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Field efficacy of selected insecticides against maize stem borer [(*Chilo partellus* (Swinhoe)]

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Abstract
A field experiment was conducted during *kharif* 2017 at SHUATS, Allahabad (U.P.) to compare the efficacy of selected insecticides against maize stem borer [(*Chilo partellus* (Swinhoe)] of maize. The experiment was conducted in a Randomized Block Design with seven treatments; (T^1) Fipronil 5EC, (T^2) Carbofuran 3G, (T^3) Lamda cyhalothrin 5EC, (T^4) Novaluron 10EC, (T^5) Flubendiamide 480SC, (T^6) Quinalphos 25EC, (T^7) Chloropyriphos 20EC and (T^8) Control each of which was three replications. Among all the treatments lowest per cent infestation of dead hearts was recorded in Carbofuran 3G (8.79%), then followed by Fipronil 5EC (9.04%), Novaluron 10EC (9.19%), Flubendiamide 480SC (12.87%), Lamda cyhalothrin 5EC (20.01%), Chloropyriphos 20EC (21.08%), Quinalphos 25EC (22.62%) and is least effective among all treatments. The cost benefit ratio (CBR) showed that the application of Chloropyriphos 20EC was economically most viable treatment (1:1.68) followed by Fipronil (1:1.61).

Keywords: *Chilo partellus*, efficacy, insecticides and maize

1. Introduction
Maize known as Queen of Cereals, also called corn is one of the most important cereal crops of the world. Maize distinguished botanically as *Zea mays*, belongs to the grains family Graminae. Maize ranks as the major grain crop worldwide. Maize, which is the only food cereal crop that can be grown in different seasons requires moderate climate for growth. It grows well in loamy soils but surplus or poor rains adversely affect yields as well as quality. Depending on colour and taste, maize is classified into two broad groups: yellow and white. Yellow maize is traditionally used for animal feed. The major pests of maize are as under: stem borer; *Chilo partellus* (Swinhoe), corn earworm; *Heliocoverpa zea* (Hubner), pink borer; *Sesamia inferense* (Walker), corn worm; *Helicoverpa armigera*, stem fly; *Atherigona orientalis*, ear head bug; *Calocoris angustatus*, web worm; *Cryptoblabes gnidiella*, ash weevil; *Myllocerus spp*, leaf hopper; *Pyrilla perpusilla*. Among these pests stem borer have gained major importance in the state by inflicting greater loss to the crop. Maize is cultivated under diverse agro-ecosystem and it is cultivated under diverse agro-ecosystem and grain yield is influenced by various biotic and biotic factors which constitutes a major constraint for its production. The crop is vulnerable to over 150 insect species from sowing to final harvest of the crop. [4] *C. partellus* can inflict severe damage and serious yield losses of maize and sorghum if not managed properly from the early growth stage of the crop. Infestation by *C. partellus* on maize starts with oviposition on the leaves causing lesions. The late third or early-forth instars bore into the stem, feeding on tissues and making tunnels. When the infestation is severe, the larvae either in the leaf whorl or in the stem can cut the meristematic tissues, the central leaves dry up to produce the "dead heart" symptom which results in to death of the plant [8] In Uttar Pradesh the stem borer on cereals has assumed the status of serious nature in recent years particularly with introduction of hybrids, however efforts to study the comparison of biology on different hosts and management of pest was lacking on different hosts. The stem borers initially damage by feeding on the leaf tissues, followed by tunneling and feeding within the stem and sometimes the maize cobs. Infestation by *C. partellus* on maize starts with oviposition on the leaves and *S. inferens* lays in between the leaf sheath and stem of the plant. After hatching, the first instars move into the leaf whorls where they feed and develop on the bases of the leaves, causing lesions. The late third or early-fourth instars bore into the stem, feeding on tissues and making tunnels. When the infestation is severe, the larvae, either in the leaf whorl or in the stem, can cut through the meristematic tissues; the central leaves dry up to

produce the "dead heart" symptom, resulting in the death of the plant. [3] Before pupation, they make exit holes on stem and pupate and adults will emerge. It also feeds at flowering stage interfering in pollination and also feeds within the cob and prone to secondary infection.

