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To evaluate the efficacy of insecticides against pod borer, *Maruca vitrata* (Fabricus) infesting Dolichos bean

SB Shelke, Dr. BD Shinde, PS Chopkar, SM Durge and RJ Choudhari

Abstract
A field experiment was conducted to evaluate the efficacy of some insecticides against pod borer, *M. vitrata* infesting lablab bean. After first and second spray, it was revealed that the treatment Emamectin benzoate 5SG @ 0.002% at 3DAS proved to be best in reducing pod damage caused by *M. vitrata* by recording (3.25 per cent) and which was at par with Indoxacarb 14.5 SC @ 0.014% (4.11 per cent) and Profenofos 50 EC @ 0.075% (5.20 per cent). At 7 DAS revealed that the lowest (2.57) per cent pod damage was recorded in the plots treated with Emamectin benzoate 5SG @ 0.002%, it was at par with Indoxacarb 14.5 SC @ 0.014% (3.84 per cent) and Profenofos 50 EC @ 0.075% (3.92 per cent). The minimum mean per cent pod damage of two sprays at 10 DAS was recorded in the treatment of Indoxacarb 14.5 SC @ 0.014% (2.46 per cent), it was at par with Emamectin benzoate 5SG @ 0.002% (2.75 per cent) and Profenofos 50 EC @ 0.075% (3.72 per cent). At 14 DAS revealed that the treatment Emamectin benzoate 5SG @ 0.002% (1.72 per cent) proved to be the best treatment amongst all and next best treatments were Indoxacarb 14.5 SC @ 0.014% (3.62 per cent), it was at par with Profenofos 50 EC @ 0.075% (4.67 per cent).
From the overall mean per cent of pod damage with two sprays it was revealed that the treatment of Emamectin benzoate 5SG @ 0.002 per cent was effective (2.57 per cent) in reducing the pod damage and was at par with Indoxacarb 14.5 SC @ 0.014 per cent (3.51 per cent). The next best treatments were Profenofos 50 EC @ 0.075% (4.38 per cent), Lambda cyhalothrin 5 EC @ 0.003% (6.33 per cent), Dichlorvos 76 EC @ 0.11% (6.37 per cent) and Deltamethrin 2.8 EC 0.0025% (8.06 per cent). The highest (17.80 per cent) pod damage was recorded in the untreated control.
The treatment Emamectin benzoate 5SG @ 0.002% recorded the highest green pod yield (86.61 q ha-1) and was at par with Indoxacarb 14.5 SC @ 0.014% which recorded (84.10 q ha-1) green pod yield. The next best treatments were Profenofos 50 EC @ 0.075% recorded (81.80 q ha-1), followed by Lambda cyhalothrin 5 EC @ 0.003% (77.01 q ha-1) it was at par with Dichlorvos 76 EC @ 0.11% (76.42 q ha-1), Deltamethrin 2.8 EC @ 0.0025% (74.70 q ha-1). and Azadirachtin 1% @ 0.003% (73.52 q ha-1) green pod yield, respectively.

Keywords: Efficacy, *Maruca vitrata*, Dolichos bean and Emamectin benzoate

Introduction
The grain legumes occupy a unique position in the world agriculture by virtue of their high protein content and capacity of fixing atmospheric nitrogen. For many of the developing countries, pulses constitute the only concentrated source of dietary protein. As regards the developed countries, grain legumes are an important source of protein being animal feeds of good biological value. Indians, in general, prefer vegetarian food and main source of getting protein is pulses. The major portion of the country is under rainfed condition and the pulses have been adjusted well in different mixed cropping, inter cropping and crop rotations. In India, pulses are being grown mostly in Madhya Pradesh, Rajasthan, Maharashtra Karnataka, Uttar Pradesh and Aandhra Pradesh. In India, the total area under pulses was 23.10 million hectares with an annual production of 17.19 million tonnes (Anonymous 2015a) [1]. while in Maharashtra the total area under pulses was 3.14 million hectares with annual production of 1.74 million tonnes (Anonymous 2015b) [2]. In Konkan the total area under pulses is 88000 hectares with an annual productions of 37 metric tonnes (Anonymous, 2015c) [3]. Dolichos bean is an ancient legume crop widely grown throughout the world for its vegetable or pulse for human consumption or as animal forage or feed. *Lablab purpureus* L. (Sweet) Usually known as Dolichos bean, Hyacinth bean or Field bean is one of the most ancient crops among cultivated plants. It is a bushy, semi erect, perennial herb, showing no tendency to climb.

