Benomyl 50% WP chemical to get remedy of red rot disease of sugarcane and 2.5% people are adopting it.

Table. 3 Distribution of the respondents according to needs which are required by farmers regarding insect pest management practices

Needs	Strongly disagree		Disagree		Somewhat agree		Agree		Strongly Agree	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Basic education	8	6.7	31	25.8	47	39.2	34	28.3	0	0.0
Technical skills	5	4.2	13	10.8	33	27.5	41	34.2	28	23.3
Experience level	0	0.0	5	4.2	28	23.2	59	49.2	28	23.3
Learning Ability	5	4.2	22	18.3	41	34.2	35	29.2	17	14.2
Team work	8	6.7	19	15.8	27	22.5	43	35.8	23	19.2
Any other	--	--	--	--	--	--	--	--	--	--

Table 3 shows that Training needs analysis is concerned with addressing skills gaps at the organizational level and the individual level, and falls under the remit of learning and development. Training needs to ensure the maximum return from training and skills throughout the organization. Training needs provide several benefits such as increased motivation, increased capacity to adopt the new technologies and methods. Table 4.11 indicates that majority (49.2%) of the respondents gave response that experience is a best way to require the insect pest management practices. Less than half (43%) of the respondents replied that the team work is another aspect to require the need of insect pest management and one- third of the respondents responded technical skills. Technical skills are another important parameter to assess the training because here in Pakistan, usually lacks of labor in technical skills which also plays important role in training regarding the insect pest management practices.

Table 4 Mean, Standard Deviation and Rank order according to needs which are required by farmers regarding insect pest management practices

Needs	Mean	Std. Deviation	Rank order
Experience level	3.91	0.79477	**1st**
Technical skills	3.62	1.10052	**2nd**
Team work	3.45	1.16569	**3rd**
Learning Ability	3.30	1.05954	**4th**
Basic education	2.89	0.89627	**5th**

Table 4show that the ‘’Experience level ranked 1st with the Mean value 3.9167 and std. deviation .79477 on the basis of training needs required by the famers regarding insect pest management practices. Technical skills (Mean=3.6250, std. deviation=1.10052), Team work (Mean=3.4500, std. deviation=1.16569) were ranked as 2nd or 3rd, respectively. Learning ability (Mean=3.3083, std. deviation=1.05954), basic education (Mean=2.8917, std. deviation=.89627) were ranked as 4th and 5th respectively.

Table. 5 Distribution of the respondents according to sugarcane grower’s perception about various factors causing effects on sugarcane production

Perception	Very low		Low		Medium		High		Very high	
	F	%	F	%	F	%	F	%	F	%
Effect by disease	2	1.7	12	10.0	30	25.0	44	36.7	32	26.7
Effect of plant density	0	0.0	24	20.0	51	42.5	40	33.3	5	4.2
Effect of weeds	2	1.7	18	15.0	50	41.7	47	9.2	3	2.5
Effect of non-availability of disease free seeds	2	1.7	11	9.2	28	23.3	45	37.5	34	28.3
Traditional-production technologies	0	0.0	32	26.7	48	40.0	34	28.3	6	5.0
Effect of traditional protection technologies	3	2.5	15	12.5	40	33.3	58	48.3	4	3.3
Effect of insects	2	1.66	22	18.33	7	5.83	39	32.5	50	41.5
Any other	--	--	--	--	--	--	--	--	--	--

Table. 5 indicates that Some various factors causing effects on sugarcane production such as effect by disease, effect of plant density, effect of weeds, effect of non-availability of disease free seeds, Traditional-production technologies, effect of traditional protection technologies and effect of insects. Majority 58% of the respondents replied the traditional protection technologies effect is a major factor to causing the quality of sugarcane, and one-third of the respondents were replied effect of insects factor is another factor to causing the quality of sugarcane quality, and about half of the respondents were replied the effects of weeds is another factor to causing the sugarcane quality. Non- availability of disease free seeds is a main factor to causing the quality of sugarcane.

Table.5 Mean, Standard Deviation and Rank order according to Sugarcane grower's perception about various factors causing effects on sugarcane production

Perception	Mean	Std. Deviation	Rank order
Effect of non-availability of disease free seeds	3.81	1.00405	**1st**
Effect by disease	3.76	1.01031	**2nd**
Effect of traditional protection technologies	3.37	0.84079	**3rd**
Effect of weeds	3.25	0.80436	**4th**
Effect of plant density	3.21	0.81151	**5th**
Traditional production technologies	3.11	0.86173	**6th**
Effect of insects	1.89	0.75366	**7th**

Table. 5 shows that the different perception of sugarcane growers about various factors to causing the quality of sugarcane. Effect of non-availability of disease free seeds on quality of sugarcane was ranked 1st with the Mean value 3.8167 and std. deviation 1.00405. Effect by disease and Effect of traditional protection technologies were ranked as 2nd or 3rd with the Mean value 3.7667, 3.3750 and std. deviation 1.01031, .84079 respectively. Effect of weeds with Mean value 3.2583 and std. deviation .80436, was ranked as 4th. Effect of plant density (Mean= 3.2167, std. deviation= .81151), Traditional production technologies (Mean=3.1167, std. deviation=.86173), Effects of insects (Mean=1.8917 std. deviation=.75366) were ranked as 5th, 6th, or 7th, respectively.