2. Materials and Methods

The experiment was conducted during the *kharif* season 2017 studies on the "Field efficacy of selected insecticides against maize stem borer [(*Chilo partellus* (Swinhoe)]", In Allahabad region under field condition will be carried out at the Central field, SHUATS, Allahabad, Uttar Pradesh, India. is situated at 25.27^0 north latitude 80.50^0 east longitude and at an altitude of 98 mt. above sea level. The climate is typically semi-arid and subtropical. The maximum temperature reaches up to 49^0C in summer and drops down to 1.5^0C in winter. The site selected was uniform, cultivable with typical sandy loam soil having good drainage. The observations on the number of pest were made on the five randomly selected and tagged plants from each plot. The observations are made a day before followed by 3rd, 7th, 14th days after spraying. Observations were recorded without disturbing the plants to minimize the observational errors. Five plants were chosen at 60 days after sowing randomly and the per cent dead hearts caused by *C. partellus* were counted individually and after summing up it, the mean dead heart value was worked out. The percent plant with stem borer infestation was worked out using following formula:

$$\text{Percent plants with dead heart} = \frac{\text{No. of plants with dead hearts}}{\text{Total no. of plants}} \times 100$$

3. Results and Discussion

Table 01: Percent infestation of dead hearts

T. No.	Treatment	1DBS	3DAS	7DAS	14DAS	Mean
T8	Control	17.44 (24.60)	22.67 (28.36)	24.86 (29.81)	26.14 (30.72)	24.55 (29.69)
T1	Fipronil 5EC	21.34 (27.47)	12.75 (20.68)	9.06 (17.22)	5.31 (13.30)	9.04 (17.25)
T2	Carbofuran 3G	20.60 (26.84)	12.21 (20.44)	9.37 (17.79)	4.66 (12.45)	8.79 (16.96)
T3	Lamda cyhalothrin 5EC	14.12 (21.57)	17.26 (24.37)	20.41 (26.80)	22.37 (28.08)	20.01 (26.54)
T4	Novaluron 10EC	20.93 (27.21)	14.56 (22.42)	8.18 (16.38)	4.85 (12.72)	9.19 (17.25)
T5	Flubendiamide 480SC	22.61 (28.26)	16.73 (24.00)	15.86 (23.41)	8.36 (16.70)	12.87 (20.84)
T6	Quinalphos 25EC	17.74 (24.75)	21.04 (27.26)	22.49 (28.30)	24.34 (29.53)	22.62 (28.39)
T7	Chloropyriphos 20EC	14.61 (22.36)	18.22 (25.20)	21.82 (27.73)	23.21 (28.75)	21.08 (27.30)
	S.Em±	4.33	2.6	2.58	2.03	2.78
	C.D. (0.05)	-	5.57	5.53	4.37	5.97
	CV (5%)	28.44	18.80	19.15	16.76	21.27

Note: DBS - Day before spraying **DAS -** Day after spraying

The data on the percent infestation of dead hearts on Mean (3th, 7th, and 14th) days after spray revealed that all the chemical treatments were significantly superior over control. Among all the treatments lowest percent infestation of dead hearts was recorded in Carbofuran (8.79%), then followed by Fipronil (9.04%), Novaluron (9.19%), Flubendiamide (12.87%), Lamda cyhalothrin (20.01%), Chloropyriphos (21.08%), Quinolphos (22.62%) and is least effective among all treatments. In the present research work mean infestation of the dead hearts was 8.79% was recorded in Carbofuran treated plot. Similar findings were reported by [5] that the lower per cent damage was observed in plot sprayed with Carbofuran (8.82%). In the present research work mean infestation of the dead hearts was 9.04% was recorded in Fipronil treated plot. Similar findings were reported by [1] that the lower percent damage was observed in plot sprayed with Fipronil (9.45). Likewise mean infestation of Novaluron treated plot is (9.19%) similar findings were reported by [6] that the lower percent dead hearts of maize borer with Novaluron would suggest this insecticide to be more toxic to the pest compared with the others. Mean infestation of Flubendiamide treated plot is (12.87%) similar findings were reported by [2] that the lower percent dead hearts (11.10) of maize borer with Flubendiamide. Mean infestation of Chlorpyriphos treated plot is (21.08%) Likewise mean infestation of Quinolphos treated plot was 22.62%. Similar findings were reported by [7] they reported the lower percent infestation (15.55%) of maize borer with Quinolphos 25EC would suggest this insecticide to be more toxic to the pest compared with the others.

4. Conclusion

The critical analysis of the present findings it can be concluded that, Carbofuran was found best in managing stem borer and recorded 40.20 q/h yield, followed by Fipronil (38.10 q/ha), Novaluron (36.85 q/ha) and Flubendiamide (34.72 q/ha). However the Carbofuran proved to be very effective treatment in the management of stem borer and grain yield of 40.20 q/ha. So using of chemicals proved to be effective method in controlling the pest and also helps to get higher yield.

5. References

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