It is mainly cultivated either as a pure crop or mixed with finger millet, groundnut, castor, corn, bajra or sorghum in Asia and Africa. It is aIt is mainly cultivated either as a pure crop or mixed with finger millet, groundnut, castor, corn, bajra or sorghum in Asia and Africa. It is a multipurpose crop grown for pulse, vegetable and forage. The crop is grown for its green pods, while dry seeds are used in various vegetable food preparations. It is also grown in home gardens as annual crop or on fences as perennial crop. It is one of the major source of protein in the diets in southern states of India. The consumer preference varies with pod size, shape, colour and aroma (pod fragrance). It is also grown as an ornamental plant, mostly in USA for its beautiful dark green, purple veined foliage with large spikes clustered with deep violet and white pea like blossoms.

The lablab bean, *Lablab purpureus* Linnaeus is an important pulse-cum-vegetable crop in India cultivated for its tender and mature pods, seeds and an also for fodder. The Wal is rich in nutritive value, The pods and seeds contain high protein content (20-28 percent). The green pods contain about 3.8 per cent protein with moisture 86.1 per cent, carbohydrates 6.7 per cent and fat 0.7 per cent. It also contains 1.8 per cent fibre and 0.9 per cent ash. The approximate composition of the dry pulse is 24.9 per cent protein with 9.6 per cent moisture, 60.1 per cent carbohydrate, 0.8 per cent fat, 1.4 per cent fibres and 3.2 per cent ash content.

Govindan (1974) recorded as many as 55 species of insects and one species of mite feeding on the crop from seedling stage till the harvest in Karnataka. Among the various pests, pod borer complex comprising of *Helicoverpa armigera* (Hubner), *Adisura atkinsoni* (Moore), *Maruca vitrata* (Geyer), *Etiella zinckenella* (Treitschke), *Cydia ptychora* (Meyrick), *Exelastis atomosa* (Walshinghan), *Sphenarches caffer* (Zeller) and *Lampides boeticus* (Linnaeus) are of considerable importance causing 80 per cent pod damage.

The larvae of pod borer, *M. vitrata* are known to cause considerable damage to lablab bean attacking various parts *viz*., buds, flowers, pods and seeds. Its nature of damage is exhibited by weaving unopened buds and flowers. The larva further damages the reproductive parts of flower leading to poor pod setting and pod formation. In the later period of crop growth, it behaves as a pod borer and completes its larval and pupal development inside the pod. This leads to poor pod formation, reduction in grain yield as well as adverse effect on market value of green pods.

The lablab bean, locally called as 'wal' is one of the important pulse crops of Konkan region grown in the *rabi* season. It is severely infested by pod borer, *M. vitrata*. Since few years, considerable research work on biology and efficacy of insecticides of this pests has been done in abroad and India, but not from Konkan region of Maharashtra. Considering the importance of lablab bean and seriousness of pod borer, *M. vitrata*, the present investigation was planned and conducted at the College of Agriculture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, Maharashtra.

Material and Methods

Field experiments were conducted to test the efficacy of different insecticides against Dolichos bean pod borer at Botany Farm of the College of Agriculture, Dapoli, Dist. Ratnagiri. A brief account of the methodology employed in present study is given under the following headings.

Cultural operations

The land was prepared as per the requirements of Dolichos bean crop and cleared by removing the residues of the previous crop. The experiment was laid out in Randomized Block Design (RBD). The entire dose of fertilizer was applied at the time of sowing. The experimental area was sown with good seed Dolichos bean (Konkan bhushan). in each plot. The gap filling was done seven days after sowing so as to maintain enough plant population in the plot. The other agronomic operations *viz.*, interculturing and weeding were done as per recommendation.

