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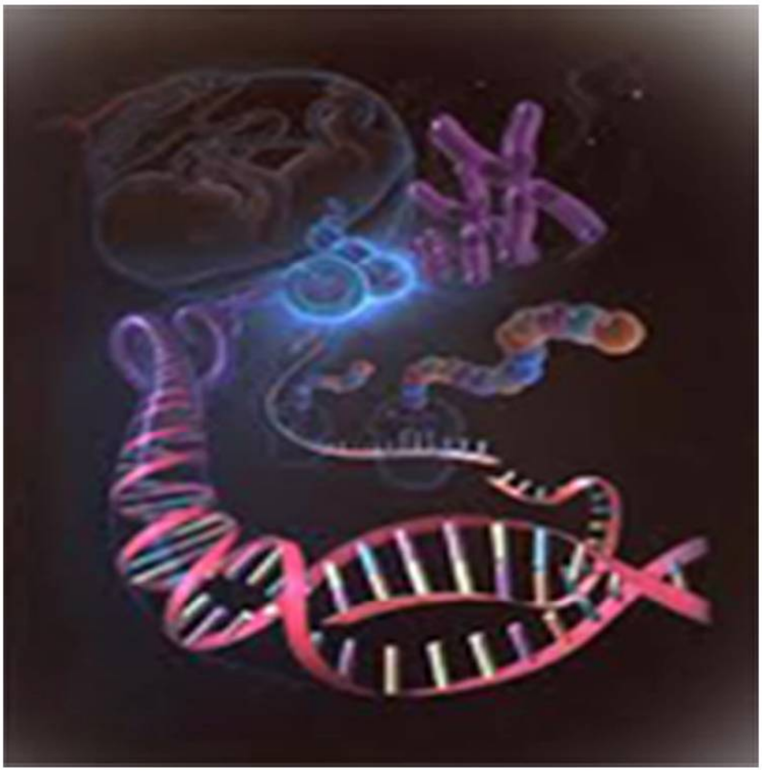

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Research Paper

IMPACT OF BIOPESTICIDES ON BUDWORM INCIDENCE AND ITS EFFECT ON YIELD IN FCV TOBACCO

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The extent of FCV tobacco leaf damage was upto 70 percent by insect pests due to the changed agro climatic situation, favourable climatic conditions and cropping patterns. In delayed plantings, the pest incidence coincides with the preferred stage of the tobacco. The registered recommended chemicals not only failed to suppress the pest but also pose adverse effects on health and environment. In order to circumvent the problems, conventional insecticides needs to be replaced with bio-pesticides. In a replicated field trial, efficacy of various bio-pesticides and synthetic insecticides were assessed against the key pest *Helicoverpa armigera* (Hubner) in FCV tobacco in kharif season at the Zonal Agricultural Research Station, Shimoga, Karnataka under rainfed conditions with a popular variety KST-19 during kharif 2010-11. ETL based sprays of these treatments were imposed after assessing 10 percent damage in leaves. Results showed that all the treatments were significantly superior over untreated control for various parameters observed against the budworm. Among the treatments, minimum number of larvae per plant was recorded in plots treated with flubendiamide 0.25 ml/l (0.33 & 0.00), novaluran 1 ml/l (1.00 and 0.00) and spinosad 0.5 ml/l (1.33 and 0.33) at three and seven days after treatment, respectively. Green and cured leaf yield was highest in flubendiamide (9364.01 and 1085.18 Kg/ha) and spinosad (8749.91 and 1075.55 Kg/ha) treatments, respectively. Highest total grade equivalent was recorded in spinosad (874.94 Kg/ha), flubendiamide (803.70 Kg/ha) and novaluron (661.72 Kg/ha) treatments. These chemicals can be used in IPM programme against *H. armigera* in tobacco.

Keywords: Tobacco, bud worm, Helicoverpa, new molecules, botanicals.

INTRODUCTION

Tobacco (*Nicotiana tobaccum* L.) is an important commercial cash crop grown extensively in India as a narcotic crop. It plays a significant role in the

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Indian economy by contributing about Rs. 8200 crores as excise revenue and Rs. 1360 crores towards foreign exchange. India is the third largest producer in the world after China and Brazil. Flue cured Virginia (FCV) tobacco alone accounts for 200 million Kg of leaf production in India. Karnataka is the third largest tobacco growing state and stands second in FCV tobacco production in the country. During the year 2009-10 the crop occupied an area of 0.16 million ha in the state with a total production of 115.68 million Kg accounting for an average productivity of 1053 Kg per ha (Reddy *et al.*2009 and Anon 2010). The productivity of tobacco is lowest because of several biotic and abiotic stresses affecting the crop. Among the biotic factors budworm, *Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae) is the most important. The *Helicoverpa* causes significant losses to tobacco during growth and reproductive stage of the crop, by feeding on growing buds at early stage and developing capsules in later stages. This pest is highly polyphagous and has been reported to damage more than 182 species of alternative host plants (Puttarudriah1983).

