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FIELD EFFICACY OF INSECTICIDES AGAINST BLUE BUTTERFLY *LAMPIDES BOETICUS* (L.) ON YARD LONG BEAN

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ABSTRACT

Field experiment was conducted to evaluate the efficacy of some insecticides against blue butterfly *Lampides boeticus* (L.), on yard long bean *Vigna unguiculata* (L.) Walp. (cv. Githika) in the Department of Agricultural Entomology, College of Agriculture (KAU), Vellayani during kharif, 2017. The results showed that chlorantraniliprole 18.5SC @ 30 g a.i.ha^{-1} followed by flubendiamide 39.35SC @ 48 g a.i.ha^{-1} and thiacloprid 21.7SC @ 120 g a.i.ha^{-1} recorded least flower damage when compared to control whereas, indoxacarb 14.5SC @ 75 g a.i.ha^{-1} recorded lowest pod infestation which was followed by flubendiamide 39.35SC @ 48 g a.i.ha^{-1} and thiacloprid 21.7SC @ 120 g a.i.ha^{-1}. Thus, foliar application of chlorantraniliprole 18.5SC @ 30 g a.i.ha^{-1} was found effective in terms of reduction in flower and pod damage, and increased yield.

Key words: *Lampides boeticus*, *Vigna unguiculata*, chlorantraniliprole, flubendiamide, thiacloprid, indoxacarb, *Bacillus thuringiensis* var. *kurstaki* efficacy, damage, flower, pod, yield

Cowpea (*Vigna unguiculata* (L.) Walp. is a popular vegetable grown in tropical and subtropical countries and is one of the most important leguminous vegetable crops of Kerala. Phenology of the yard long bean comprises of four main stages viz., pre-flowering, flowering, pod formation and pod maturation. Various borer pests are noticed to attack the crop from seedling stage up to harvest coinciding with important phenological stages. Documentation of borer pest in yard long bean from two locations of Thiruvananthapuram district revealed blue butterfly *Lampides boeticus* (L.) as the major pod borer (Bindu, 1997; Thamilarasi, 2016). Among the pod borers *L. boeticus* is the major one (Ganapathy and Durairaj, 2000). Although pest biology on yard long bean has been studied extensively, the agroclimatic conditions differ completely among agroecosystems and these differences could influence the population fluctuation of insect pests. Thus, research on these aspects regarding Kerala conditions is valuable. Recently, various novel groups of insecticides with unique mode of action, low dosage requirement, more tissue-specificity which act in different ways inside the target cells of insects have been introduced. Unlike the conventional ones, most of the new molecules have excellent toxicological and ecotoxicological profiles and are widely acclaimed as potent compounds for management of borer pests of vegetables. Hence, this study on the evaluation of field efficacy of some insecticides on yard long bean.

MATERIALS AND METHODS

Field experiment was conducted at the Instructional Farm, College of Agriculture, Vellayani (KAU) during kharif 2017. Seeds of yard long bean variety, Githika were sown @ 2 seeds/ pit at the four corners of the beds with a spacing 2x 2 m. The experiment was conducted in randomized block design (RBD) with three replications. There were ten treatments viz., chlorantraniliprole 18.5SC, spinosad 45SC, thiacloprid 21.7SC, indoxacarb 14.5SC, emamectin benzoate 5SG, flubendiamide 39.35SC, dimethoate 30EC, cyantraniliprole 10.26OD, *B. bassiana, B. thuringiensis* var. *kurstaki* 0.5WP and untreated control. Each treatment was applied once at the peak flowering stage. The observations on three-days old unopened buds and opened flowers were examined from each plot at three, five, seven, ten and fifteen days after spraying and the number of buds/ flower damaged by *L. boeticus* were recorded. Similarly, each pod at vegetative maturity stage was examined to determine the number of pods with entry/ exit holes made by *L. boeticus* at three, five, seven, ten, and fifteen days after spraying and the number of pods and flower damaged were recorded. The extent of damage was worked out and data were subjected to statistical analysis after calculating the % flower and pod damage.

