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# EFFICACY OF NEWER INSECTICIDES AGAINST MAIZE STEM BORER *CHILO PARTELLUS* SWINHOE INFESTING MAIZE IN *KHARIF* IN SOUTHERN RAJASTHAN

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## ABSTRACT

Bioefficacy of insecticides *viz*., Chlorantaniliprole 20 SC @ 0.3 &0.4 ml/litre, Flubendiamide 480 SC @ 0.1 &0.2 ml/litre, Novaluron 10 EC @ 0.75 &1.0 ml/litre and Deltamethrin 2.8 EC @ 0.4 ml/litre against *Chilo partellus* was tested under artificial infestation at Rajasthan College of Agriculture during 2015. The results revealed that the application of Flubendiamide 480 SC @ 0.2 ml/litre at 4 days after artificial infestation gave lowest LIR of 1.06 followed by Flubendiamide 480 SC @ 0.1 ml/litre at 4 days after artificial infestation and were found promising for stem borer management. The Flubendiamide 480 SC at half dosages proved most effective against the *C. partellus* followed by the Chlorantaniliprole 20 SC @ 0.3 & 0.4 ml/litre. The treatment of Novaluron 10 EC @ 0.75 &1.0 ml/litre of water was next effective against *C. partellus*. The application of Flubendiamide 480 SC @ 0.2 ml/litre resulted in higher grain yield as compared to other treatments at harvest during 2015.

**Key words:** Stem borer, insect pest, flubendiamide, maize

## INTRODUCTION

Maize (*Zea mays* L.) is an important cereal crop belonging to the family Poaceae and is originated from South America. Maize it cultivated for various purposes including grain, fodder, green cobs, sweet corn and baby corn. It is the third most important cereal crop in India after Wheat and Rice. It has the highest genetic yield potential among the cereal crops and accounts for 9 per cent of total food grain in the country. In India; Karnataka, Rajasthan, Andhra Pradesh, Maharashtra, and Uttar Pradesh, are the major maize producing states. Maize contains about 10.5 per cent protein, 4.0 per cent oil, 70 per cent carbohydrates, 2.3 per cent crude fibers, 10.4 per cent albuminoids, 1.4 per cent ash (Khan *et. al*. 2014). It has significant quantities of vitamin A, nicotinic acid, riboflavin and vitamin E. Maize is low in calcium, fairly high in phosphorus. It can be used for manufacturing starch, alcohol, acetic acid, lactic acid, syrup, vinegar, resin powder, fuel for torpedoes, artificial leather, boot polish etc. The green cobs are roasted and consumed by the people with great interest. Maize grains are milled into broken grits for making grovel for human consumption. According to Mathur (1992), there are more than 250 insect and mite pests infesting maize crop in India. Kumar *et al*. (2005) further reported that amongst the pest complex of maize, *Chilo partellus* (Swinhoe) is the key pest of kharif maize. The control of this pest relies mainly on the use of synthetic pyrethroids in Punjab. However, the ecological and biological adversities posed by the use of single group of insecticides demands the evaluation of new molecules against *C. partellus.* The serious insect pests are, maize stalk borer (*Chilo partellus* Swinhoe), pink borer (*Sesamia inferens* Walker), shoot fly (*Atherigona soccata* Rondani), shoot bug (*Peregrinus maidis* Ashmead), corn leaf aphid (*Rophalosiphum maidis* Fitch), etc. The stalk borers, *viz., C. partellus* and *S. inferens* are the most serious pests of maize. The loss due to *C. partellus*, varied from 26.7 to 80.4 per cent in different agro-climatic regions of India (Chatterji *et al*., 1969). The principal aim of the management of pest population is to hold pest below the economic injury level which has more relevance in relatively short duration crops like maize. Several insecticidal

recommendations have been made from time to time by various workers for the control of this pest. As the return per unit area is very low, many farmers avoid using costly pesticides. Moreover, these pesticides are associated with many ecological problems. Looking to the above constraints, the present investigation was carried out.

## MATERIAL AND METHOD

**Site and location of the experiment.** The present investigation was carried out at the Agronomical Instructional farm and Department of Entomology, Rajasthan College of Agriculture, Udaipur, during *kharif*, 2018. Udaipur is located at 23.4° N longitudes and 75° E latitude at an elevation of 579.5 MSL (Mean Sea Level) in the state of Rajasthan.

**Climatic condition of the location.** The zone hasa typical sub-tropical climatic condition characterized by mild winters and moderate summers associated with high humidity especially during the months of July to September. The average annual rainfall of this tract ranges between 450-650 mm, which is contributed by Southwest monsoons from July to September and occasional rain during the winter season. During summer, the temperatures may go as high as 42°C, while in winter it may fall to as low as 4.5°C. This region provides a safe and long growing season for most of the crops.