Table 6: Distribution of the respondents according to the awareness about modern biological and mechanical practices to control insects / pests.

Biological Control	Awareness			
	Yes		No	
	f	%	*f*	%
Ladybird beetle	**109**	**90.83**	**11**	**9.16**
Lacewings	**53**	**44.16**	**67**	**55.83**
Trichogramma	**27**	**22.5**	**93**	**77.5**
Any-other	-----	-----	-----	-----
Mechanical Control	**Yes**		**NO**	
	f	%	*f*	%
Light traps	**61**	**50.83**	**59**	**49.16**
Pheromones traps	**76**	**63.33**	**44**	**36.66**
Modern techniques	**81**	**67.5**	**39**	**32.5**
Any-other	-----	----	-----	-----

Table.6 indicates the awareness of respondents about modern biological and mechanical practices to control the insects and pests. According to the table 90.83% respondents have the awareness about ladybird beetle which is very beneficial insect for farmers and also known as farmer friend insect and only 9.16% respondents have no awareness about the ladybird beetle. Table shows that only 44.16% respondents have the awareness about lacewings insects which are also very beneficial insects for farmers and 47.5% respondents have no how know with these insects. 22.5% respondents have the awareness about trichogramma insects and 77.5% respondents have no awareness about these beneficial insects. In the table it is shown that 50.83% respondents have the awareness about light trap technique and rest 49.16% respondents have no awareness about these beneficial techniques. 63.33% respondents have the awareness about pheromones trap and rest 36.66% respondents have no awareness about this very beneficial technique. About 67.5% respondents have the awareness about modern techniques to control the attack of harmful insects and pests for high production level and 32.5% respondents have no awareness about modern techniques.

Table 7 Distribution of the respondents according to the adoption of modern biological and mechanical practices to control insects / pests.

Biological Control	**Yes**		**No**	
	f	**%**	***f***	**%**
Ladybird beetle	**21**	**17.5**	**99**	**82.5**
Lacewings	**3**	**2.5**	**117**	**97.5**
Trichogramma	**1**	**0.83**	**119**	**99.6**
Any-other	----------		----------	
Mechanical Control				
	f	**%**	***f***	**%**
Light traps	**29**	**24.16**	**91**	**75.83**
Pheromones traps	**7**	**5.83**	**113**	**94.16**
Modern techniques	**41**	**34.16**	**79**	**65.83**
Any-other	----------		----------	

Table 7 indicates about the adoption of modern biological and mechanical practices to control the harmful insects and pests of sugarcane crop. According to the table 4.16(b) 17.5% respondents adopt the ladybird beetle and 82.5% do not adopt this beneficial insect. Lacewings insects are another beneficial insects for sugarcane crop and just 2.5% respondents adopt it and other 97.5% do not adopt it. About 0.83% respondents adopt the trichogramma insects and rest 99.6% do not adopt it. There are some beneficial technuques are present by adopting them production of sugarcane crop can be enhance for example light traps, pheromones traps and some modern techniques but only 24.16% respondents adopt the light traps technique and 75.83% do not adopt it. Only 5.83% respondents adopt the pheromones traps technique and rest 94.16% do not adopt it. About 34.16% respondents are using modern techniques to overcome the harms of insects and pests of sugarcane crop and other 65.83% are not using these modern techniques.

Several reasons for low yield of sugarcane in Pakistan. Lack of breeding efforts for development of improved variety and poor availability of good quality seed to farmer was responsible for low yields. Ever increasing cultivation of pest and disease susceptible varieties was identified as a cause of concern. Lack of agricultural education and sowing of sugarcane in poorly prepared land decreases production of sugarcane crop. Conventional methods of sowing resulted in lower seed rates, hence lower yields. Imbalance use of fertilizers, late sowing, water scarcity, poor plant protection measures and lack of credit facilities to farmer were identified as causes for low yields and productivity. Poor cane procurement system and lack of understanding between farmers and mill owners further worsened the dire situation of sugarcane production in Pakistan.

Suggestions:

- Inputs should be given on subsidized prices and enhancement of storage facility should be done for sugarcane growers.
- To approach the far off places transportation facilities and incentives should be given to the extension field staff for the effectiveness of training programs.
- To aware the farmers about modern and improved technologies agricultural exhibitions should be arranged by the Agriculture department.
- Before the cultivation of crops Govt. needs to announce the fair prices.
- Certified and recommended verities should be adopted by farmers.
- Govt. should provide subsidies on inputs to farmers without any interest.

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