Cultivation of the crop in large areas with a sole dependence on insecticides at various doses leads to development of resistance to the pest. Extensive use of synthetic pyrethroids on tobacco, against *Helicoverpa* has become resistant at several locations in the country (Dhingra *et al.,* 1988 and Armes *et al.,* 1992). Thus, in order to develop an effective management strategy the present study was planned. In the present study efficacy of different new molecules and botanicals were tested for their efficacy against budworm.

MATERIALS AND METHODS

A field experiment was carried out during Kharif 2010-2011 at ZARS, Shimoga, to assess the efficacy of different insecticides against tobacco budworm. The field experiment was laid out in Randomized Complete Block Design (RCBD) using KST-19 variety of FCV tobacco with three replications and seven treatments including control. The plot size was 5.6 X 5.6 m. Transplanting was done on 19th July 2010 with a spacing of 90 X 60 cm between the row and plants, respectively. Ten plants were selected from each plot for recording observations. The treatments were randomized completely and plants were tagged with luggage labels. All agronomic practices were followed as per the package of practices except pest management, recommended by the UAS, Bangalore (Anon 2010).

Seven different insecticides were evaluated against budworm. The insecticides were sprayed whenever the population of pest reached Economic Threshold Level (ETL). Spray applications were made with hand operated knapsack sprayer.

Observations were made on the larval population of budworm on buds and leaves from selected plants from each plot. Population of larvae was recorded at one day before, third and seventh day after application of chemicals. The mean larval population of budworm was worked out and data were subjected to statistical analysis.

RESULTS AND DISCUSSION

Larval Population

The mean number of larvae present per plant before chemical application ranged from 2.00 to 3.33 (Table 1 and Figure 1). Three days after application of chemicals the average larval population ranged from 0.33 to 2.67. Flubendiamide recorded significantly the lowest larval population (0.33 larvae/ plant) followed by novaluron and *Nomuraea rileyi* with 1.00 and 1.33 larvae per plant, respectively. Whereas, HaNPV and BT halt recorded slightly higher larval population (1.67 larvae/plant), and were significantly superior than the untreated control (2.67 larvae/plant).

Table1: Comparative Efficacy of New Molecules Against Tobacco Budworm *Helicoverpa armigera* (Hubner)

S. No.	Treatments	Number of larvae/plant			Green leaf yield (kg/ha)	Cured leaf yield (kg/ha)	TGE (kg/ha)
		PTC	3DAT	7DAT			
T1	Spinosad 45 SC 0.5 ml/l	3.33(1.94)	1.33(1.34)	0.33(0.88)	8746.91	1075.55	874.94
T2	HaNPV 500LE 1ml/l	2.33(1.64)	1.67(1.39)	0.33(0.88)	6748.01	840.51	573.94
T3	Flubendiamide 480 SC 0.25 ml/l	2.00(1.56)	0.33(0.88)	0.00(0.71)	9364.01	1085.18	803.70
T4	Novaluron 10 EC 1ml/l	2.00(1.56)	1.00(1.17)	0.00(0.710)	8208.64	941.97	661.72
T5	Bt 17600 IU/mg 1gm/ 1	2.67(1.72)	1.67(1.46)	0.33(0.88)	5271.60	646.05	350.37
T6	Nomuraea rileyi 1 gm/l	2.33(1.64)	1.33(1.34)	0.67(1.05)	4706.17	553.33	307.40
T7	control	2.67(1.77)	2.67(1.77)	2.33(1.68)	4122.22	529.41	296.42
CV (%)	21.24	24.97	26.06	4.86	5.40	16.50	
CD@ 5%	0.17	0.16	0.16	280.03	37.44	77.89	

Note: PTC= pretreatment count, DAT= days after treatment * figures in the parentheses are “x+0.5 transformed values.

Figure 1: Efficacy of Insecticides on Larval Population of Budworm on FCV Tobacco

