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BIOASSAY OF FLUBENDIAMIDE ON *Spodoptera litura* (Fab) POPULATION COLLECTED FROM DIFFERENT HOST CROPS

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Abstract: A experiment was carried out at Main Agricultural Research Station, University of Agricultural Science, Raichur to find out the bioassay of Flubendiamide 39.5 % SC against tobacco caterpillar *Spodoptera litura* (Fab) populations collected from different host crops like castor, ground nut, chilli, sunflower, soybean, cabbage and onion *etc.,* by leaf dip method. The result revealed that the population collected from castor recorded minimum LC_{50} value of (2.66 ppm) and it was followed by sunflower (2.81 ppm), groundnut (2.82 ppm), onion (2.86 ppm), cabbage (2.90 ppm) and soybean (2.94 ppm). Highest LC_{50} value of 3.29 ppm was found in population collected from chilli ecosystem indicating that these populations showed less susceptibility than the population collected from other ecosystem.
Key words: *Spodoptera litura,* Host crops, Bioassay, Flubendiamide and Populations

INTRODUCTION

The tobacco caterpillar, *Spodoptera litura* (Fabricius) is distributed worldwide and it is a member of the economically important polyphagous pest (>120 host plants) and causes serious crop losses (Singh and Jalali, 1997). In India, it is a major pest that attacks a wide variety of economically important crops such as tobacco, cotton, groundnut, castor, chilli, potato, soybean, cauliflower, cabbage, tomato, beans, sunflower and onion. Chilli is an important spice and vegetable crop of India. The productivity of chilli is very low due to several factors. Among them, insect pests cause severe loss. It is attacked by various insect and mite pests from seedling to fruiting stage. The damage caused by *Helicoverpa armigera* (Hubner) and *Spodoptera litura* (Fb.) during flowering and fruit formation is the most concern. As reported by (Reddy and Reddy, 1999). Due to severe attack of fruit borers lead to 90 per cent flower and fruit drop in chilli. Many conventional insecticides are being used to manage these pests. But because of development of many fold resistance to existing

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insecticides, it has become difficult to manage the fruit borers. There is a need to replace ineffective ones with effective insecticides. In this direction, flubendiamide is novel insecticide and very effective against lepidopteran insects (Masanori *et al.*, 2005). The *S. litura* larvae initially scrape the leaf tissue gregariously in clusters and skeletonise the leaves and is next only to american bollworm *Helicoverpa armigera* (Hub.) in economic importance both at national and global level. Recently, the pest has been appearing in severe form, especially during rainy and post rainy seasons causing heavy yield losses throughout India. Hazards and harmful effects of insecticides as chemical control especially the wide application of conventional insecticides necessitate the new chemistry insecticides which are more effective, safer for humans and much less toxic to our ecosystem (Korrat *et al.*, 2012). These new chemistry insecticides are, however, more specific or specialist for particular insect pest management. To enhance crop productivity with multiple pest situations, more than one insecticide in mixtures are used having different chemical groups. These may also be used to manage resistant field population of a certain pest and delay the development of insecticide resistance (Attique *et al.*, 2006; Ahmad *et al.*, 2009). However, the first case of insecticide resistance in *S. litura* was documented by (Srivastava and Joshi, 1965). The evolution of resistance to insecticides is a threat to modern agriculture, to tackle this problem bioassay of insecticides will address the development of base line data for new chemistries.

MATERIAL AND METHODS

Maintenance of pure culture of *S. litura* on various crops

S. litura larvae collected from different host crops were reared on respective host crops which were maintained at Department of Agricultural Entomology and Main Agricultural Research Station, Raichur during the study period 2013-14. Pupae were kept separately for moth emergence in a plastic jar of size 15 cm diameter where in the pupae were placed on a moist sand. To facilitate egg laying fresh host plant leaves were kept within the plastic jar and 10 per cent honey solution with yeast was provided as a adult food and each plastic jar was covered with muslin cloth. Eggs collected from each host crops were sterilized with one per cent sodium hypochlorite solution (4 % available chlorine added in 250 ml concentration sodium hypochlorite and made volume to 1000 ml of distilled water) to avoid any entomopathogenic contamination. After sterilization, eggs of *S. litura* collected from respective host crops were kept for incubation in a BOD incubator with 20 ± 1^0 C and 70-80 per cent relative humidity.

