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In vivo efficacy of two synthetic insecticides and two bio-extracts against maize stem borer (*Chilo partellus*)

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Abstract

Effect of different insecticides and bio extracts was studied against maize stem borer *Chilo partellus* (Lepidoptera: Pyralidae). The experiment was conducted at the farm of Cereal Crop Research Institute (CCRI) Pirsabaq, Khyber Pakhtunkhwa, Pakistan during July to September, 2014. Four treatments Refree® @ 1kg/acre, Neem extract@ 5%, Lannate25sp® @ 350g/100L, garlic extract @ 10% along with control plot, replicated three times. It was concluded from the study that synthetic insecticides Refree® and Lannate® proved to be best and show higher biological efficiency (47.46) and (44.05) respectively as compared to bio extracts (neem, garlic). The neem extract gives better results than garlic extract@10% and control plot. Therefore Lannate® and Refree® are recommended for quick and best control of maize stem borer in maize crop.

Keywords: Maize stem borer, *Chilo partellus*, neem extract, garlic extract, Refree and Lannate

1. Introduction

Maize (*Zea mays* L.) is the third major and important kharif crop of the world after wheat and rice and is the highest yielding crop. This crop is mainly grown on tropical, subtropical and temperate region of the world. Besides its nutritive values, it is also a good source of high quality edible oil. Due to high yielding capacity and short growth duration, maize increasingly gaining important position and is also used as a fodder crop. Maize is also increasingly gaining important position due to its high yielding capacity and short growth duration. It is also used as a fodder crop. Maize is also used in industry for preparing of different products like corn sugar, corn oil, corn protein, corn flakes and corn syrup [1]. Maize grain is also being increasingly used in animal and poultry feed and grown as a fodder crop for silage [15]. During winter maize is consumed as food in the villages but major portion of it goes to wet milling, poultry and animal feed industries. After Khyber Pakhtunkhwa, Punjab is the largest maize growing province in Pakistan [9]. Maize being the highest yielding crop and have a significant importance for a country like Pakistan where due to increasing population the food supplies becomes deprived. It is 90 days crop and 3 crops are gain per year. It can act as the alternate food source when the conventional cereal grains such as wheat and rice are deficient. Pakistan has sufficient advantages to grow maize crop because it is the third most important cereal after wheat and rice and is currently planted on 1.026 million ha area with 2.986 million tonnes grains, and an average national yield of 2893 kg/ha [6]. Plenty of factors are responsible for this lower production in the country, among which the insect pest is the most important and major one. Sorghum shoot fly (*Atherigona varies soccata*), maize jassid (*Zignia* Spp.), cutworm (*Agrotis ipsilon*), corn ear worm (*Heliothis armigera*) and corn aphid (*Rhopalosiphum maidis*), Snail (*Helix* spp.) and the maize borer, (*Chilo partellus*) are pest of maize crop [3]. The young larvae first feed on leaves making a few shot holes and then bore their way downwards through the central whorl, reaching the growing point of the maize plant. As the whorl opens more shot holes are visible, that indicate the earlier attack and the plant also shows dead hearts [1]. Yield losses of 24-75% have been reported by the attack of this pest alone [7] [8]. 10-50% damage by maize stem borer in Peshawar valley was reported [5]. According to [12] in a conservative estimate 20-30% of the crop is destroyed by the stem borer. For increasing population, upgrading maize production is considered to be the major strategy for food security. Keeping in view the importance of the crop, and the demoralizing capacity of the pest, the present research work was initiated to investigate the suitability of two bio extracts

and two synthetic pesticides for effective and safe suppression of *C. partellus*.

2. Materials and Methods

Study on comparison of two bio extracts with two different synthetic pesticides against maize stem borer (*Chilo partellus*) was carried out in Cereal Crop Research Institute (CCRI), Pirsabaq, Khyber Pakhtunkhwa, Pakistan. Maize variety, Iqbal was sown during July to September, 2014. There were five treatments replicated three times in a Randomized Complete Block Design (RCBD). The plot size was (3x4 m²) with row to row distance of 75 cm and plant to plant distance of 25 cm. All the treatments were given standard agronomic practices. Ten plants were randomly selected from each treatment for data collection. Data was recorded 1 hour before pesticide application. After application of treatments, data was collected at 24 hours, 48 hours and 72 hours, one week and two weeks interval. Two synthetic and two bio extracts were applied after the pests reached their economic threshold levels. Their details are as follows;

2.1 Synthetic pesticides

Trade name	Common name	Dosage
Lannate 25 _{SP} ®	Methomyl	350g/100Lwater
Refree3G®	Carbofuran	1 kg/acre

2.2 Synthesis of bio extracts

2.2.1 Preparation of Neem Extract

Neem seed was bought from local market and crushed with a grinder to fine powder the 200g was taken along with 10g detergent and tightened in muslin cloth and placed in 2 litre water for 24 hours to make a stock solution of 20% and further concentration 5% were prepared will prepare from it with below mention formula $C_1V_1=C_2V_2$.

2.2.2 Preparation of Garlic Extract

Garlic bulbs were crushed in grinder and tightened in muslin

cloth and squeezed so as to get pure garlic extract. 10% solution was prepared using formula.

$$V_1 C_1 = V_2 C_2$$

V_1 = Volume of water which is required

V_2 = Volume of known quantity

C_1 = Given concentration

C_2 = Required concentration

2.3 Statistical Analysis

The data were analyzed using STATISTIX 8.1 computer software and means were compared using LSD test at 5% level of significance.