RESULTS AND DISCUSSION

Significant variation in flower damage was observed in the treated plots. On 3 DAS, least flower damage was recorded from plots treated with chlorantraniliprole 18.5SC @ 30 g a.i.ha^{-1}(1.96%) followed by emamectin benzoate 5SG @ 10 g a.i.ha^{-1} (2.56%) whereas cyantraniliprole 10.26OD @ 60 g a.i.ha^{-1} (7.28%), indoxacarb 14.5EC @ 75 g a.i.ha^{-1} (8.51%) and spinosad 45SC @ 100 g a.i.ha^{-1} (10.25%) were found on par with the above against untreated plot (50.69%) (Table 1). Similar findings were also obtained by Katagihallimath and Siddappaji (1962), who observed that *L. boeticus* is the most important pest. Govindan et al. (1989) observed that *L. boeticus* damages the flower buds and feed on the developing seeds of pulses, similar with present results in yard long bean. At 5 DAS, least flower damage (1.75%) was recorded in plot sprayed with chlorantraniliprole 18.5SC @ 30 g a.i.ha^{-1} which was on par with thiacloprid 21.7SC @ 120 g a.i.ha^{-1} (2.39%), indoxacarb 14.5EC @ 75 g a.i. ha^{-1} (3.03%), emamectin benzoate 5SG @ 10 g a.i.ha^{-1} (3.50%) and spinosad 45SC @ 100 g a.i.ha^{-1} (6.52%) as against 30.91% in untreated plot. Vijayasree (2013) observed that chlorantraniliprole 18.5SC @ 30 g a.i. ha^{-1}, indoxacarb 14.5SC @ 60 g a.i. ha^{-1} and emamectin benzoate 5SG @ 10 g a.i. ha^{-1} proved superior.

Similarly, on 7 DAS chlorantraniliprole 18.5SC @ 30 g a.i.ha^{-1} recorded least flower damage (3.60%) and was on par with flubendiamide 39.35SC @ 48 g a.i.ha^{-1} (6.42%) and cyantraniliprole 10.26OD @ 60 g a.i.ha^{-1} (8.97%) whereas the untreated plot had 48.14% flower damage. Drastic decline in flower damage was observed at 10 DAS with flubendiamide 39.35SC @ 48 g a.i.ha^{-1} (1.38%) followed by spinosad 45SC @ 100 g a.i.ha^{-1} (2.77%) and chlorantraniliprole 18.5SC @ 30 g a.i.ha^{-1} (5.29%). These observations are in agreement with those of Srivastava and Joshi (2011) in pigeonpea with spinosad 45SC @ 73 g a.i.ha^{-1}, flubendiamide 20WG @ 50 g a.i.ha^{-1}, indoxacarb 14.5SC @ 0.4 kg ha^{-1} and emamectin benzoate 5WSG @ 11 g a.i. ha^{-1}. On 15 DAS, plot treated with thiacloprid 21.7SC @ 120 g a.i. ha^{-1} recorded minimum flower damage (3.03%) followed by cyantraniliprole 10.26OD @ 60 g a.i.ha^{-1} (4.76%) and flubendiamide 39.35SC @ 48 g a.i.ha^{-1} (9.69%) whereas it was 29.72% in the untreated plot (Table 1).