Experimental details

Table 1: The treatment details are given in Table 1, while the details of experiment are given below;

Location	:	**Botany farm, College of Agriculture, Dapoli, Dist-Ratnagiri.**
Period of study	:	October 2016 to February 2017
Variety	:	Konkan bhushan
Spacing	:	45cm x 45cm
Total plot size	:	20m x 10m
Gross plot size	:	2.50m x 2.50m
Net plot size	:	2.25m x 2.25m
Date of sowing	:	26th October 2016
Method of sowing	:	Hand dibbling
Date of harvesting	:	7th February
Design	:	Randomized Block Design (RBD)
Number of replications	:	Three
Number of treatments	:	Eight

Table 2: Treatments details

Tr. No.	**Treatment**	**Conc. (%)**
T_1	Dichlorvos 76 EC	0.11
T_2	Emamectin benzoate 5 SG	0.002
T_3	Profenofos 50 EC	0.075
T_4	Deltamethrin 2.8 EC	0.0025
T_5	Azadirachtin 1%	0.003
T_6	Lambda cyhalothrin 5EC	0.003
T_7	Indoxacarb 14.5 SC	0.014
T_8	Untreated Control	-

Spraying

The quantity of spray suspension required for each treatment was calibrated by spraying water over three plots in the experiment prior to the application of insecticide. Spray suspension of desired strength of each insecticide was prepared and applied using manually operated knapsack sprayer. Details of insecticides evaluated against *M.vitrata* in the field are given in (Table 2). Two sprays of each insecticide were applied at 50 per cent flowering and 50 per cent pod filling stage. Five plants from each plot were selected randomly and marked permanently for recording observations.

Method of recording observations

To study the efficacy of different insecticides, total number of pods and number of infested pods were counted. The observations were taken from five randomly selected plants from each plot at 3,7,10 and 14 days after application of insecticides. The pre-count observation was recorded before application of insecticides. The observations at 15 days after first spray were considered as pre-count observation of second

spray. The per cent pod damage was calculated on the basis of total pod and total infested pods, respectively. Data thus obtained were converted into arcsine transformation and then statistically analyzed.

Yield

The harvesting of crop was done manually. The plot wise weight of the healthy pods was recorded. This weight was converted into hectare basis.

Table 3: Details of insecticides used against pod borer, *M. vitrata* on field conditions

Tr. No.	Common name	Trade name	Formulation	Per cent conc.
1	Dichlorvos 76 EC	Demand	76 EC	0.11
2	Emamectin benzoate 5 SG	Safari	5 SG	0.002
3	Profenofos 50 EC	Celcron	50 EC	0.075
4	Deltamethrin 2.8 EC	Decis	2.8 EC	0.0025
5	Azadirachtin 1%	Neemazal	1%	0.003
6	Lambda cyhalothrin 5 EC	Karate	5 EC	0.003
7	Indoxacarb 14.5 SC	Amasac	14.5 SC	0.014
8	Control	-	-	-

Results and Discussion

A field experiment was carried out at Botany Farm of the College of Agriculture, Dapoli, Dist. Ratnagiri, during *Rabi* season of 2016 - 2017 to test the efficacy of different insecticides against *M. vitrata* infesting lablab bean. Total two sprays were applied at 50 per cent flowering and 50 per cent pod filling stage of the crop. Data pertaining to the per cent pod damage, yield are presented here under following subheadings.

First spray

Data on the per cent pod damage by *M. vitrata* on number basis in various insecticidal treatments at 3rd, 7th, 10th and 14th day after spraying (DAS) were significantly superior over control are presented in (Table 3)

At 3 DAS of first spray, the treatment of Indoxacarb 14.5 SC @ 0.014% was noticed to be the most effective and recorded (4.15 per cent) pod damage. It was at par with other treatments Emamectin benzoate 5 SG @ 0.002% (4.88 per cent), Azadirachtin 0.003% (5.87 per cent), Profenofos 50 EC @ 0.075% (6.12 per cent) and Deltamethrin 2.8 EC @ 0.0025% (7.49 per cent), while the maximum (15.57 per cent) pod damage was recorded in untreated control.

