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EVALUATION OF INSECTICIDES AGAINST SUCKING PESTS OF INDIAN BEAN

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ABSTRACT

Among the various insecticides evaluated for their field efficacy against sucking pests of Indian bean, the treatments of thiamethoxam 25WG at 0.025%, acetamiprid 20SP at 0.004% and buprofezin 25SC at 0.05% were found to be the most effective against *Aphis craccivora* Koch, *Empoasca kerri* Pruthi and *Bemisia tabaci* Gennadius. While, thiacloprid 21.7SC at 0.012% emerged as the moderately effective. Emamectin benzoate 5SG at 0.002%, indoxacarb 14.5SC at 0.007%, lambda-cyhalothrin 5SC at 0.005% and novaluron 10EC at 0.01% were found to be less effective.

Key words: *Lablab purpureus*, *Aphis craccivora*, *Empoasca kerri*, *Bemisia tabaci*, acetamiprid, thiamethoxam, buprofezin, thiacloprid, emamectin benzoate, indoxacarb, lambdacyhalothrin, novaluron

Indian bean *Lablab purpureus* L. is a legume crop widely grown as vegetable or pulse. Insect pests are major constraints in its productivity. It is attacked by a number of insect pests viz*.,* aphid *Aphis craccivora* Koch.; jassids *Empoasca fabae* (Harris)*; E. krameri* Ross and Moore and *E. kerri* Pruthi; pod borer *Etiella zinckenella* (Treit.); whitefly *Bemisia tabaci* (Genn.); stem fly, *Ophiomyia phaseoli* (Tryon); hairy caterpillars *Ascotis imparta (*Walk.*);* Bihar hairy caterpillar, *Spilosoma obliqua* (Walk.) etc. Among these, aphids, jassids and whiteflies are the major sucking pests. These pests attack all parts of the plants including pods which result in stunted growth and decreased yield. The honey dew secretion of the aphids provides a suitable media for the development of sooty mould and fungi which ultimately hamper the process of photosynthesis (David and Kumarswami, 1982). Chemical control of *A. craccivora*, *E. kerri* and *B. tabaci* is usally recommended (Garhwal et al*.,* 1994; Dhamaniya et al*.,* 2005; Yadav et al*.,* 2011) but, due to its continuous and enormous use, problems of resistance, deleterious effect on parasitoids and predators, and residue hazards, and environment pollution have arisen. Hence, there is renewed interest in search for new insecticides, and the present study evaluates some of these.

MATERIALS AND METHODS

The field experiments on the evaluation of efficacy of insecticides were conducted at the College Farm, N M College of Agriculture, Navsari Agricultural University, Navsari, Gujarat during 2019-20. The variety GNIB-22 was used and the seeds sown in plots of size 11 m^2 at 60x 30 cm spacing in 2nd fortnight of October. Eight insecticides viz., thiamethoxam 25WG (1 g/ l), thiacloprid 21.7SC (0.6 ml/ l), buprofezin 25SC (2.0 ml/ l), acetamiprid 20SP (0.2 g/ l), indoxacarb 14.5SC (0.5 ml/ l), emamectin benzoate 5SG (0.4g/ l), lambda-cyhalothrin 5SC (1ml/ l) and novaluron 10EC (1 ml/ l) were evaluated along with untreated control with each replicated thrice. These were applied as a foliar spray on the crop using pre-calibrated knapsack sprayer when the pest incidence was sufficiently built up. Second spray was repeated after 15 days of the first spray. The observations were recorded a day before spray as well as 1st, 3rd, 5th, 7th and 14th days after each spray. The observations were made from five randomly selected plants/ plot. *Aphis craccivora* incidence was observed on three randomly selected twigs (about 10 cm in length). *Empoasca kerri* and *B tabaci* were counted from three leaves (from top, middle and bottom). The pooled data were subjected to statistical analysis.

RESULTS AND DISCUSSION

The pooled results over two sprays given in Tables 1-3 reveal that significantly minimum incidence of *A. craccivora* was observed in plots treated with thiamethoxam 25WG (3.57 aphids/ twig) and it was at par with acetamiprid 20SP (3.82 aphids/ twig) and buprofezin 25SC (4.04 aphids/ twig), while novaluron 10EC (12.49 aphids/ twig) was found less effective (Table 1). Chaudhary et al. (2015) reported that

