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EFFICACY OF INSECTICIDES AGAINST POD BORERS OF INDIAN BEAN

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ABSTRACT

Among the various insecticides evaluated for their field efficacy against pod borers of Indian bean, the treatment of emamectin benzoate 5SG at 0.002%, indoxacarb 14.5SC at 0.007% and lambdacyhalothrin 5SC at 0.005% were found to be most effective against *Helicoverpa armigera* (Hubner) and *Maruca vitrata* Geyer. While, thiacloprid 21.7SC at 0.012% and novaluron 10EC at 0.01% were moderately effective. The least pod damage was observed with emamectin benzoate 5SG at 0.002% (13.16%) which was at par with indoxacarb 14.5SC at 0.007% (14.16%) and lambdacyhalothrin 5SC at 0.005% (16.33%). Maximum pod yield (21.75 q/ ha), increase in yield over control (95.76%) and % of avoidable loss (48.91%) was observed with emamectin benzoate 5SG at 0.002%.

Key words: Indian bean, *Helicoverpa armigera*, *Maruca vitrata,* emamectin benzoate, indoxacarb, lambda-cyhalothrin, thiacloprid, novaluron, pod damage, yield

Indian bean *Lablab purpureus* L. is a legume crop widely grown as vegetable or pulse crop. In Gujarat, this crop is mainly attacked by aphid *Aphis craccivora* Koch, leaf hopper *Empoasca kerri* Pruthi, whitefly *Bemisia tabaci* (Gennadius), thrips *Megaleurothrips distalis* Karny and pod borer *Helicoverpa armigera* (Hubner) (Chaudhari et al., 2016). Of these, pod borers are most important regularly causing crop loss to the tune of 80-100% (Reddy et al., 2017), and thus a key impediment for productivity; nearly 54% loss occurs due to these in field beans. The major pod feeders include *Maruca vitrata* Geyer besides *H. armigera*. Many insecticides are effective against the pod borers of Indian bean, but resistance to common insecticides is known and it occurs due to its injudicious use. Therefore, this study to evaluate efficacy of some newer molecules.

MATERIALS AND METHODS

The field experiments on the evaluation of field 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 with sowing done in plots of size 11 m^2 at 60x 30 cm spacing. The crop was sown in the second fortnight of October. Nine treatments were evaluated along with untreated control, each replicated thrice. The insecticides i.e., 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), lambdacyhalothrin 5SC (1ml/ l) and novaluron 10EC (1 ml/ l) were evaluated. These were applied as foliar spray using pre-calibrated knapsack sprayer when the pest incidence was sufficiently builtup. 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, from 5 randomly selected plants/ plot. Number of *H. armigera* and *M vitrata* larvae were counted and mean was calculated. For recording observations on pod damage, total and damaged pods were counted at each picking. The yield of green pods was recorded plot-wise during each picking, and plot-wise yield obtained was converted into kg ha^{-1}. The data were subjected to statistical analysis.

RESULTS AND DISCUSSION

Results of pooled data over two years revealed that the significantly minimum incidence of *H. armigera* and *M. vitrata* larvae was recorded in plots treated with emamectin benzoate 5SG (1.54, 2.17 larvae/ plant) and it was at par with indoxacarb 14.5SC (1.60, 2.29 larvae/ plant) and lambdacyhalothrin 5SC (1.69, 2.36 larvae/ plant, respectively). Thiacloprid 21.7SC (2.57, 3.68 larvae/ plant) was the next effective and it was at par with novaluron 10EC (2.65, 3.78 larvae/ plant, respectively). Significantly minimum pod damage was

