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# SIDE EFFECTS OF INSECTICIDES ON THE LARVAL PARASITOID, *COTESIA FLAVIPES* CAMERON OF MAIZE STEM BORER, *CHILO PARTELLUS* SWINHOE

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## ABSTRACT

The side effects of insecticides on the maize stem borer larval parasitoid, *Cotesia flavipes* Cameron was investigated at the Instructional Farm, Rajasthan College of Agriculture, MPUAT, Udaipur, during *kharif,* 2012. Among the different insecticides tested for their efficacy on parasitization of *C. partellus* by the larval parasitoid revealed that the application of Spinosad 45 SC at 200 ml/ha and Flubendiamide 480 SC at 150 ml/ha resulted into mean parasitisation of 54.21 and 52.39 per cent and were relatively safe to *Cotesia flavipes* Cameron; whereas, Profenophos 50 EC at 2000 ml/ha and Quinalphos 25 EC at 1000 ml/ha were relatively more toxic to *C. flavipes* as the parasitisation recorded was 36.26 and 39.12 per cent, respectively.

## INTRODUCTION

Maize is an important cereal food crop of the world with highest production and productivity as compared to rice and wheat. It is the third most important cereal after rice and wheat used as human food throughout the world. In India, its production has increased more than 12 times from a mere 1.73 million tons in 1950-51 to 23.29 million tons in 2013 (Anonymous, 2013). Rajasthan ranks first in the country in respect of area under maize 9.09 lakh hectares with a production of 15.67 lakh tons (Anonymous, 2014). The crop is infested by over 250 species of insect pests (Mathur, 1991); of these, four species of tissue borers *viz*., maize stem borer or spotted stem borer (*Chilo partellus* Swinhoe), pink stem worm (*Sesamia inferens* Walker), shoot fly (*Atherigona soccat* Rondani) and Asiatic corn borer (*Ostrinisa furnacalis* Gueneee) are regular and serious pests of maize. Among these, maize stem borer (*Chilo partellus* Swinhoe; Crambidae: Lepidoptera) is the principal pest in all maize growing countries. Among the natural enemies a dozen species of insect parasitoids have been recorded attacking immature stages of *C. partellus* from different parts of the country (Panwar, 2005); of which, *Cotesia flevipes* Cameron (Hymenoptera: braconidae) is an important gregarious endo-larval parasitoid of graminaceous stem borers. It is found in nature during *kharif* season throughout the country and has proved as a dominant larval parasitoid by reducing the borer population up to 32 – 55 per cent (Divyel *et al.,* 2009, Kfir *et al.,* 2002, Padmaja and Prabhakar, 2004 and Khambadkar *et al.,* 2003). The present study was thus undertaken to evaluate the side effects of insecticides used for management of the stem borer on the parasitization of stem borer by *Cotesia flavipes* Cameron and on the population of coccinellids prevailing in maize ecosystem.

## MATERIAL AND METHODS

To evaluate the side effects of insecticides on larval parasitization of *C. partellus* by *C. flavipes an* experiment was laid out at the Instructional Farm and Department of Entomology, Rajasthan College of Agriculture, Udaipur, during *kharif* 2012. The variety Pratap Maize-3 was planted on $5^{th}$ July, 2012 under a Randomized Block Design with 3 replications. The row to row and plant to plant spacing maintained were 60cm × 60cm and 30cm × 30cm, respectively; and there were 10 plants in each row. The insecticides were sprayed on the crop 14 days after germination and 10 neonate larvae of *C. partellus* were released per plant on the 10 tagged plants after 24 hours of the spray. In all 30 plants were observed for the side effects of insecticidal treatments on natural parasitisation by the larval parasiotid. These tagged plants were uprooted at 14 days after artificial infestation of *C. partellus* larvae and split-open to collect the larvae of *C. partellus* on $6^{th}$ August, 2012. These larvae were reared on cut pieces of green maize stems at 27 ± 2° C temperature and 70 ± 5 per cent relative humidity to observe for parasitization by *C. flavipes*. The cocoons of *C. flavipes* obtained from parasitized larvae were separated, collected treatment-wise and counted.

