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Perception of the sugarcane farmers regarding effectiveness of integrated pest management in Punjab, Pakistan

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Abstract

Integrated Pest Management (IPM) is an environmentally friendly, combination of biological, chemical, cultural and mechanical technique which is used to control the sugarcane insects and pests in the world. The purpose of this study was to analyze the perception of the sugarcane farmers regarding the effectiveness of integrated pest management in Punjab, Pakistan. The study was conducted in District Rahim Yar Khan purposively as it has most of the fertile areas under cultivation of sugarcane due to the recent paradigm shift from cotton to sugarcane. Tehsil Sadiqabad and Rahim Yar Khan were selected purposively as they have comparatively more area under the cultivation of sugarcane. From each tehsil, two rural union councils were selected randomly. Out of each selected rural union council, 30 respondents were selected randomly. The results revealed that the awareness level of the respondents regarding inter-cultivation recommended dose of pesticides and seed treatment was 58.33%, 55.83%, and 41.67% respectively. It also indicated that only 23.3% of the respondents were fully knowledgeable about the use of biopesticides and less than twenty percent (19%) of the growers had full knowledge about the use of natural enemies against sugarcane pests. Whereas 19.2% of the respondents were fully aware of the use of light and pheromones and 15% had full knowledge about the trap picking of insect pests, hot water treatment 18.3%, and pest monitoring 5.0%. There is a dire need to create awareness campaigns regarding the effectiveness (through mass media) in coordination with public and private sectors to improve the adoption level of integrated pest management among sugarcane growers.

Keywords: Sugarcane Pest, Pesticides, Environmental Health, Human Health, IPM, Perception of Growers, Sustainable Sugarcane Production

Introduction

Sugarcane is an important cash crop grown all over the world. It plays an important role in the economy of Pakistan. It is a basic source of sucrose in human diet all over the world. It is used for making of brown sugar, white sugar and jaggery production. There are many byproducts of sugarcane like bagasse and molasses (GOP, 2016). Pakistan is the world's seventh

largest sugar producer as well as eighth largest sugar consumer, while it is also the world's fifth largest cane sugar producer as well as sixth largest net exporter of white sugar (PSMA, 2016). Sugarcane is grown on an area of 1.22 million hectares providing raw material for 89 sugar mills in the country and its production is 73 million tons recorded in Pakistan. Pakistan

sugarcane contribution in the world level is only 3% and its contribution in the sugar industry of Pakistan is 98%. Sugarcane sector contribution is 0.7% in the GDP and it also has 3.6% role in the overall agriculture sector of Pakistan (PSMA, 2017). Increased climate variability and extreme weather events are negatively impacting food stability, food production and livelihood of the farmers and vulnerable people. Threatened ecosystem services are limiting our capacity to achieve sustainable agriculture in the long run. The national average yield of almost all the crops is low and productivity is declining over time due to climate change effects. The crop is damaged by a number of insect pests. There are 2000 species of insects have been recorded on sugarcane but only few insects are reducing sugarcane production. So, some are the important pests which affect the different stages of growth, the majors are root borer, shoot borer, top shoot borer, pathogen and nematodes. There are few sucking insects like sugarcane pyrilla and whitefly which are serious pests of sugarcane crop throughout Pakistan. Diseases and insects pests are the major causes in reducing the economic value of sugarcane production which is about 20% to 30% in Pakistan (Sanyal et al., 2008). Sugarcane farmers are frequently using toxic chemicals to control the insects' pests' population. Due to frequently usage of insecticides, insects are becoming tolerant against chemicals. Usage of the excessive insecticides is threatening to the health of sugarcane farmers and also kills natural enemies of the pest as well as disturbs the natural ecosystem. One of the safest ways to overcome the insect's pest's population and reduce the impact on natural ecosystem is the use of integrated pest management (Gibbons et al., 2015; Wijnands, 2012). Integrated Pest Management (IPM) is an ecological approach to pest management that based on a combination of conventional practices. IPM is an inclusive use practices and up-to-date information related to life cycle of the pest and their ecology. Cane farmers who used the IPM for pests control have reduced insects' pests' population while those who did not practice IPM faced serious problems of insects' pests in North America (Alyokhin et al. 2015). The reality is that sugarcane farmers, who practice IPM for controlling pests, prevent resistance problems while those who lead the "old ways" lose control over pests on their farms. Clearly identified the IPM's potential to reduce dependence on conventional pesticides while maintaining plant productivity and plant efficiency (Lechenet et al., 2017).

