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EFFICACY OF DIFFERENT INSECTICIDES AGAINST SUGARCANE WHITEFLY (*ALEUROLOBUS BARODENSIS* MASK)

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ABSTRACT

The present study was conducted in a farmer field of tehsil Kot Addu, district Muzaffargarh to evaluate the efficacy of different insecticides available in the market against sugarcane whitefly (*Aleurolobus barodensis* Mask) in ratoon US-633 sugarcane variety. There was a total five treatments including a check. Four insecticides including Oshin (Dinotefuron), Movento (Spirotetramate), Pyriproxyfen (Pyriproxyfen) and Matoi (Pyrifluquinazon) were used at the dose of 100 g, 125 ml, 500 ml and 200 g per acre respectively. The randomized complete block design was followed with three replications of each treatment. Insecticides were sprayed when the pest had reached the economic threshold level and data were recorded after three, seven, fourteen, twenty one and twenty seven days after treatment for comparison with pre-treatment pest population data. Results revealed that Matoi (Pyrifluquinazon) was the most effective insecticide against sugarcane whitefly in ratoon US-633 sugarcane variety with highest corrected mortality of 84.4 % followed by the Movento (Spirotetramate) with about 80% corrected mortality. The minimum corrected mortality (64 %) was resulted after spray of Oshin (Dinotefuron). It is concluded that Matoi (Pyrifluquinazon) should be recommended for control of sugarcane whitefly ata dose of 200 g/acre.

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INTRODUCTION

Sugarcane is an important gramineous crop with perennial growth pattern into tall sticks. Sugarcane crop is mainly utilized in the sugar industry and some other industries like paper, molasses, bio-diesel and its byproducts are used as fuel in bricks kilns, domestic fueling and small industrial fueling (James and Tate, 2004; Koohzad et al., 2017). This crop is providing major industrial raw material in sugarcane industry (Sadeghzadeh et al., 2011). Sugarcane crop is grown on large areas and its production is divided into many mill zones of Punjab, Pakistan. District Muzaffargarh has three working sugarcane mills, therefore, it is grown as monoculture crop in irrigated areas of Muzaffargarh.

Due to monoculture cropping pattern of sugarcane in Muzaffargarh, many insect pests have developed on sugarcane crop including *Aleurolobus barodensis* (Maskell) and *Neomaskellia andropogonis* (Corbett), the two different species of whitefly. In Pakistan, mostly reported whitefly on sugarcane was *Aleurolobus barodensis* (Maskell). *A. barodensis*) is very serious and economical pest of sugarcane in Pakistan as well as Iran

(Koohzad et al., 2021).

Sugarcane whitefly attack increases from late July to mid of September or even late of November until there is a rapid fall in temperature (Minaeimoghadam et al., 2010). The initial attack of sugarcane can start from early June as the relative humidity starts to increase. Immatures of this pest are found underside of the leaves and suck the plant sap resulting in heavy excretions causing sooty mold development on lower leaves. Sooty mold development has lethal effect on photosynthesis and cause heavy weight loss and reduces sugar recovery. In case of heavy infestation, the drying of whole plant has also been reported (Askarianzadeh, 2011; Askarianzadeh and Manzari, 2006). The occurrence of sugarcane whitefly has been reported from many sugarcane growing countries like Pakistan, Iran and India (Masood et al., 2011; Vemuri et al., 2014; Vijayaraghavan and Regupathy, 2006). Field studies have shown that males of this pest lived for a month and females are prolonged one week extra from males (Pandya, 2005).

Management of sugarcane whitefly includes the biological control, cultural control, resistant varieties and chemical control (Chaudhary and Jaipal, 2006; Goebel and Nikpay, 2017; Jena and Nayak, 2005; Khadempour et al., 2014; Koohzad et al., 2017, 2018; Pastagia et al., 2002). Chemical control is mostly preferred by the farmers due to quick results. Chemical control is also only feasible method when pest has developed above the ETL and ecological parameters are hindering other controlling methods. The spray of monocrotophos 36 WSC, endosulfan 35 EC, triazophos 40 EC, carbosulfan 25 SP, acephate 75 SP and Neemark (azadirachtin 100 EC) were some commonly used insecticides in earlier period against sugarcane whitefly (Ananthanarayana et al., 1994; Bhavani and Rao, 2013; Rai et al., 1996). Imidacloprid and dimethoate were also successfully used individually and in combination with other cultural practices (Bhavani and Rao, 2013). Deltamethrin, dinotefuran and spiromesifen were also used against this pest and suggested to be used in integrated pest management programs (Koohzad et al., 2021). The present study was therefore, planned to evaluate the available new chemistry insecticides against the sugarcane whitefly.