Neonate larvae of *S. litura* from different host crops were reared separately in a bread box 18 X 11 cm size and the fresh leaves of different host crops were provided and in each bread box it was lined with moist foam to maintain the turgidity of the leaves. Later instar larvae such as second and third were reared separately on respective host crops in a plastic basin of 30 cm size diameter and the basin were covered with muslin cloth. The different host crops leaves were changed daily and the muslin cloth was moistened by sprinkling water with water atomizer regularly.

Bioassay

Newly moulted third instar larvae of F1 generation were exposed to test insecticides at five different concentrations using leaf dip technique. Unsprayed leaves were taken washed and these leaf discs were dipped in the test solutions for ten seconds with gentle agitation and were placed on tissue papers for drying. On drying, these were placed in bread box 18 X 11 cm size having moist filter papers underneath to avoid desiccation. On each leaf disc, larvae were placed with a fine camel hairbrush and the test containers were covered with black muslin cloth and the distilled water to serve as untreated check.

Details of concentrations of Flubendiamide used for bioassay on *Spodoptera litura*

Sl. No.	Treatments	Concentrations (ppm)
1	**Flubendiamide 39.35 % SC**	6.00
2	**Flubendiamide 39.35 % SC**	5.00
3	**Flubendiamide 39.35 % SC**	4.00
4	**Flubendiamide 39.35 % SC**	3.00
5	**Flubendiamide 39.35 % SC**	2.00
6	**Untreated control**	--

Bioassay of flubendiamide

Primary stock solutions of insecticides were calculated and bracketing was done to arrive the different concentration on third instar larvae of *S. litura.* After breakage different concentration like 6.00, 5.00, 4.00, 3.00 and 2.00 ppm of flubendiamide was prepared and compared with untreated control. In each concentration thirty, third instar larvae of uniform age were used for leaf dip bioassay technique. Leaves of respective host crops were collected from the field, washed and dipped into the insecticide solutions, for ten seconds, with the gentle agitation and shade dried on the tissue papers, such leaves were placed in the bread box of 18 X 11 cm size and then ten larvae per box were released and was covered with muslin cloth. Mortality was recorded at 72 hrs after exposure.

RESULTS AND DISCUSSION

The result of present investigation indicated that the LC_{50} value of flubendiamide varied on the different host crops like castor, ground nut, chilli, sunflower, soybean, cabbage and onion among seven host crops minimum LC_{50} value of 2.66 ppm was recorded the population collected from castor host crop and the correspondence lower and upper values was 1.78 to 3.25 respectively at 95 per cent indicated that the population collected from castor host crop high susceptibility to flubendiamide followed by population collected from sunflower (2.81 ppm), ground nut (2.82 ppm), onion (2.86 ppm), cabbage (2.90 ppm) and soybean (2.94 ppm) and the correspondence lower and upper values was 2.10 to 3.87 respectively at 95 per cent while maximum LC_{50} value of 3.29 ppm was noticed in chilli ecosystem and the correspondence lower and upper values was 2.58 to 3.94 respectively at 95 per cent.