The main objective of the research was to analyze the perception of the sugarcane farmers regarding effectiveness of integrated pest management in district Rahim Yar Khan. This research will help to sort the current challenges of sugarcane growers regarding sugarcane protection threats. It will also help the government mitigate the sugarcane growers' problems and formulate policies to ensure the adoption of IPM for increasing sustainable sugarcane production and enhancing the income of the small cane growers.

Methodology

The present study to access the perception of sugarcane growers regarding the effectiveness of integrated pest management was conducted in the purposively selected province Punjab, Pakistan. The multistage sampling technique was used for the selection of respondents for the present study. Province Punjab comprises of 32 districts. Among them, District Rahim Yar Khan was selected purposively as it has the most fertile area under cultivation of sugarcane due to the recent paradigm shift from cotton to sugarcane. District Rahim Yar Khan comprises of 4 Tehsils Kanpur, Liaquatpur, Rahim Yar Khan, and Sadiq Abad. Among four Tehsils, two tehsils i-e Tehsil Rahim Yar Khan and Tehsil Sadiq Abad were selected purposively as they have comparatively more area under the cultivation of sugarcane. All the sugarcane growers in Tehsil Rahim Yar Khan and Tehsil Sadiq Abad were considered as a population of the study. From each tehsil, two rural union councils were selected randomly. Out of each selected rural union council, 30 respondents were selected randomly to make a sample size of 120 respondents.