MATERIALS AND METHODS

The experiment to evaluate the efficacy of different insecticides against sugarcane whitefly was conducted in tehsil Kot Addu, district Muzaffargarh in Fatima Sugar Mills zone. The Ratoon sugarcane crop cv. US-633 from a plot was selected after a preliminary survey in the month of July 2020. The continuous weekly observations were recorded, and trial was started when sugarcane nymphal population reached ETL. The selected insecticides viz, Oshin (Dinotefuron), Movento (Spirotetramate), Pyriproxyfen (Pyriproxyfen) and Matoi (Pyrifluquinazon) were purchased form the pesticide market (Table 1).

Table 1: Details of treatments applied for controlling whitefly in sugarcane crop.

Name of insecticide	Generic Name	Formulation	Dose/acre	Marketed by
Oshin	Dinotefuron	20% SG	100 gm/A	Arysta Lifescience Pakistan (Pvt) Ltd.
Movento	Spirotetramat	240 SC	125ml/A	Bayer Crop Sciences Pakistan (Pvt) Ltd
Pyriproxyfen	Pyriproxyfen	10.8% EC	500ml/A	Jaffr Agro Services (Pvt.) Ltd.
Matoi	Pyrifluquinazon	20% WG	200gm/A	Jaffr Agro Services (Pvt.) Ltd.
Control	-	-	-	

The population of sugarcane whitefly reached above ETL at the end of June 2020. The first Spray was applied on 6th of August 2019 after recording pretreatment data. The data were recorded after three, seven, fourteen, twenty one and twenty seven days after treatment. The experiment was repeated after normalization of natural whitefly population and results were pooled. The corrected percent mortality was calculated using the Henderson and Tilton's (1955) equation given below;

$$\text{Corrected \%} = 1 - \frac{\text{n in Co before treatment} \times \text{n in T after treatment}}{\text{cn in Co after treatment} \times \text{n in T before treatment}} \times 100$$

Where: n = Whitefly population, T = treated, Co = control

Computer based analytical software Statistix 8.1 was used for the analysis of data (Anonymous, 2005). The data of sugarcane whitefly (nymphs) were subjected for analysis of variance through two-way factorial (Mean corrected mortality) and RCBD for whitefly population after 3,7,14, 21 and 27 days of treatment. Means were separated using Tukey's HSD (α=0.05).

RESULTS AND DISCUSSION

Effect of insecticides on corrected mortality

The data generated from this study revealed that the insecticides were significantly effective over control for the management of whitefly and were statistically significant with each other as shown in figure 1. The analysis of variance has been shown in Table 2. Maximum percent corrected mortality (80.5%) of sugarcane whitefly nymphs was resulted after the treatment of Pyrifluquinazon @ 200 g/acre in US-633 plot followed by Spirotetramat @ 125 ml/ acre as shown in Figure 1. The minimum nymphal corrected mortality was observed in with Dinotefuron which was 65% (Figure 1).

The results of this study are similar with earlier studies which showed that Pyrifluquinazon has the ability to control eggs, immatures and matures of sugarcane whitefly as well of mites on greenhouse crops (Vemuri et al., 2014). The earlier studies have also shown that sugarcane whitefly was not reduced to 100 % as spraying equipment plays an important role at this stage of crop (Bhavani and Rao, 2013).

Table 2. Analysis of variance regarding corrected mortality of sugarcane whitefly.

Source	DF	SS	MS	F		P		
Replication		2		167.2	83			
Treatments		3		567.3		189	29.1	0.0006
Error	6		38.9		6.48			
Total	11		773.2					