3. Results

Table 1 showed that Lannate® (2.67) and Refree3G® (2.67) showed significant control of maize stem borer as compared to Bio extracts (Neem, Garlic) which were better than check plot (5.67) on 1st day. 2nd day data showed that only Refree3G® and Lannate® control the population of maize stem borer significantly. The reason for non significant difference among bio extracts and control was environmental factors i.e. rainfall few hours after application of pesticides on sunny day. Table shows that on 3rd day Lannate® (2.67) and Refree3G® (2.67) significantly controlled maize stem borer population than the bio extracts which were significantly different from control (5.67). Data of 1st week after application showed that Lannate®, Refree3G® and Neem were significantly better while both control plot and garlic showed no-significant decrease in the population of maize stem borer. ?? Shows that Refree3G® (4.33) and Lannate® (4.33) significantly controlled maize stem borer population on 2nd week, while the bio extracts and control didn't showed any better control and were non-significant with each other. It is evident from the result that there were significant differences among the treatments and control.

Table 1: Mortality of maize stem borer after application of first spray

Treatments	1 st Day	2 nd Day	3 rd Day	1 st Week	2 nd Week
Refree3G®	2.67 c	3.33 b	2.67 c	3.00 b	4.33 b
NSE @5%	4.33 b	4.67 a	4.33 b	4.00 b	6.67 a
Garlic @10%	5.00 ab	5.00 a	4.00 b	5.67 a	6.33 a
Lannate25 _{SP} ®	2.67 c	3.33 b	2.67 c	2.67 b	4.33 b
Control	5.67 a	5.33 a	5.67 a	6.66 a	7.33 a
LSD	1.06	1.06	0.97	1.52	1.14

Table 2 data showed mean number of damage plants by maize stem borer on the first day. Refree (2.33) significantly better from all other treatments followed by Lannate 25_{SP}® (3.33) NSE (4.33) and Garlic (4.67) statistically no significant difference was recorded between NSE 5% and Garlic 10%; all the treatments were better from control. Data recorded on the second day showed that Refree and Lannate were found better and show no difference among each other which were followed by NSE 5%, Garlic and control. On third day no difference was recorded between treatment Refree, Lannate

and NSE 5% and better from garlic and control which show no significant difference to each other. After one week data showed that synthetic insecticides Refree (5.33) and Lannate (5.00) were again found better followed by NSE 5%, Garlic (8.67) and control (9.67). Data recorded after two weeks showed that Refree, Lannate and NSE5% significantly controlled the maize stem borer population and showed no significant difference amongst each other and were found better from Garlic (11.33) and Control plot (12.33).

Table 2: Mortality of maize stem borer after application of second spray

Treatments	1 st Day	2 nd Day	3 rd Day	1 st Week	2 nd Week
Refree3G®	2.33 d	2.33 c	3.33 b	5.33 c	6.00 b
NSE @5%	4.33 b	3.67 b	4.67 b	7.33 b	8.00 b
Garlic @10%	4.67 b	5.67 a	6.67 a	8.67 ab	11.33 a
Lannate25 _{SP} ®	3.33 c	2.67 c	3.33 b	5.00 c	6.67 b
Control	6.33 a	6.00 a	7.33 a	9.67 a	12.33 a
LSD	0.88	0.88	1.40	1.77	3.20

Table.3 showed the percent biological efficacy of different treatments applied Refree 3G®, NSE @ 5%, Garlic @10% and Lannate 25SP®. Means of the two means were calculated and manipulated for result. Treatment Refree showed highest

(47.46%) biological efficacy followed by Lannate 25sp® (44.05%) while the neem seed extract (NSE) @ 5% showed 25.38% and the lowest biological efficacy showed by garlic extract (10.17%).

Table 3: Percent B.E: Biological Efficacy of different treatments

Treatments	1 st Spray	2 nd Spray	Mean	B.E (%)
Refree3G®	4.33	6	5.17	47.46
NSE @5%	6.67	8	7.34	25.38
Garlic @10%	6.33	11.33	8.83	10.17
Lannate25sp®	4.33	6.67	5.50	44.05
Control	7.33	12.33	9.83	

4. Discussion

It was found out from the results that there are significant differences among insecticides and control. The biological efficacy of treatments showed that the most superior insecticide in suppressing pest population was Refree followed by Lannate, Neem and Garlic. Our results are in agreement with [15] who applied different insecticides against maize stem borer and found Carbofuran 3G most superior. Similar results was reported by [2] who revealed that Carbofuran (Refree3G®) @ 0.3 kg a.i/ha was the most effective treatments against maize stem borer with mean efficacy of 73.50% and 72.60%. The results also subscribe to the findings of [4], who reported superior efficacy of Carbofuran 3G @ 0.3 kg a.i/ha against maize stem borer on maize. Our results are in conformity with [10] who reported 50% reduction in maize stem borer infestation compare to control. [14] also reported lowest population of *Lipaphis erysimi* with Lannate® (methomyl). But our recommendation is contradictory to the detection of [13] who studied the efficacy of bio extracts and chemical pesticides and concluded from the results that neem seed extract was as effective as synthetic insecticide. Highest yield and less percent damage were obtained in neem seed extract and Emamectin benzoate treated plot.

5. Conclusion and Recommendation

Statistical analysis showed that Refree3G® followed by Lannate® were the most effective among the treatments for controlling maize stem borer population as compared to bio-extracts, which did not proved to be effective against maize stem borer. From the study we recommended that Lannate® and Refree3G® should be used against maize stem borer (*Chilo partellus*) in maize crop for effective control.

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