Table 1. Efficacy of insecticides against *Aphis craccivora* on Indian bean

Tr. No.	Treatments	Before spray	Mean no. of aphids/ twig										Pooled
			First spray					Second spray					
			1DAS	3DAS	5DAS	7DAS	14DAS	1DAS	3DAS	5DAS	7DAS	14DAS	
T_1	Thiamethoxam 25WG at 0.025%	4.05 (16.43)	2.33 (5.44)	2.23 (4.99)	2.05 (4.20)	1.85 (3.42)	2.26 (5.09)	1.94 (3.75)	1.88 (3.52)	1.66 (2.75)	1.39 (1.95)	1.08 (1.16)	1.89 (3.57)
T_2	Thiacloprid 21.7SC at 0.012%	4.13 (17.03)	3.01 (9.04)	2.96 (8.74)	2.84 (8.08)	2.65 (7.00)	2.94 (8.66)	2.68 (7.16)	2.54 (6.48)	2.36 (5.57)	2.16 (4.69)	1.84 (3.38)	2.61 (6.84)
T_3	Buprofezin 25SC at0.05%	3.97 (15.79)	2.41 (5.82)	2.35 (5.54)	2.20 (4.86)	2.02 (4.08)	2.35 (5.52)	2.02 (4.08)	1.91 (3.63)	1.78 (3.19)	1.58 (2.48)	1.25 (1.55)	2.01 (4.04)
T_4	Acetamiprid 20SP at 0.004%	4.12 (16.95)	2.37 (5.62)	2.28 (5.19)	2.13 (4.56)	1.94 (3.79)	2.30 (5.27)	1.98 (3.92)	1.89 (3.57)	1.77 (3.12)	1.54 (2.36)	1.13 (1.27)	1.95 (3.82)
T_5	Indoxacarb 14.5SC at 0.007%	3.95 (15.58)	3.73 (13.89)	3.68 (13.57)	3.59 (12.91)	3.53 (12.46)	3.58 (12.79)	3.36 (11.31)	3.29 (10.84)	3.13 (9.83)	3.00 (8.98)	2.70 (7.30)	3.37 (11.39)
T_6	Emamectin Benzoate 5SG at 0.002%	3.84 (14.72)	3.63 (13.18)	3.59 (12.88)	3.45 (11.94)	3.35 (11.22)	3.52 (12.36)	3.30 (10.87)	3.22 (10.36)	3.08 (9.46)	2.92 (8.50)	2.42 (5.85)	3.26 (10.63)
T_7	Lambda-cyhalothrin 5SC at 0.005%	3.97 (15.76)	3.67 (13.51)	3.63 (13.18)	3.53 (12.46)	3.38 (11.44)	3.54 (12.56)	3.33 (11.08)	3.24 (10.54)	3.10 (9.61)	2.94 (8.66)	2.66 (7.07)	3.31 (11.01)
T_8	Novaluron 10EC at 0.01%	4.05 (16.40)	4.07 (16.56)	3.92 (15.41)	3.82 (14.61)	3.70 (13.73)	3.63 (13.20)	3.43 (11.81)	3.44 (11.85)	3.21 (10.34)	3.09 (9.56)	2.87 (8.23)	3.53 (12.49)
T_9	Control (Treated with water)	4.12 (16.97)	4.65 (21.63)	4.55 (20.67)	4.38 (19.21)	4.22 (17.86)	4.21 (17.76)	3.99 (15.94)	3.94 (15.55)	3.79 (14.38)	3.56 (12.72)	3.27 (10.69)	4.07 (16.56)
	S.E.m ±	0.19	0.18	0.19	0.16	0.14	0.18	0.17	0.14	0.17	0.14	0.13	0.04
	S.E.m ± (P×T)	-	-	-	-	-	-	-	-	-	-	-	0.06
	C.D (p= 0.05)	NS	0.55	0.57	0.48	0.44	0.55	0.51	0.41	0.52	0.43	0.38	0.13
	C.D (p= 0.05) (P×T)	-		-	-	-	-		-	-	-	-	NS

DAS = Days after spraying; Figure in parentheses original, and outside $\sqrt{x + 0.5}$ transformed values.