**Treatment details:**

| S.No. | Treatments | Formulations | Dose/plot | Dose/hectare |
|---|---|---|---|---|
| $T_1$ | Chlorfluazuron | 5.4 EC | 1.35 ml | 1500 ml |
| $T_2$ | Flubendiamide | 480 SC | 0.135 ml | 150 ml |
| $T_3$ | Novaluron | 10 EC | 0.675 ml | 750 ml |
| $T_4$ | Profenophos | 50 EC | 0.18 ml | 2000 ml |
| $T_5$ | Quinalphos | 25EC | 0.9 ml | 1000 ml |
| $T_6$ | Spinosad | 45 SC | 0.18 ml | 200 ml |
| $T_7$ | Untreated Control | --- | --- | --- |

**Experiment Details:**

1. Experimental design : RBD
2. Total number of treatments : 7
3. Total number of replicates : 3
4. Plot size : 9 $m^2$ (3m x 3m)
5. Spacing : 60cm row-row and 30cm plant-plant

## RESULT AND DISCUSSION

The data recorded on natural larval parasitisation by *C. flavipes* have been presented in Table-1. The data reveal that the natural parasitisation of *C. partellus* larvae by *C. flavipes* ranged from 36.26 per cent in Profenophos 50 EC at 2000 ml/ha to 54.21 in Spinosad 45 SC at 200 ml/ha as against 64.43 per cent in untreated control. The highest mean parasitisation 64.43 per cent was found in control and was followed by that in Spinosad 45 SC at 200 ml/ha and Flubendiamide 480 SC at 150 ml/ha with mean parasitisation of 54.21 and 52.39 per cent, respectively; however, these two treatments were at par with control. Chlorfluazuron 5.4 EC at 1500 ml/ha, Novaluron10 EC at 750 ml/ha, Profenophos 50 EC at 2000 ml/ha and Quinalphos 25 EC at 1000 ml/ha were statistically at par to each other with mean parasitisation of 41.39, 44.13, 36.26 and 39.12 per cent, respectively. These treatments caused significantly lower parasitisation of the maize stem borer (*C. partellus*) by *C. flavipes* as compared to that by treatment with Flubendiamide 480 SC at 150 ml/ha, Spinosad 45 SC at 200 ml/ha and the untreated control. Earlier, Ishaaya *et al*. (2002) reported that Novaluron had no appreciable

**Table 1: Effect of insecticide application on parasitisation of maize stem borer by the larval parasitoid, *Cotesia flavipes* Cameron during *kharif,* 2012**

| S.No. | Treatments | Dosage (ml/ha) | Mean Parasitization Efficacy | | |
|---|---|---|---|---|---|
| | | | Total larvae (No.) | Parasitized larvae (No.) | Parasitisation (%) |
| $T_1$ | Chlorfluazuron 5.4 EC | 1500 ml | 3.53* (12.00) | 2.34 (5.00) | 40.03 [41.39] |
| $T_2$ | Flubendiamide 480 SC | 150 ml | 3.89 (14.67) | 2.86 (7.67) | 46.37 [52.39] |
| $T_3$ | Novaluron 10 EC | 750 ml | 3.94 (15.00) | 2.67 (6.67) | 41.60 [44.13] |
| $T_4$ | Profenophos 50 EC | 2000 ml | 4.34 (18.33) | 2.67 (6.67) | 36.95 [36.26] |
| $T_5$ | Quinalphos 25 EC | 1000 ml | 4.49 (19.67) | 2.85 (7.67) | 38.68 [39.12] |
| $T_6$ | Spinosad 45 SC | 200 ml | 4.10 (16.33) | 3.03 (8.67) | 47.45 [54.21] |
| $T_7$ | Untreated Control | | 5.34 (28.00) | 4.30 (18.00) | 53.43 [64.43] |
| | S. Em. ± | | 0.09 | 0.12 | 2.43 |
| | CD (5%) | | 0.29 | 0.37 | 7.47 |

Note: *Mean of three replications; numerical data (No.) are square root transformed [$\sqrt{x+0.5}$, x= population]; figures in the parentheses are population/10 plants; figures in the square brackets are retransformed percent values.*

effect on parasitoids and phytoseiids and a mild effect on other natural enemies and may be considered a potential component in IPM programmes. Similarly, Ameta and Bunkar (2007) and Ameta and Kumar (2008) observed that Flubendiamide did not cause adverse effect on natural enemies in tomato and chilli. Similarly, Bueno *et al.* (2008) found that Chlorfluazuron was harmless to all immature stages of *Trichogramma pretiosum.*

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