Results and Discussion

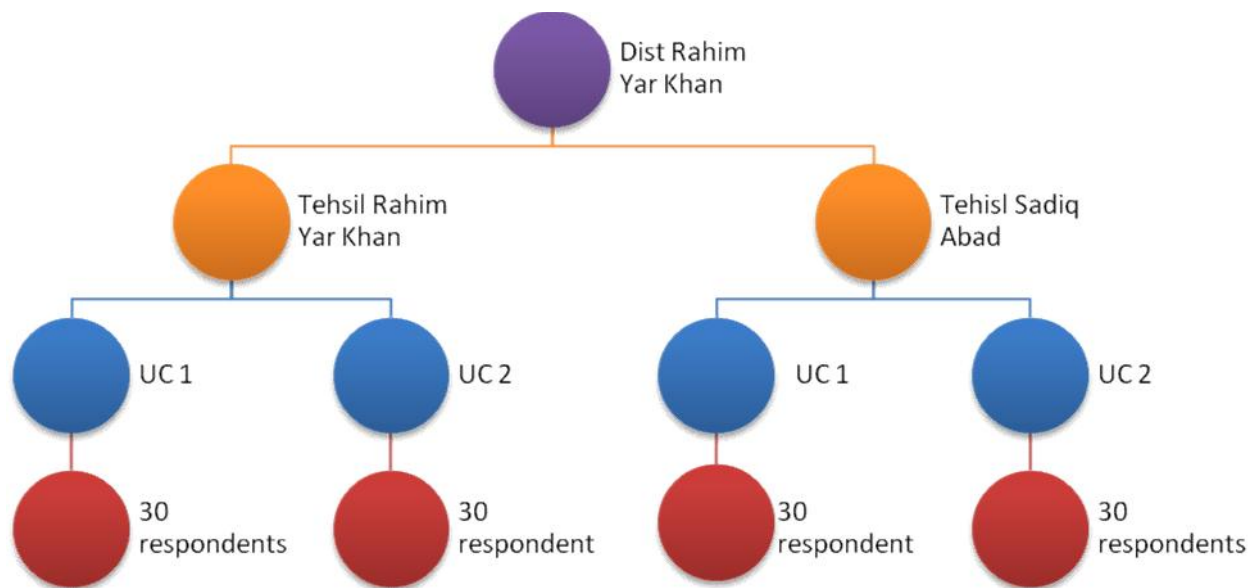


Fig 1: Flow chart showing sample selection procedure for the purposed study

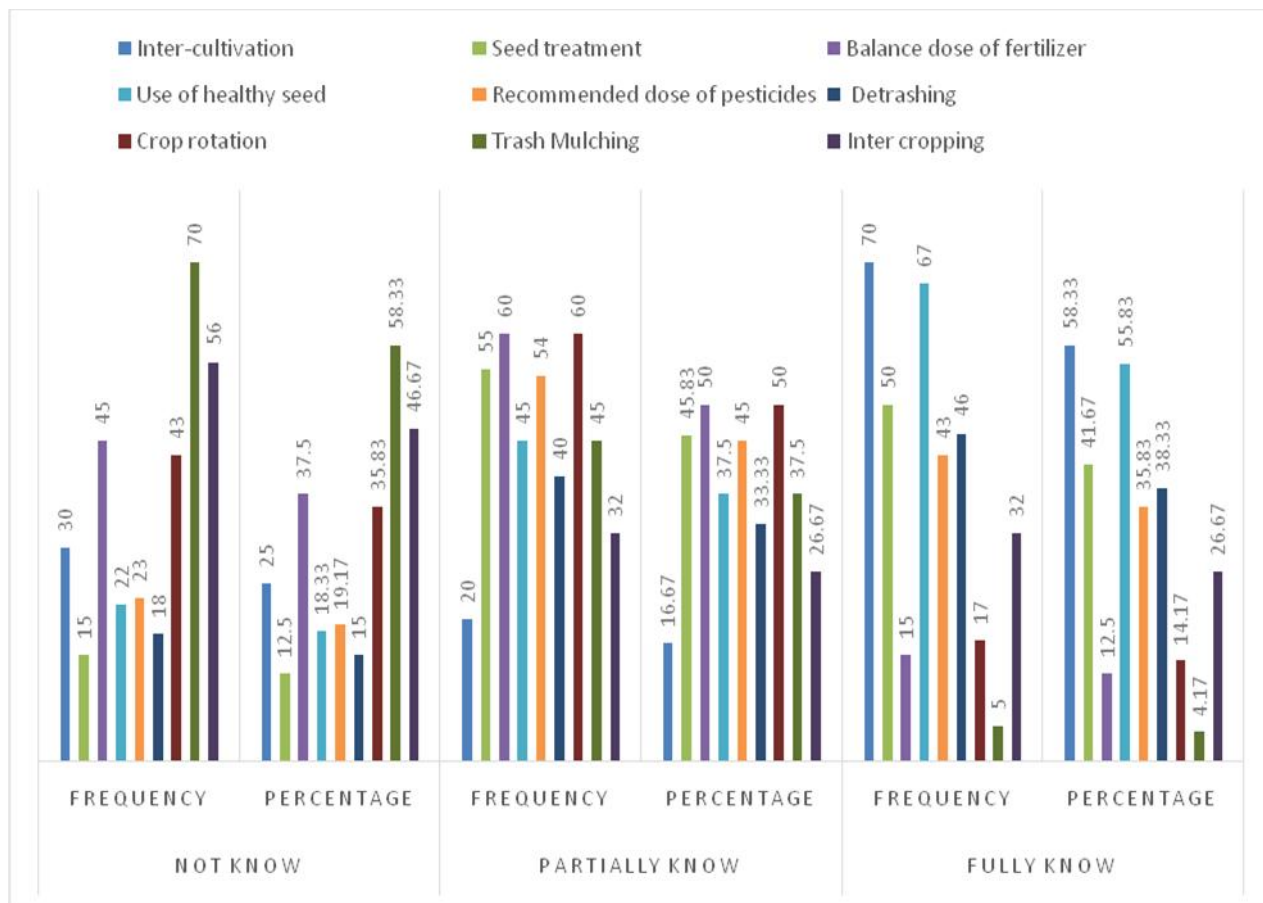


Fig.1 Perceived the perception of sugarcane farmers regarding cultural methods in the study area.