The minimum pod damage (4.30 per cent) was recorded in the treatment of Emamectin benzoate 5 SG @ 0.002% at 7 days after first spray which were at par with Indoxacarb 14.5 SC @ 0.014% (4.63 per cent), Profenofos 50EC @ 0.075% (4.80 per cent), Lambda cyhalothrin 5EC @ 0.003% (5.29 per cent) and Deltramethrin 2.8 EC @ 0.0025% (6.19 per cent), while the maximum (14.75 per cent) pod damage was recorded in untreated control.

Table 4: Efficacy of insecticides against pod borer, *Maruca vitrata* (Geyer) infesting lablab bean after first spray:

Tr. No.	Treatments	Conc. (%)	Per cent pod damage				
			Pre-count	3 DAS	7 DAS	10 DAS	14 DAS
1	Dichlorvos 76 EC	0.11	18.74 (25.61)	10.34 (18.67)	8.36 (16.74)	8.5 (16.83)	8.13 (16.23)
2	Emamectin benzoate 5 SG	0.002	15.37 (22.98)	4.88 (12.74)	4.30 (11.92)	4.83 (12.44)	3.43 (10.53)
3	Profenofos 50 EC	0.075	14.74 (22.46)	6.12 (14.32)	4.80 (12.66)	5.21 (13.06)	6.47 (14.65
4	Deltamethrin 2.8 EC	0.0025	16.66 (23.74)	7.49 (15.67)	6.19 (14.32)	9.83 (18.03)	10.14 (18.51)
5	Azadirachtin 1%	0.003	15.78 (23.36)	5.87 (14.00)	7.24 (15.58)	11.03 (19.37)	12.39 (20.53)
6	Lambda cyhalothrin 5EC	0.003	13.90 (21.47)	9.41 (17.53)	5.29 (13.28)	6.02 (14.01)	8.22 (16.64)
7	Indoxacarb 14.5 SC	0.014	17.31 (24.50)	4.15 (11.60)	4.63 (12.29)	3.74 (11.11)	6.41 (14.55)
8	Control	-	14.41 (22.16)	15.57 (23.21)	14.75 (22.52)	17.30 (24.56)	18.10 (25.11)
	S.Em. +		2.08	1.50	0.97	1.56	1.20
	CD (p=0.05)		NS	4.55	2.95	4.74	3.65

*Figures in the parentheses are arcsine values. DAS= Days after spraying

Data recorded on per cent pod damage of *M. vitrata* at 10 DAS revealed that the lowest per cent pod damage (3.74 per cent) was recorded in the plots treated with Indoxacarb 14.5 SC @ 0.014 per cent which were at par with Emamectin benzoate 5 SG @ 0.002% (4.83 per cent), Profenofos 50 EC @ 0.075% (5.21 per cent), Lambda cyhalothrin 5 EC @ 0.003% (6.02 per cent), while the highest (17.30 per cent) pod damage was recorded in untreated control.

At 14 DAS minimum per cent pod damage recorded in the treatment Emamectin benzoate 5 SG @ 0.002% (3.43 per cent), which was significantly superior over rest of the treatments. The treatment Indoxacarb 14.5 SC @ 0.014% was the next best treatment was recorded (6.41 per cent) pod damage.

Second spray

Data on the per cent pod damage on number basis in various insecticidal treatments at 3rd, 7th, 10th and 14th day after spraying (DAS) were significantly superior over control are presented in (Table 19) and graphically depicted in (Fig 2). At 3DAS of second spray, the treatment of Emamectin benzoate 5 SG @ 0.002% was noticed to be the most effective and recorded (1.63 per cent) pod damage which were at par with Indoxacarb 14.5 SC @ 0.014% (4.07 per cent) and Profenofos 50 EC @ 0.075% (4.28 per cent), while the maximum (18.19 per cent) pod damage was recorded in untreated control.

At 7 DAS the minimum pod damage (0.83 per cent) was recorded in the treatment of Emamectin benzoate 5 SG @ 0.002% was significantly superior over rest of the treatments.