The variation in LC_{50} values might be due to the facts that change biochemical composition of host crops, nutrient composition of host crops. These results are in conformity with the Sufian, *et al.,* 2013, Stated that LC_{50} value of second instar *S. litura* larvae exposed to flubendiamide recorded 2.77 ppm. (Meena, *et al.,* 2013). reported the efficacy of flubendiamide 39.35% SC (Fame) at two concentrations 60 and 48 g.a.i/ha, against the chilli defoliator *S.litura.* Maximum reduction in mean larvae per plant as wel as lowest foliage damage was recorded in flubendiamide 39.35 % SC @ 60 g.a.i/ha folowed by its next lower dosage@ 40 g.a.i/ha. (Mallikarjunappa *et al.*, 2008). who reported that flubendiamide 20 WG @ 35 g a.i./ha was the most effective in reducing the incidence of rice stem borer, *Scirphophaga incertulas* (Walker) and leaf folder *Cnaphalocrosis medinalis* (Guen.) and recorded higher yield. Similar results were also obtained by (Lakshminarayana and Rajashri 2006). who reported that flubendiamide 20 WG was highly effective against, *H. armigera* on cotton. (Javaregowda and Nalk 2005). reported that flubendiamide 20 WDG was very effective against paddy pests. (Masanori *et al.,* 2005) reported that flubendiamide is highly effective against lepidopteran insects.

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FIGURES AND TABLES

Figure-1. Shows the Bioassay of flubendiamide 39.35 % SC on *Spodoptera litura* collectedfrom major host crops.

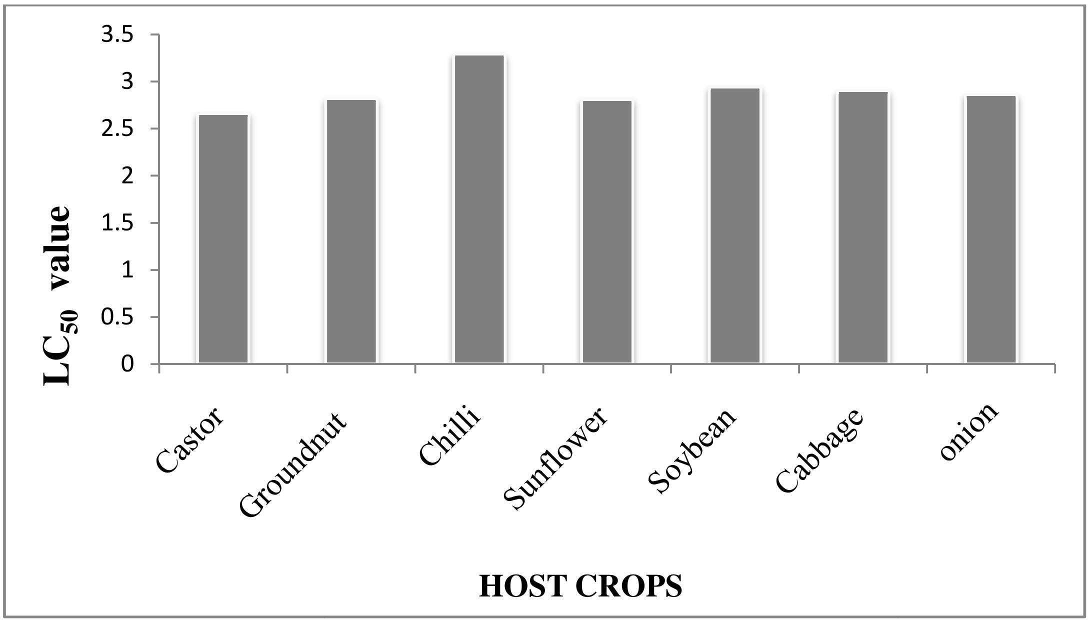

Table-1. Bioassay of flubendiamide 39.35 % SC on *Spodoptera litura* collected from major host crops

Crops	LC_{50} (ppm)	Fiducial limit (95%)		χ^2 P= 0.05	Regression equation (slope)
		LL (ppm)	UL (ppm)		
Castor	2.66	1.78	3.25	2.92	2.53 + 3.92X
Groundnut	2.82	1.99	3.41	1.87	2.59 + 3.82X
Chilli	3.29	2.58	3.94	2.19	2.73 + 3.58X
Sunflower	2.81	2.05	3.37	2.91	3.75 + 2.76X
Soybean	2.94	2.10	3.57	3.30	2.51 + 3.82X
Cabbage	2.90	2.06	3.51	2.61	2.53 + 3.82X
Onion	2.86	2.03	3.46	2.13	2.56 + 3.82X