Figure 1 indicates the response of the respondents regarding the knowledge of cultural practices. Responses of the growers were ranked in three different rated scales (not know = 0, 1= partially know, 3= fully know). The data presented in figure 1 depicts the awareness level of different practices such as summer hoeing, seed treatment, balance dose of fertilizer, judicious use of pesticides, recommended dose of pesticides, soil treatment, crop rotation, mulching, and intercropping. Above all the cultural practices awareness level of the respondents regarding inter-cultivation, recommended dose of pesticides, and seed treatment were (58.33%, 55.83%, and 41.67%) respectively. The knowledge of the remaining cultural practices was lower as perceived by the sugarcane growers. Inter-cultivation is also one of the important practices to be followed in the sugarcane ecosystem to bring down many insect pests. It is the best suitable practice which increases the fertility and moisture conservation of the soil and enhances the resistance of the sugarcane to bring down the population of insect pests such as weeds and nematodes. There are

different agronomic practices which are used to control insect pest. The use of a healthy seed of sugarcane is one of the best practices to avoid insects' pests and second practice is crop rotation and intercropping is considered important to avoid the similar types of insect pests that adversely affect the sugarcane production (van Antwerpen, 2005; Pillegowda, 2010). Detrashing eliminates or reduces the population of scale insect; shoot borer, mealy bugs and woolly aphids whenever a possible intercropping system is followed like garlic or onion or coriander for early shoot borer. So, it is going to keep away some of the insect pests especially shoot borer, and don't return the water shoot which is going to attack all the insect both sucking insect pests and the borers. Thereby, remove watery shoots because it contains less sucrose. In this practice, deep harvesting is done which helps in the destruction of stubbles as well as maintain or reduce the population of insect pest in the next season (Leslie, 2004). Trash mulching increases the natural enemies and reduces the pest population especially early shoot borer (Salin, 2007).