The next best treatment was Profenofos 50EC @ 0.0075% (3.03 per cent), Indoxacarb 14.5 SC @ 0.014% (3.49 per cent) which was at par with the treatments Dichlorovos 76EC @ 0.02% (4.20 per cent) and Deltamethrin 2.8EC @ 0.0025%. (5.97 per cent)

At 10 DAS, minimum pod damage was recorded in the plots treated with Emamectin benzoate 5 SG @ 0.002% (0.67 per cent) and was at par with the treatments were Indoxacarb 14.5 SC @ 0.014% and Profenofos 50 EC @ 0.075% which showed (1.18 per cent) and (2.23 per cent) pod damage, respectively. The next best treatments was Dichlorvos 76 EC @ 0.11% (3.05 per cent) and Lambda cyhalothrin 5 EC @ 0.003%. (4.56 per cent).

At 14 DAS no pod damage was observed in the treatment Emamectin benzoate 5 SG @ 0.002%. The next best treatment was Indoxacarb 14.5 SC @ 0.014% recorded 0.83 per cent pod damage.

Table 5: Efficacy of insecticides against pod borer, *Maruca vitrata* (Geyer) infesting lablab bean after second spray:

Tr. No.	Treatment	Conc. (%)	Per cent pod damage			
			3DAS	7DAS	10 DAS	14 DAS
1	Dichlorvos 76 EC	0.11	6.3 (14.38)	4.20 (11.77)	3.05 (9.96)	2.03(8.00)
2	Emamectin benzoate 5 SG	0.002	1.63(7.23)	0.83(4.35)	0.67(3.92)	0.00(0.29)
3	Profenofos 50 EC	0.075	4.28 (11.91)	3.03 (10.00)	2.23 (8.25)	2.86 (9.63)
4	Deltamethrin 2.8 EC	0.0025	7.33(15.68)	5.97(14.03)	7.40(15.73)	10.17(18.57)
5	Azadirachtin 1%	0.003	8.42(16.77)	7.56(15.94)	9.10(17.54)	11.70(19.95)
6	Lambda cyhalothrin 5EC	0.003	6.30(14.35)	5.21(13.00)	4.56(12.28)	5.66(13.72)
7	Indoxacarb 14.5 SC	0.014	4.07(9.60)	3.49(10.75)	1.18(4.80)	0.83(4.16)
8	Control	-	18.19(25.18)	19.02(25.82)	19.52(26.19)	19.99(26.51)
	S.Em. +		1.76	1.28	1.58	1.10
	CD (p=0.05)		5.35	3.89	4.80	3.34

* Figures in the parentheses are arcsine values
DAS= Days after spraying

Cumulative average of two sprays

Data regarding cumulative mean per cent pod damage of two sprays are presented in (Table 20) and depicted in (Fig 3) revealed that the treatment Emamectin benzoate 5 SG @ 0.002% at 3DAS proved to be best in reducing pod damage caused by *M. vitrata* by recording (3.26 per cent) and which was at par with Indoxacarb 14.5 SC @ 0.014% (4.11 per cent) and Profenofos 50 EC @ 0.075% (5.20 per cent).

Data recorded on cumulative mean per cent pod damage of two sprays at 7 DAS revealed that the lowest (2.57 per cent) was recorded in the plots treated with Emamectin benzoate 5 SG @ 0.002%, it was at par with Indoxacarb 14.5 SC @ 0.014% (3.84 per cent) and Profenofos 50 EC @ 0.075% (3.92 per cent).

The minimum mean per cent pod damage of two sprays at 10 DAS was recorded in the treatment of Indoxacarb 14.5 SC @ 0.014% (2.46 per cent), it was at par with Emamectin benzoate 5 SG @ 0.002% (2.75 per cent) and Profenofos 50 EC @ 0.075% (3.72 per cent).

The mean per cent pod damage of two sprays at 14 DAS revealed that the treatment Emamectin benzoate 5 SG @ 0.002% (1.72 per cent) proved to be the best treatment amongst all and next best treatments were Indoxacarb 14.5 SC @ 0.014% (3.62 per cent), it was at par with Profenofos 50 EC @ 0.075% (4.67 per cent).