Least pod damage (4.16%) was in plots treated with emamectin benzoate 5SG @ 10 g a.i.ha^{-1} which was on par with indoxacarb 14.5 EC at 75 g a.i.ha^{-1} (4.76%), cyantraniliprole 10.26 OD @ 60 g a.i.ha^{-1} (9.04%) and thiacloprid 21.7SC @ 120 g a.i. ha^{-1} (10.89%). At 7 DAS, plot treated with indoxacarb 14.5EC @ 75 g a.i.ha^{-1} recorded significantly least infestation (6.98%) followed by flubendiamide 39.35SC @ 48 g a.i.ha^{-1} (12.63%), thiacloprid 21.7SC @ 120 g a.i. ha^{-1} (15.27%) and dimethoate (16.83%) as compared to 45.07% in untreated plot. Flubendiamide 480SC @ 0.1 ml/ l gave maximum protection against *L. boeticus* after second spray as stated by Anusha et al. (2014). At 10 DAS, pod damage declined significantly with flubendiamide 39.35SC @ 48 g a.i.ha^{-1} (2.56%) followed by emamectin benzoate 5SG @ 10 g a.i.ha^{-1} (4.73). The present results agree with those of Pant et al. (2021) on chlorantraniliprole 18.5%SC against cowpea pod borer. Ameta et al. (2011) revealed lowest pod (5.67 and 6.14%) damage by *H. armigera* and *M. testulalis* in flubendiamide 480SC @ 100 ml ha^{-1} treated plot in pigeonpea. Significant effect was observed in the foliar application of bioinoculants like *B. bassiana* and *B. thuringiensis* applied plots on pod borer complex of cowpea (Soundararajan and Chitra, 2011; Subhasree and Mathew, 2014; Anitha and Parimala, 2014).

At fifteen days after spraying least pod damage (5.55%) was recorded in plots treated with emamectin benzoate 5SG @ 10 g a.i.ha^{-1} which was on par with the thiacloprid 21.7SC @ 120 g a.i. ha^{-1} having damaged pods of 5.89%. In the rest of the treatments, the pod damage ranged from 6.33 to 30.48% and all the treatments were superior. Emamectin benzoate 5SG @ 10 g a.i.ha^{-1} gave maximum crop yield (160.77 g plant^{-1}) which was on par with chlorantraniliprole 18.5SC @ 30 g a.i.ha^{-1} @ (159.83 g plant^{-1}) and flubendiamide 39.35SC @ 48 g a.i.ha^{-1} (152.66 g plant^{1}) (Table 1). Similar findings were observed by Ameta et al. (2011) on pod and flower damage by *H. armigera* with flubendiamide 480SC @ 100 ml ha^{-1} in pigeonpea. The novel insecticides like chlorantraniliprole, flubediamide and spinosad were highly effective against lepidopteran pests (Chatterjee and Mondal, 2012). Highest yield of pigeonpea with use of chlorantraniliprole followed by flubendiamide had been reported earlier (Sreekanth et al., 2015). Similar results were also obtained by Mohanraj et al. (2012) and Sapkal et al. (2018).

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Table 1. Effects of insecticides on flower and pod damage by *L. boeticus*