**Evaluation of insecticides against *Chilo partellus* (Swinhoe).** The field experiment for testing the efficacy of newer insecticides against the maize stem borer was carried out during *kharif*, 2018. The field experiment was conducted under artificial infestation conditions. The experiment was laid out in Randomized Block design (RBD) with eight treatments including one untreated control and each treatment was replicated three times in a plot having 4.5 m × 3.0 m size (Table 1). The major insect pests infesting maize was recorded on variety Pratap makka-5 from 9 days after germination till harvest of the crop at weekly intervals Where middle two rows of each plot of each plot was utilized for artificial infestation by releasing 10-12 newly hatched larvae in the whorl of maize plants after 12 DAG. The culture of stem borer egg or larvae was obtained from the Maize laboratory of the department. The treatments comprising of bio-pesticides were applied after two days of infestation and second spray was applied 10 days after first application.

**Table 1. Treatment details**

| S. No. | Treatments | Dose ml/ litre water |
|---|---|---|
| 1 | Chlorantaniliprole 20 SC | 0.30 |
| 2 | Chlorantaniliprole 20 SC | 0.40 |
| 3 | Flubendiamide 480 SC | 0.10 |
| 4 | Flubendiamide 480 SC | 0.20 |
| 5 | Novaluron 10 EC | 0.75 |
| 6 | Novaluron 10 EC | 1.00 |
| 7 | Deltamethrin 2.8 EC | 0.40 |
| 8 | Control | – |

**Observations.** The observations on the efficacy of different newer insecticides against stem borer was recorded in terms of leaf injury rating (LIR) on 1-9 scale as suggested by Chatterji *et al.*1969 at 30 days after infestation. The leaf injury by stem borer on plants was scored on 1-9 scale as suggested by Chatterji *et.al* 1969 as detailed below:

| Scale | Damage severity |
|---|---|
| 1 | No visible leaf injury or a small amount of pin or fine shot hole type injury on a few leaves |
| 2 | Small amount of shot hole type lesions on a few leaves |
| 3 | Shot hole injury common on several leaves |
| 4 | Several leaves with shot hole & elongated lesions |
| 5 | Several leaves with elongated lesions |
| 6 | Several leaves with elongated lesions about 2.5 cm long |
| 7 | Long lesions common on about half of the leaves |
| 8 | Long lesions common on about 2/3 of leaves |
| 9 | Long lesions in more than 2/3 of leaves |

**Table 2. Evaluation of insecticides against *Chilo partellus***

| S.No. | Treatments | Dose ml/ litre water | Mean LIR |
|---|---|---|---|
| 1 | Chlorantaniliprole 20 SC | 0.30 | 2.73 |
| 2 | Chlorantaniliprole 20 SC | 0.40 | 2.80 |
| 3 | Flubendiamide 480 SC | 0.10 | 2.53 |
| 4 | Flubendiamide 480 SC | 0.20 | 2.26 |
| 5 | Novaluron 10 EC | 0.75 | 3.53 |
| 6 | Novaluron 10 EC | 1.00 | 5.46 |
| 7 | Deltamethrin 2.8 EC | 0.40 | 3.20 |
| 8 | Control | – | 7.86 |

## RESULTS AND DISCUSSION

### Evaluation of insecticides against *Chilopartellus*

**Leaf injury rating (LIR).** The data on leaf injury rating at 30 days after infestation is presented in Table 2 and Figure 1. All the newer insecticides were significantly superior over untreated check at 30 days after infestation, It is evident from the data on leaf injury rating at 30 days after infestation during *Kharif,* 2015 that the minimum leaf injury rating of 2.26 was recorded in plot treated with Flubendiamide 480 SC@ 0.20 ml/l, which was significantly superior over the other pesticides, followed by Flubendiamide 480 SC @ 0.10 ml/l, (mean LIR 2.53). The maximum leaf injury rating (7.86) was recorded with untreated control. The present result is in accordance with the study of Ram Kumar and Tanweer Alam (2017) that they achieved the minimum and maximum mean per cent infestation (10.60 and 72.60) as well as mean per cent dead heart (3.75 and 23.50) in chlorantraniliprole 20 SC @ 0.3 ml/l. However, they found the highest benefit: cost ratio (13.96:1) with treatment of flubendiamide 480 SC @ 0.2 ml/l.However, Kumar and Jindal (2015), and Jindal and Singh (2015) had reported that formulation of chlorantraniliprole 18.5 SC and deltamethrin 2.8 EC were at par with each other against *C. partellus.*

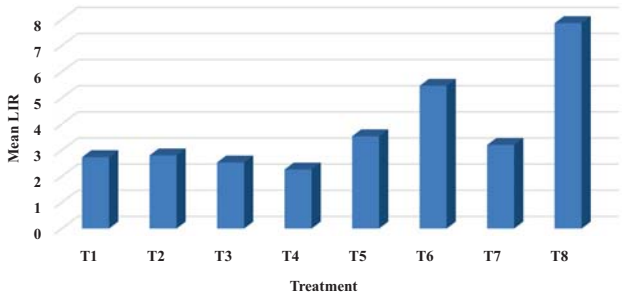



**Figure 1. Evaluation of insecticides against *Chilopartellus***

All the pesticides were significantly superior over untreated check at 30 days after infestation. The application of Flubendiamide 480 SC @ 0.2 ml/litre resulted in minimum leaf injury and can be recommended to manage maize stem borer in maize ecosystem.

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