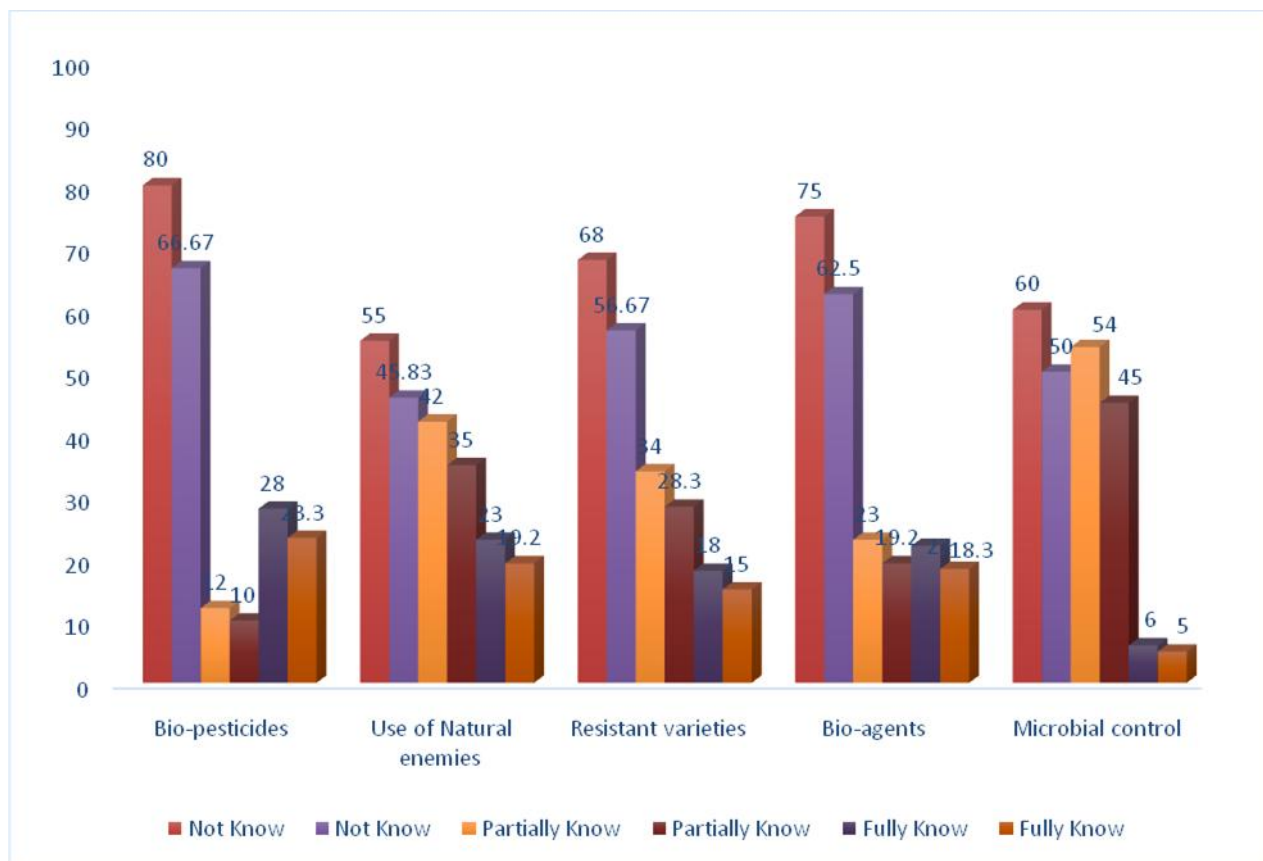


Fig. 2 Perceived the perception of sugarcane farmers regarding Biological methods in the study area.

Figure 2 shows the answer of the respondents regarding the knowledge of Biological methods of IPM practices among sugarcane farmers. In this table, the responses of the farmers were ranked in three different rated scales (not know = 0, 1= partially know, 3= fully know). The data presented in figure 2 describes the awareness level of biological methods of IPM practices such as bio-pesticides, use of natural enemies, resistant varieties, bio-agents, and microbial control. Only 23.3% of the respondents were fully aware regarding the use of biopesticides and less than twenty percent (19%) of the growers had full

knowledge of natural enemies whereas the knowledge of the growers about the remaining IPM practices was very low. Sugarcane resistant and high yielding varieties grow like CPF-246 and CPF-247 in the province of Punjab similarly Thatta-10 and LRK-2001 in Sindh province. In case of early shoot borer earthing up is an important practice to reduce its infestation very effectively (Chatta, 2007) gained popularity among growers. Biological control agents can maintain themselves and spread natural enemies, plants and persons are useful in an area where biological control is used (Bashir *et al.*, 2007).