The results of present investigation are in conformity with the findings of following workers.

Karmarker (2006) reported that Cypermethrin + Profenophos 0.004 per cent and 0.002 per cent Emamectin benzoate were effective against the infestation of *M. vitrata* on dolichus bean. The present findings are also in agreement with Vaidya (2008) who reported that the treatment 0.0033 per cent Emamectin benzoate, 0.0035 per cent Spinosad and 0.005 per cent Lambda cyhalothrin were significantly superior over rest of the treatment in controlling pod borer of cowpea.

Patel *et al.* (2012) [13] reported that Emamectin benzoate 5 SG (2.70%), Indoxacarb 14.5 SC (2.98%) and Spinosad 45 SC (3.58%) were significantly effective for management of *M. vitrata* on cowpea.

Rekha and Mallapur (2007) [16] observed that Emamectin benzoate, Spinosad and Indoxacarb proved significantly superior with a lower pod damage of 11.75, 12.92 and 14.01 per cent, respectively.

Table 6: Efficacy of insecticides against pod borer, *Maruca vitrata* (Geyer) infesting lablab bean (Cumulative average of two sprays)

Tr. No.	Treatment	Conc. (%)	Per cent pod damage				Overall Mean of two sprays
			3 DAS	7DAS	10 DAS	14 DAS	
1	Dichlorvos 76 EC	0.11	8.33 (16.67)	6.28 (14.50)	5.78 (13.89)	5.08 (12.79)	6.37 (14.46)
2	Emamectin benzoate 5 SG	0.002	3.26 (10.35)	2.57 (9.17)	2.75 (9.36)	1.72 (7.42)	2.57 (9.08)
3	Profenofos 50 EC	0.075	5.20 (13.17)	3.92 (11.41)	3.72 (11.06)	4.67 (12.40)	4.38 (12.01)
4	Deltamethrin 2.8 EC	0.0025	7.41 (15.70)	6.08 (14.22)	8.62 (17.00)	10.15 (18.55)	8.06 (16.37)
5	Azadirachtin 1%	0.003	7.14 (15.46)	7.40 (15.77)	10.06 (18.49)	12.04 (20.30)	9.16 (17.51)
6	Lambda cyhalothrin 5EC	0.003	7.85 (16.15)	5.25 (13.20)	5.29 (13.25)	6.94 (15.25)	6.33 (14.46)

7	Indoxacarb 14.5 SC	0.014	4.11 (11.52)	3.84 (11.08)	2.46 (8.87)	3.62 (10.86)	3.51 (10.58)
8	Control	-	16.88 (24.21)	16.89 (24.21)	18.41 (25.40)	19.04 (25.84)	17.80 (24.92)
	S.Em. +		1.13	0.92	0.95	0.78	0.74
	CD (p=0.05)		3.44	2.80	2.89	2.37	2.17

*Figures in the parentheses are arcsine values. DAS-Days after spray

Overall Cumulative mean per cent pod damage of two sprays

The data on results of overall mean per cent pod damage of two sprays are presented in (Table 20).

The overall mean per cent pod damage of two sprays revealed that the treatment of Emamectin benzoate 5 SG @ 0.002 per cent was effective (2.57 per cent) in reducing the pod damage and was at par with Indoxacarb 14.5 SC @ 0.014 per cent (3.51 per cent). The next best treatments were Profenofos 50 EC @ 0.075% (4.38 per cent), Lambda cyhalothrin 5 EC @ 0.003% (6.33 per cent), Dichlorvos 76 EC @ 0.11% (6.37 per cent) and Deltamethrin 2.8 EC 0.0025% (8.06 per cent). The highest (17.80 per cent) pod damage was recorded in the untreated control.

The results of present study are similar with the findings of following workers.

Mahi Imam Mollah *et al.* (2009) [10] found that Neem oil, Fenitrothion 50 EC and Emamectin benzoate 5 SG performed best by reducing 59.46, 51.35 and 54.95 per cent infested pod production, respectively in *Lablab perpureus L*.