Treatments	Flower damage (%)					Pod damage (%)				Crop yield ($g\ plant^{-1}$)
	3 DAS	5 DAS	7 DAS	10 DAS	15 DAS	5 DAS	7 DAS	10 DAS	15 DAS	
Chlorantraniliprole 18.5SC @ 30 g $a.i.ha^{-1}$	1.96 $(1.31)^{a}$	1.75 $(1.27)^{a}$	3.60 $(1.85)^{a}$	5.29 $(2.13)^{abc}$	16.98 $(4.17)^{bcd}$	18.70 $(4.32)^{ab}$	26.19 $(5.0)^{bcd}$	10.68 $(2.94)^{ab}$	12.79 $(3.47)^{abc}$	159.83
Spinosad 45SC @ 100 g $a.i.ha^{-1}$	10.25 $(2.89)^{abc}$	6.52 $(2.34)^{ab}$	14.39 $(3.35)^{ab}$	2.77 $(1.46)^{ab}$	17.85 $(4.24)^{bcd}$	18.51 $(4.21)^{ab}$	26.94 $(5.07)^{bcd}$	26.85 $(5.21)^{cd}$	24.90 $(4.88)^{bcd}$	115.38
Thiacloprid 21.7SC @ 120 g $a.i.ha^{-1}$	10.97 $(3.18)^{abc}$	2.39 $(1.58)^{a}$	11.34 $(3.36)^{ab}$	7.53 $(2.79)^{bcd}$	3.03 $(1.50)^{a}$	10.89 $(2.87)^{ab}$	15.27 $(3.96)^{abc}$	17.41 $(4.20)^{abc}$	5.89 $(2.26)^{ab}$	141.11
Indoxacarb 14.5EC @ 75 g $a.i.ha^{-1}$	8.51 $(2.56)^{ab}$	3.03 $(1.50)^{a}$	15.95 $(4.05)^{b}$	5.41 $(2.18)^{abcd}$	17.24 $(4.15)^{bcd}$	4.76 $(1.75)^{a}$	6.98 $(2.40)^{a}$	15.12 $(3.94)^{bc}$	17.15 $(3.91)^{abc}$	139.66
Emamectin benzoate 5SG @ 10 g $a.i.ha^{-1}$	2.56 $(1.42)^{a}$	3.50 $(1.57)^{a}$	19.26 $(4.29)^{b}$	10.84 $(3.28)^{abc}$	12.22 $(3.12)^{abc}$	4.16 $(1.67)^{a}$	42.06 $(6.50)^{d}$	4.73 $(2.06)^{a}$	5.55 $(1.85)^{a}$	160.77
Flubendiamide 39.35SC (48 g $a.i.ha^{-1}$)	11.37 $(3.38)^{abc}$	11.78 $(3.49)^{bcd}$	6.42 $(2.62)^{ab}$	1.38 $(1.19)^{a}$	9.69 $(2.77)^{ab}$	14.81 $(3.31)^{ab}$	12.63 $(3.61)^{abc}$	2.56 $(1.42)^{a}$	6.33 $(2.59)^{ab}$	152.66
Dimethoate 30EC @ 85 g $a.i.ha^{-1}$)	17.12 $(4.16)^{cd}$	12.45 $(3.56)^{bcd}$	9.50 $(3.14)^{ab}$	8.88 $(2.69)^{bcde}$	22.99 $(4.82)^{cd}$	33.14 $(5.75)^{bc}$	16.83 $(3.97)^{abc}$	20.86 $(4.60)^{abc}$	30.48 $(5.48)^{cd}$	133.05
Cyantraniliprole 10.26OD @ 60 g $a.i.ha^{-1}$	7.28 $(2.67)^{ab}$	7.41 $(2.45)^{ab}$	8.97 $(2.67)^{ab}$	8.62 $(3.01)^{bcd}$	4.76 $(1.75)^{a}$	9.04 $(3.08)^{ab}$	16.86 $(3.56)^{ab}$	24.76 $(4.99)^{cd}$	26.72 $(4.71)^{cd}$	146.61
B. bassiana @ 10^{7} spores ml^{-1}	23.10 $(4.80)^{bcd}$	23.69 $(4.84)^{bc}$	13.61 $(3.70)^{ab}$	14.76 $(3.87)^{cd}$	20.41 $(4.47)^{bcd}$	23.61 $(4.82)^{abc}$	20.55 $(4.57)^{abcd}$	34.98 $(5.84)^{de}$	16.18 $(3.97)^{abc}$	116.27
thuringiensis var. *kurstaki* @ 1 ml/ 1	29.46 $(5.29)^{cd}$	24.59 $(4.71)^{bc}$	18.70 $(4.36)^{b}$	14.76 $(3.90)^{cd}$	16.62 $(4.10)^{bcd}$	33.33 $(4.97)^{abc}$	34.44 $(5.81)^{bc}$	15.80 $(3.95)^{bc}$	26.09 $(4.91)^{bcd}$	132.83
Untreated	50.69 $(6.92)^{d}$	30.91 $(5.18)^{c}$	48.14 $(6.90)^{c}$	16.37 $(4.10)^{e}$	29.72 $(5.47)^{d}$	66.66 $(8.01)^{c}$	45.07 $(6.65)^{d}$	51.54 $(7.17)^{e}$	57.14 $(7.58)^{d}$	93.11
CD (p=0.05)	2.404	2.587	2.066	1.733	1.795	3.369^{*}	2.219^{*}	1.687^{**}	2.770^{*}	33.187

Figures in parentheses square root transformed values; DAS - Days after spraying

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