Table 2. Efficacy of insecticides against *Empoasca kerri* on Indian bean

Tr. No.	Treatments	Before spray	Mean no. of jassids/ leaf										Pooled
			First spray					Second spray					
			1DAS	3DAS	5DAS	7DAS	14DAS	1DAS	3DAS	5DAS	7DAS	14DAS	
T_1	Thiamethoxam 25WG at 0.025%	2.93 (8.58)	1.91 (3.65)	1.95 (3.82)	1.88 (3.55)	1.73 (2.98)	1.92 (3.67)	1.68 (2.83)	1.73 (2.99)	1.56 (2.42)	1.17 (1.36)	0.95 (0.90)	1.67 (2.80)
T_2	Thiacloprid 21.7SC at 0.012%	2.91 (8.47)	2.32 (5.37)	2.37 (5.63)	2.31 (5.35)	2.22 (4.94)	2.31 (5.35)	2.17 (4.71)	2.19 (4.82)	2.04 (4.15)	1.79 (3.22)	1.49 (2.22)	2.14 (4.60)
T_3	Buprofezin 25SC at0.05%	2.86 (8.16)	2.30 (5.29)	2.34 (5.47)	2.29 (5.28)	2.20 (4.86)	2.29 (5.25)	2.13 (4.55)	2.17 (4.72)	1.95 (3.82)	1.72 (2.96)	1.38 (1.90)	2.10 (4.41)
T_4	Acetamiprid 20SP at 0.004%	2.83 (7.99)	1.89 (3.56)	1.91 (3.67)	1.84 (3.39)	1.71 (2.92)	1.88 (3.56)	1.66 (2.76)	1.69 (2.85)	1.51 (2.29)	1.10 (1.22)	0.88 (0.77)	1.63 (2.67)
T_5	Indoxacarb 14.5SC at 0.007%	2.88 (8.29)	2.74 (7.51)	2.78 (7.74)	2.74 (7.54)	2.70 (7.27)	2.74 (7.52)	2.63 (6.92)	2.67 (7.12)	2.52 (6.35)	2.31 (5.34)	2.09 (4.38)	2.61 (6.82)
T_6	Emamectin Benzoate 5SG at 0.002%	2.90 (8.39)	2.71 (7.36)	2.74 (7.54)	2.71 (7.34)	2.66 (7.06)	2.72 (7.41)	2.60 (6.78)	2.65 (7.02)	2.47 (6.08)	2.30 (5.29)	2.09 (4.35)	2.58 (6.67)
T_7	Lambda-cyhalothrin 5SC at 0.005%	2.82 (7.95)	2.77 (7.65)	2.80 (7.87)	2.75 (7.59)	2.71 (7.34)	2.78 (7.73)	2.65 (7.04)	2.71 (7.34)	2.56 (6.55)	2.36 (5.59)	2.15 (4.64)	2.64 (6.99)
T_8	Novaluron 10EC at 0.01%	2.87 (8.23)	2.80 (7.86)	2.83 (8.00)	2.78 (7.75)	2.75 (7.56)	2.80 (7.88)	2.69 (7.23)	2.73 (7.49)	2.56 (6.55)	2.41 (5.81)	2.19 (4.80)	2.67 (7.15)
T_9	Control (Treated with water)	2.84 (8.10)	2.99 (8.96)	3.03 (9.16)	2.99 (8.92)	2.94 (8.64)	2.99 (8.98)	2.84 (8.08)	2.88 (8.34)	2.86 (8.20)	2.69 (7.25)	2.53 (6.40)	2.89 (8.36)
	S.E.m ±	0.12	0.13	0.11	0.12	0.14	0.12	0.14	0.12	0.09	0.11	0.10	0.03
	S.E.m ± (P×T)	-	-	-	-	-	-	-	-	-	-	-	0.05
	C.D (p= 0.05)	NS	0.39	0.34	0.36	0.40	0.37	0.41	0.36	0.27	0.34	0.32	0.09
	C.D (p= 0.05) (P×T)	-		-	-	-	-		-	-	-	-	NS

DAS = Days after spraying; Figure in parentheses are original value whereas, those outside are $\sqrt{x} + 0.5$ transformed values.