Grand Mean 76.264 CV 3.34

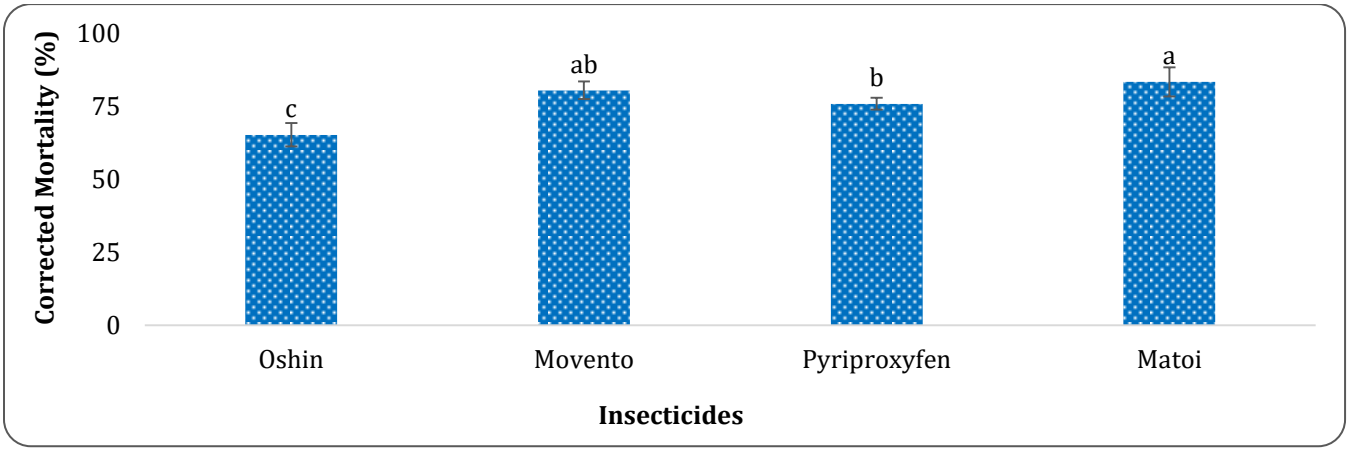

Figure 1: Effect of insecticides application on percent corrected mortality of sugarcane whitefly (Nymphs).

Effect of insecticides on whitefly population after treatment

The effect of different insecticides applied for the management of sugarcane whitefly was similar and revealed that all insecticides were effective against whitefly when applied in repetition. The maximum whitefly population reduction was observed after 27 days and then started to increase in all treatments without any statistical difference as shown in Figure 2. Overall population of whitefly (nymph) was higher (above 40/leaf) in control as compared with other insecticides showing gradual decrease in population.

The results of present study are authenticated by earlier studies showing that the mortality of sugarcane whitefly

nymphs started after five days of treatment and there was a gradual decrease as shown in Figure 2 (Behnam et al., 2020). Similarly, Lee et al. (2002) has shown that pyriproxyfen had good enough activity against sugarcane whitefly nymphs as shown in Figure 1 in this study. Pyrifluquinazon is merely tested against the sugarcane whitefly earlier so there is not enough literature is about its efficacy.

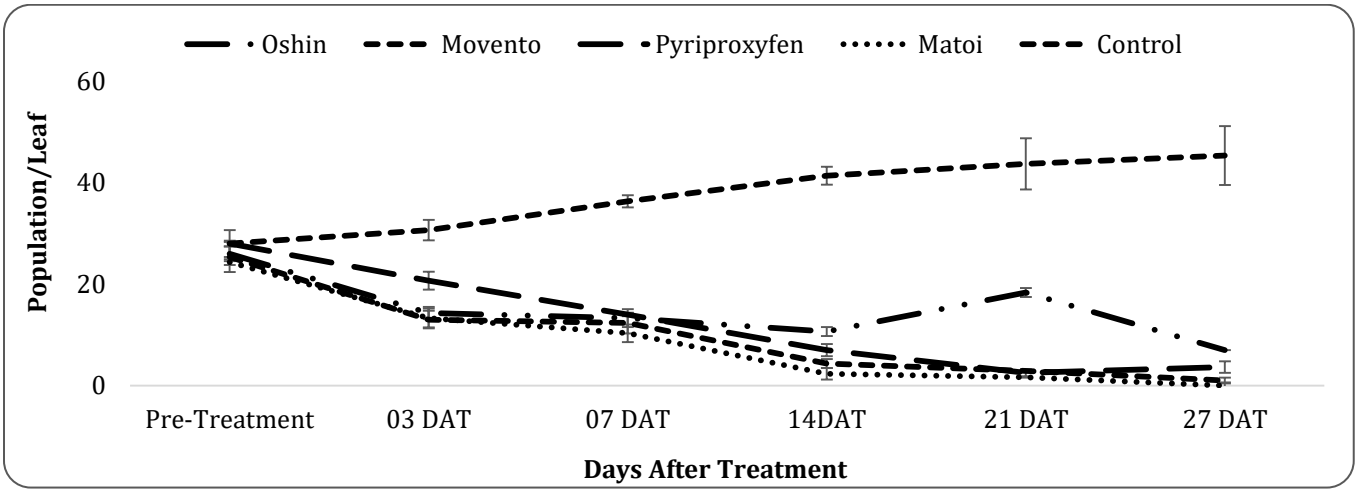

Figure 2: Effect of insecticides application (mean of repeated treatment observations) on percent corrected mortality of sugarcane whitefly (Nymphs).

CONCLUSION

In conclusion, the appropriate use of insecticides in alternation could improve control of sugarcane whitefly. Pyrifluquinazon @ 200 g/acre, minimized the whitefly infestations and reduced the risk of whitefly resistance to insecticides.

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AUTHOR'S CONTRIBUTION

WM designed the study, WM, SH, MZ and MWS conducted the experiment, collected the data, WJ analyzed the data statistically, WM wrote the manuscript and all the authors reviewed it.

CONFLICT OF INTEREST

Regarding the publication of this manuscript, there is not any conflict of interest among authors.

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