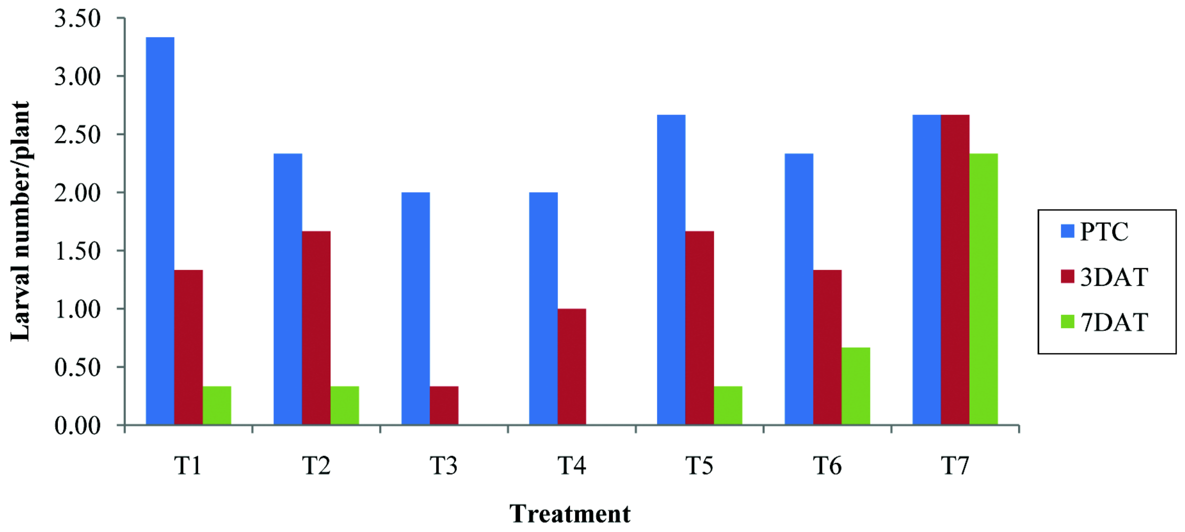
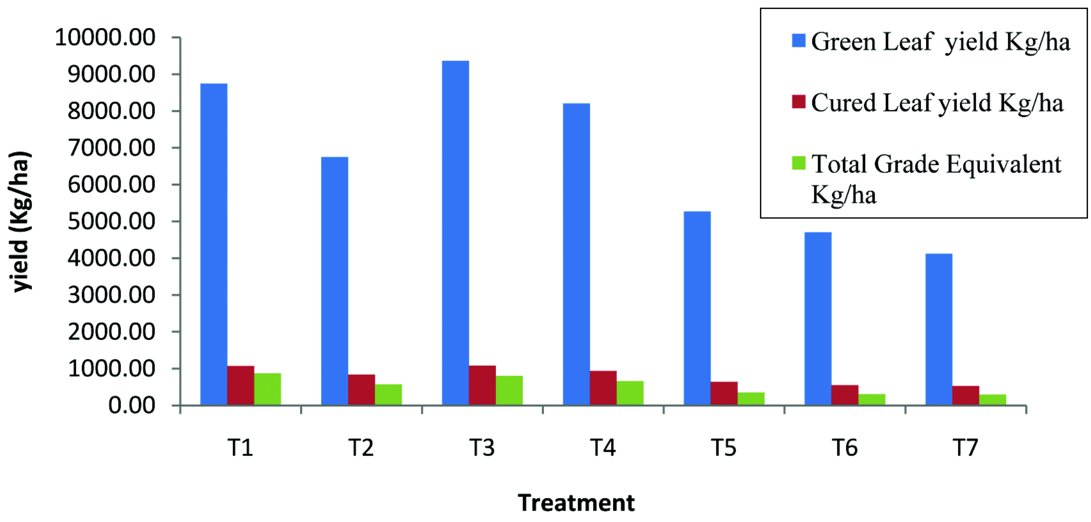


Figure 2: Efficacy of Insecticides on Budworm Against Yield in FCV Tobacco



Seven days after application, all treatments were statistically superior over control (2.33 larvae/plant). Flubendiamide and novaluron was significantly superior to all other treatments by recording zero larvae per plant as against the higher number of 2.33 larvae per plant in control.

Present findings are in line with report of Waware *et al.* (2008) who reported that the different concentrations of novaluron suppressed all developing stages of the pest. Similar type of reports were also obtained in cotton plots treated with spinosad and growth regulators against *Helicoverpa* (Banerjee *et al.* 2001, Brickle *et al.* 2001, Dandale *et al.*2001, Prasad *et al.*2001, Vikas Jindal 2007and Gosalwad *et al.* 2009). Kuttalam *et al.* (2008) reported the lower activity of budworm in tobacco plots treated with Flubendiamide. Mistray *et al.* (1984), Rabindra *et al.* (1985), Jeyakumar and Gupta (2002), Ramteke *et al.* (2002), Udikeri *et al.* (2004), Santharam and Balasubramanian (2005) reported slightly higher larval population of budworm with plots treated with NPV and Bt are in close agreement with present findings.

Green and Cured Leaf Yield

With regard to the yield and yield attributing characters, flubendiamide and spinosad treated plots recorded significantly higher green leaf yield (9364.01 and 8746.91*Kg*/ha) and cured leaf yield (1085.18 and 1075.55*Kg*/ha), respectively as against the lower yield (529.41*Kg*/ha) in untreated check (Table 1 and Figure 2). Similarly, total grade equivalent (TGE) was significantly high in plots treated with spinosad (874.94 *Kg*/ha) and flubendiamide (803.70 *Kg*/ha). The higher yield in both these treatments is because of efficacy of these chemicals to penetrate the larval body of the insects. Present findings are in conformity with the earlier reports of cotton (Banerjee *et al.,* 2001, Brickle *et al.,* 2001, Dandale *et al.*, 2001 Sohail *et al.*, 2004, Raghuraman and Uthamasamy, 2005 and Kuttalam *et al.,* 2008).

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