Table 3. Efficacy of insecticides against *Bemisia tabaci* on Indian bean

Tr. No.	Treatments	Before spray	Mean no. of whitefly/ leaf										Pooled
			First spray					Second spray					
			1DAS	3DAS	5DAS	7DAS	14DAS	1DAS	3DAS	5DAS	7DAS	14DAS	
T_1	Thiamethoxam 25WG at 0.025%	2.73 (7.45)	2.11 (4.47)	2.12 (4.48)	1.84 (3.39)	1.63 (2.68)	1.86 (3.46)	1.47 (2.16)	1.48 (2.18)	1.39 (1.92)	1.18 (1.39)	1.01 (1.03)	1.63 (2.68)
T_2	Thiacloprid 21.7SC at 0.012%	2.68 (7.18)	2.53 (6.40)	2.56 (6.55)	2.31 (5.35)	2.13 (4.54)	2.30 (5.27)	1.99 (3.97)	2.00 (4.01)	1.92 (3.67)	1.74 (3.03)	1.54 (2.36)	2.12 (4.51)
T_3	Buprofezin 25SC at0.05%	2.75 (7.54)	2.14 (4.59)	2.14 (4.58)	1.86 (3.47)	1.70 (2.89)	1.90 (3.62)	1.50 (2.24)	1.52 (2.30)	1.45 (2.10)	1.22 (1.48)	1.07 (1.15)	1.67 (2.82)
T_4	Acetamiprid 20SP at 0.004%	2.71 (7.36)	2.09 (4.38)	2.10 (4.41)	1.83 (3.36)	1.62 (2.62)	1.83 (3.36)	1.40 (1.96)	1.43 (2.04)	1.33 (1.77)	1.16 (1.34)	0.94 (0.90)	1.60 (2.57)
T_5	Indoxacarb 14.5SC at 0.007%	2.82 (7.97)	2.73 (7.43)	2.79 (7.80)	2.65 (7.05)	2.54 (6.47)	2.63 (6.93)	2.40 (5.76)	2.43 (5.92)	2.32 (5.37)	2.11 (4.47)	1.92 (3.67)	2.47 (6.11)
T_6	Emamectin Benzoate 5SG at 0.002%	2.76 (7.64)	2.72 (7.38)	2.77 (7.69)	2.63 (6.93)	2.53 (6.40)	2.62 (6.88)	2.38 (5.66)	2.42 (5.84)	2.32 (5.37)	2.10 (4.42)	1.89 (3.56)	2.45 (6.03)
T_7	Lambda-cyhalothrin 5SC at 0.005%	2.80 (7.84)	2.76 (7.60)	2.81 (7.93)	2.67 (7.12)	2.58 (6.67)	2.64 (7.00)	2.45 (6.03)	2.51 (6.28)	2.35 (5.54)	2.16 (4.65)	2.00 (4.00)	2.51 (6.31)
T_8	Novaluron 10EC at 0.01%	2.70 (7.30)	2.76 (7.65)	2.83 (8.00)	2.72 (7.41)	2.61 (6.83)	2.68 (7.16)	2.47 (6.11)	2.52 (6.37)	2.37 (5.62)	2.21 (4.87)	2.05 (4.22)	2.54 (6.46)
T_9	Control (Treated with water)	2.79 (7.78)	2.90 (8.45)	3.01 (9.08)	3.04 (9.24)	2.96 (8.47)	3.00 (9.00)	2.85 (8.16)	2.89 (8.39)	2.82 (7.95)	2.71 (7.34)	2.46 (6.04)	2.88 (8.31)
	S.E.m ±	0.13	0.13	0.12	0.10	0.10	0.10	0.12	0.12	0.13	0.10	0.08	0.06
	S.E.m ± (P×T)	-	-	-	-	-	-	-	-	-	-	-	0.04
	C.D (p= 0.05)	NS	0.38	0.36	0.32	0.32	0.30	0.37	0.37	0.38	0.31	0.25	0.20
	C.D at 5 % (P×T)	-	-	-	-		-	-	-	-		-	0.12

DAS = Days after spraying; Figure in parentheses are original value whereas, those outside are $\sqrt{x} + 0.5$ transformed values.

imidacloprid followed by acetamiprid were superior; Choudhary et al. (2017) showed that thiamethoxam (0.005%) was the most effective. As regards the incidence of *E. kerri*, acetamiprid 20SP (2.67 jassids/ leaf) followed by thiamethoxam 25WG (2.80 jassids/ leaf) were the best (Table 2); buprofezin 25SC and thiacloprid 21.7SC were the next best. Chaudhary et al. (2015) found that imidacloprid followed by acetamiprid were superior; while Singh et al. (2019) showed that acetamiprid (0.004%) was the most effective in green gram. Meena et al. (2020) reported that imidacloprid > thiamethoxam > acetamiprid were the most effective in green gram. The incidence of *B. tabaci* was significantly reduced with acetamiprid 20SP (2.57 whiteflies/ leaf) and it was at par with thiamethoxam 25WG (2.68 whiteflies/ leaf); it was followed by buprofezin 25SC and thiacloprid, while was the least effective (Table 3). These results agree with those of Chaudhary et al. (2015) that incidence of whitefly was significantly reduced with acetamiprid. Kukvaya et al. (2018) revealed that thiamethoxam 25 WG @ 0.005 was highly effective against whitefly in moth bean. Singh and Singh (2018, 2019) observed that acetamiprid was the most effective in green gram.

AUTHOR CONTRIBUTION STATEMENT

All authors equally contributed.

CONFLICT OF INTEREST

No conflict of interest.

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