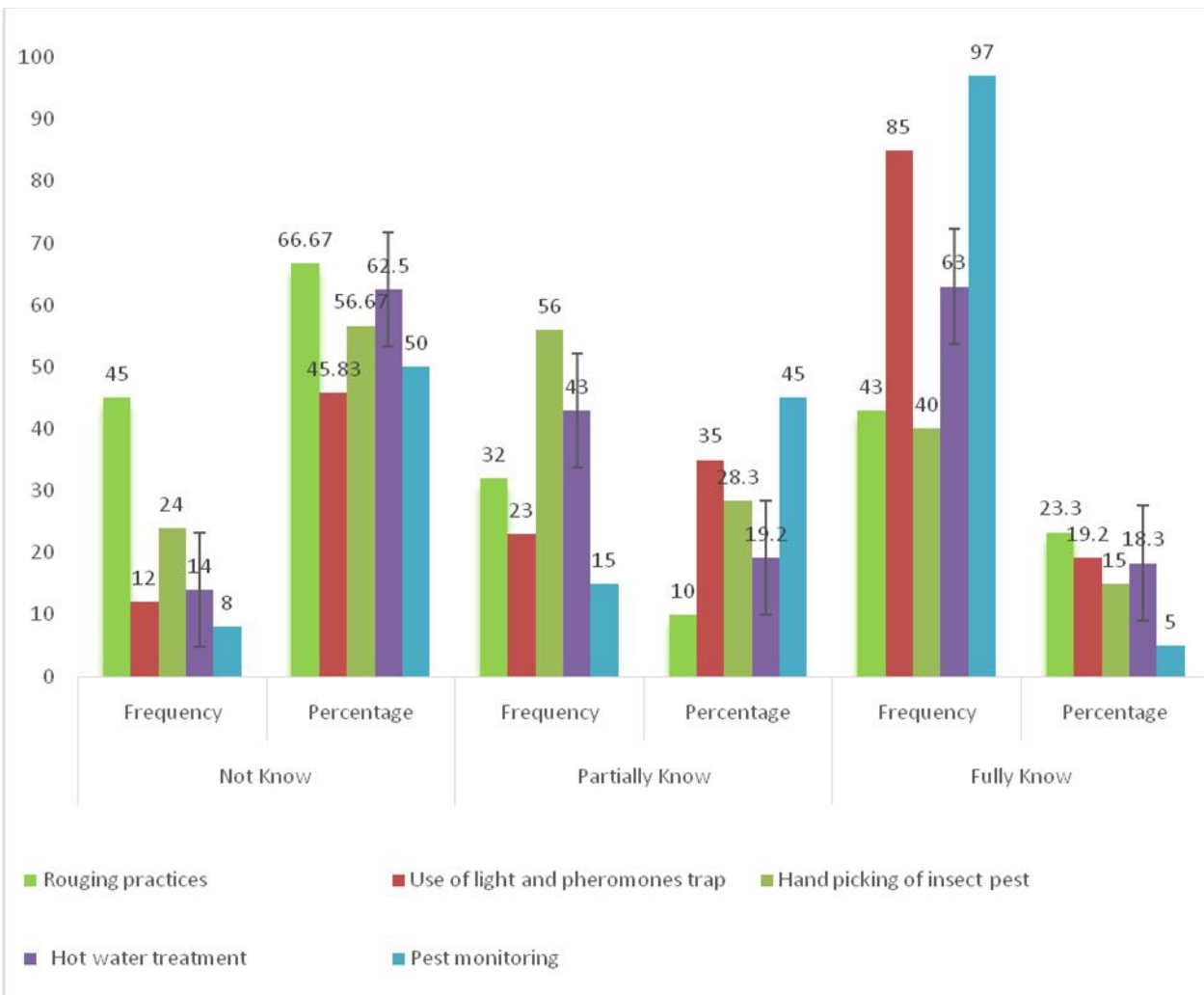


Fig.3 Perceived the perception of sugarcane farmers regarding mechanical methods in the study area

Figure 3 indicates the knowledge of mechanical methods of IPM practices perceived by the sugarcane growers. In this table, the responses of the farmers were ranked in three different rated scales (not know = 0, 1= partially know, 3= fully know). The data presented in figure 3 indicates the responses of the

respondents who were fully known about the mechanical methods of IPM practices such as bio-pesticides 23.3%, the use of light and pheromones trap 19.2%, picking of insect pests 15.0, hot water treatment 18.3% and pest monitoring 5.0%.

Table.1 Perceived the different factors affecting the adoption of IPM practices among sugarcane farmers

Factors	Mean ± S. D	Rank Order
Lack of awareness	4.316±.467	1
Slowly result orientated	4.01±.484	2
Less effective in high temperature	3.66±.555	3
Risk orientation	2.27±.961	4
Complicated	2.05±1.071	5
Achievement motivation	1.85±.972	6

Table 1 describes the factors affecting the adoption of IPM practices among sugarcane farmers. The sugarcane growers perceived that lack of awareness was at first rank with mean value 4.316 as a factor affecting the adoption of IPM practices. Similarly, slowly result, less effective in high temperature, risk orientation and complicated were ranked 2,3,4,5 and 6 with mean value 4.01, 3.66, 2.27, 2.05 and 1.85 respectively.

Conclusion

Sugarcane pests have become serious threats in sugarcane production. These pests affect its production by about 20 to 30%, which has a negative impact on sugarcane production. So, the excessive use of pesticides to control pests has become vulnerable to weather hazards and the environment as well as creating resistance in sugarcane pests. In addition to the loss of economic development which indirectly affects natural resources, food security, and livelihoods of sugarcane farmers. It is essential for detecting the harmful insect pests of sugarcane in order to improve the knowledge level of the farmers regarding different practices adopted in integrated pest management. It reduces the risk of damage; increase the production of sugarcane and kill the pest effective manner. As a result, the damage to sugarcane crops from pests is minimized. There is a dire need to create awareness campaigns regarding the effectiveness of integrated pest management (through mass media) in coordination with public and private sectors.

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