Table 1. Efficacy of insecticides against *H. armigera* on Indian bean

Tr. No.	Treatments	Mean no. of *H. armigera* larvae/ plant											
		Before-spray	First spray					Second spray					Pooled
			1DAS	3DAS	5DAS	7DAS	14DAS	1DAS	3DAS	5DAS	7DAS	14DAS	
T_1	Thiamethoxam 25 WG at 0.025%	2.25 (5.08)	2.05 (4.20)	2.12 (4.49)	2.09 (4.35)	1.89 (3.59)	2.05 (4.20)	1.89 (3.58)	1.95 (3.82)	1.86 (3.47)	1.77 (3.13)	1.70 (2.89)	1.96 (3.85)
T_2	Thiacloprid 21.7 SC at 0.012%	2.32 (5.40)	1.70 (2.90)	1.81 (3.27)	1.75 (3.08)	1.52 (2.31)	1.72 (2.94)	1.50 (2.24)	1.58 (2.49)	1.47 (2.16)	1.41 (1.98)	1.29 (1.66)	1.60 (2.57)
T_3	Buprofezin 25 SC at0.05%	2.18 (4.77)	2.03 (4.13)	2.10 (4.42)	2.07 (4.28)	1.84 (3.38)	2.02 (4.08)	1.84 (3.39)	1.90 (3.62)	1.82 (3.30)	1.76 (3.10)	1.66 (2.76)	1.92 (3.72)
T_4	Acetamiprid 20 SP at 0.004%	2.24 (5.03)	2.06 (4.26)	2.12 (4.49)	2.10 (4.24)	1.91 (3.66)	2.07 (4.28)	1.91 (3.65)	1.97 (3.88)	1.92 (3.69)	1.85 (3.43)	1.72 (2.96)	1.98 (3.95)
T_5	Indoxacarb 14.5 SC at 0.007%	2.31 (5.32)	1.40 (1.97)	1.51 (2.28)	1.41 (1.99)	1.10 (1.21)	1.44 (2.07)	1.12 (1.25)	1.25 (1.55)	1.11 (1.23)	1.01 (1.03)	0.95 (0.90)	1.26 (1.61)
T_6	Emamectin Benzoate 5 SG at 0.002%	2.28 (5.18)	1.38 (1.90)	1.48 (2.20)	1.36 (1.86)	1.05 (1.10)	1.42 (2.01)	1.05 (1.10)	1.19 (1.42)	1.07 (1.15)	0.98 (0.97)	0.91 (0.83)	1.23 (1.54)
T_7	Lambda-cyhalothrin 5 SC at 0.005%	2.25 (5.06)	1.43 (2.04)	1.53 (2.35)	1.46 (2.15)	1.14 (1.31)	1.47 (2.17)	1.13 (1.29)	1.27 (1.61)	1.14 (1.29)	1.04 (1.08)	0.98 (0.97)	1.29 (1.69)
T_8	Novaluron 10 EC at 0.01%	2.29 (5.27)	1.72 (2.98)	1.83 (3.33)	1.77 (3.14)	1.47 (2.17)	1.73 (2.99)	1.51 (2.29)	1.61 (2.60)	1.53 (2.33)	1.46 (2.13)	1.35 (1.81)	1.62 (2.65)
T_9	Control (Treated with water)	2.32 (5.39)	2.36 (5.60)	2.49 (6.23)	2.45 (6.03)	2.36 (5.60)	2.44 (5.97)	2.33 (5.46)	2.39 (5.71)	2.33 (5.43)	2.29 (5.23)	2.26 (5.11)	2.34 (5.73)
	S.E.m ±	0.10	0.09	0.08	0.09	0.09	0.09	0.10	0.09	0.07	0.09	0.07	0.02
	S.E.m ± (P×T)	-	-	-	-	-	-	-	-	-	-	-	0.03
	C.D (p= 0.05)	NS	0.26	0.24	0.26	0.29	0.27	0.31	0.26	0.21	0.27	0.22	0.06
	C.D (p= 0.05) (P×T)	-	-	-	-	-	-	-	-	-	-	-	NS

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

Table 2. Efficacy of insecticides against *M. vitrata* on Indian bean

Tr. No.	Treatments	Mean no. of *M. vitrata* larvae/ plant												Yield (q/ ha)	Increase in yield over control (%)
		Before spray	First spray					Second spray					Pooled		
			1DAS	3DAS	5DAS	7DAS	14DAS	1DAS	3DAS	5DAS	7DAS	14DAS			
T_1	Thiamethoxam 25 WG at 0.025%	2.63 (6.93)	2.27 (5.14)	2.33 (5.44)	2.30 (5.30)	2.27 (5.15)	2.43 (5.88)	2.22 (4.91)	2.26 (5.09)	2.15 (4.61)	2.05 (4.20)	1.92 (3.69)	2.24 (5.02)	14.58	31.23
T_2	Thiacloprid 21.7 SC at 0.012%	2.57 (6.62)	2.22 (4.91)	2.27 (5.15)	2.13 (4.54)	1.95 (3.81)	2.05 (4.21)	1.77 (3.12)	1.80 (3.25)	1.71 (2.92)	1.59 (2.52)	1.46 (2.13)	1.92 (3.68)	17.12	54.09
T_3	Buprofezin 25 SC at0.05%	2.67 (7.13)	2.26 (5.12)	2.31 (5.36)	2.29 (5.23)	2.25 (5.09)	2.42 (5.84)	2.19 (4.78)	2.22 (4.94)	2.13 (4.54)	2.03 (4.13)	1.90 (3.60)	2.22 (4.94)	15.04	35.37
T_4	Acetamiprid 20 SP at 0.004%	2.63 (6.92)	2.28 (5.20)	2.36 (5.58)	2.32 (5.38)	2.28 (5.22)	2.44 (5.97)	2.23 (4.99)	2.28 (5.21)	2.19 (4.81)	2.10 (4.41)	1.94 (3.75)	2.26 (5.13)	13.65	22.86
T_5	Indoxacarb 14.5 SC at 0.007%	2.57 (6.59)	1.81 (3.26)	1.84 (3.37)	1.67 (2.80)	1.58 (2.48)	1.70 (2.87)	1.36 (1.84)	1.39 (1.94)	1.27 (1.60)	1.16 (1.34)	1.07 (1.15)	1.51 (2.29)	20.60	85.41
T_6	Emamectin Benzoate 5 SG at 0.002%	2.51 (6.28)	1.80 (3.23)	1.82 (3.31)	1.64 (2.69)	1.52 (2.32)	1.64 (2.70)	1.28 (1.63)	1.36 (1.85)	1.24 (1.53)	1.13 (1.27)	1.00 (1.01)	1.47 (2.17)	21.75	95.76
T_7	Lambda-cyhalothrin 5 SC at 0.005%	2.62 (6.88)	1.82 (3.33)	1.85 (3.42)	1.69 (2.87)	1.60 (2.56)	1.72 (2.95)	1.38 (1.91)	1.42 (2.02)	1.29 (1.67)	1.18 (1.40)	1.10 (1.21)	1.53 (2.36)	19.81	78.30
T_8	Novaluron 10 EC at 0.01%	2.48 (6.16)	2.25 (5.06)	2.27 (5.17)	2.16 (4.66)	1.98 (3.93)	2.08 (4.35)	1.80 (3.24)	1.83 (3.34)	1.74 (3.02)	1.61 (2.60)	1.48 (2.19)	1.94 (3.78)	17.59	58.32
T_9	Control (Treated with water)	2.51 (6.32)	2.67 (7.12)	2.72 (7.42)	2.71 (7.34)	2.70 (7.29)	2.77 (7.69)	2.62 (6.88)	2.69 (7.22)	2.65 (7.02)	2.60 (6.76)	2.64 (6.97)	2.69 (7.26)	11.11	-
	S.E.m ±	0.13	0.12	0.12	0.12	0.09	0.10	0.12	0.11	0.11	0.12	0.10	0.08	0.98	-
	S.E.m ± (P×T)	-	-	-	-	-	-	-	-	-	-	-	0.04	-	-
	C.D (p= 0.05)	NS	0.37	0.36	0.38	0.29	0.31	0.35	0.33	0.34	0.36	0.31	0.25	2.95	-
	C.D (p= 0.05) (P×T)	-	-	-	-	-	-	-	-	-	-	-	0.12		-

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

recorded in the plots treated with emamectin benzoate 5SG (13.16%) which was at par with indoxacarb 14.5SC (14.16%) and lambdacyhalothrin 5SC (16.33%). The next effective treatments were thiacloprid 21.7SC (24.50%) and novaluron 10EC (27.83%). Maximum pod yield was obtained with emamectin benzoate 5SG (21.75 q/ ha) followed by indoxacarb 14.5SC (20.60 q/ ha) (Table 1, 2). Mohapatra and Srivastava (2002) observed that lambdacyhalothrin 5EC @ 25 g a.i./ ha was the most effective against *M. vitrata* in pigeon pea. Rao et al. (2007) showed that the indoxacarb 14.5SC @ 1 ml/ l was the most effective against *M. vitrata* in pigeonpea. Srinivasan and Durairaj (2007) found that spinosad 45SC @ 73 g a.i./ ha was the most effective against *H. armigera* followed by indoxacarb 14.8SC in pigeon pea. Babariya et al. (2010) with indoxacarb 0.0075% observed maximum mortality of *H. armigera* in pigeon pea. Sonune et al. (2010) observed that the indoxacarb 0.008% and lambdacyhalothrin 0.005% were the most effective in against *M. vitrata* in black gram. Nebapure and Sagar (2019) revealed that chlorantraniliprole 18.5SC @ 30g a.i./ ha followed by indoxacarb 15.8EC @ 73g a.i./ ha at 15 days interval were effective against *M. vitrata* on pigeonpea. Ahmed et al. (2020) found emamectin benzoate @ 1.0 g/ l as the most effective against *M. vitrata.* Haripriya et al. (2021) revealed that spinosad 45SC @ 75 ml/ ha followed by emamectin benzoate 5SG @ 200 ml/ ha were effective against *M. vitrata* on lablab and green gram. Thus, emamectin benzoate 5SG at 0.002%, indoxacarb 14.5SC at 0.007% and lambda-cyhalothrin 5SC at 0.005% can be recommended against *H. armigera* and *M. vitrata*.

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