Rekha S. (2006) [16] revealed that Emamectin benzoate recorded lower pod and seed damage of 11.75 and 20.67 per cent, respectively and consequently resulted in higher yield of 15.14 q/ha. The next treatment to follow was Spinosad (0.2 ml/ha) in which the pod and seed damage were recorded at 12.92 and 21.92 per cent, with a yield of 14.11 q/ha. In *Lablab perpureus S.*

Randhawa *et al*. (2015) [15] revealed that the minimum pod damage with mean of 16.75 and 21.25 per cent was recorded in case of two sprays of Spinosad 48SC which was closely followed by Indoxacarb 15EC (19.00 and 22.50%) and Cypermethrin 20EC (24.25 and 26.75%). These three insecticidal treatments were also significantly superior to Profenophos 50EC (33.50 & 36.50%).

Yield

The data regarding Green pod yield of lablab bean obtained from different plots treated with different insecticides are presented in (Table 6)

The results revealed that Emamectin benzoate 5 SG @ 0.002% was recorded the highest green pod yield (86.61 q ha-1) and it was at par with Indoxacarb 14.5 SC @ 0.014% which recorded (84.10 q ha-1) green pod yield. The next best treatment was Profenofos 50 EC @ 0.075% (81.80 q ha-1), Lambda cyhalothrin 5 EC @ 0.003% (77.01 q ha-1) it was at par with Dichlorvos 76 EC @ 0.11% (76.42 q ha-1) and Deltamethrin 2.8 EC @ 0.0025% (74.70 q ha-1). The next best treatment was Azadirachtin 1 @ 0.003% (73.52 q ha-1). Among all the treatments untreated control recorded lowest yield (50.53 q ha-1).

Table 7: Yield of lablab bean in different insecticidal Treatments

Tr. No.	Treatments	Conc. (%)	Yield q/ha
1	Dichlorvos 76 EC	0.11	76.42
2	Emamectin benzoate 5 SG	0.002	86.61
3	Profenofos 50 EC	0.075	81.80
4	Deltamethrin 2.8 EC	0.0025	74.70
5	Azadirachtin 1%	0.003	73.52
6	Lambda cyhalothrin 5EC	0.003	77.01
7	Indoxacarb 14.5 SC	0.014	84.10
8	Control	-	50.53
SE (m)±			0.90
CD @ 5%			2.74

The present findings are in conformity with Rekha (2006) [16] observed that the maximum pod yield (15.14 q/ha) was obtained from the plots treated with Emamectin benzoate followed by Spinosad (14.11 q/ha), Indoxacarb (13.11q/ha) and Fenvalerate (11.87q/ha) in pod borer complex of lablab bean.

Vaidya (2008) observed that 0.0033 per cent Emamectin benzoate recorded the highest grain yield (1316.97Kg ha-1) of cowpea. The next best treatment was 0.0035 per cent Spinosad which recorded (1296.81 Kg ha-1) grain yield followed by 0.005 per cent Lambda-cyhalothrin (1185.48 Kg. ha-1).

Conclusion

The lablab bean is one of the important pulse crops of Konkan region. It is severely infested by pod borer, *Maruca vitrata* (Geyer) causing heavy loss in yield. No comprehensive information was available on the pest, particularly under the conditions of Konkan region. Therefore, the present investigation was carried out, to study biology of pod borer, *M. vitrata* (Geyer) and to test the efficacy of insecticides against pod borer, *M. vitrata* under Konkan conditions.

A field experiment was conducted to evaluate the efficacy of some insecticides against pod borer, *M. vitrata* infesting lablab bean. The data on mean per cent pod damage of first spray At 3 DAS of first spray, revealed that the treatment of Indoxacarb 14.5 SC @ 0.014% was noticed to be the most effective and recorded (4.15 per cent) pod damage. It was at par with other treatments Emamectin benzoate 5 SG @ 0.002% (4.88 per cent), Azadirachtin 0.003% (5.87 per cent), Profenofos 50 EC @ 0.075% (6.12 per cent) and Deltamethrin 2.8 EC @ 0.0025% (7.49 per cent). The minimum pod damage (4.30 per cent) was recorded in the treatment of Emamectin benzoate 5 SG @ 0.002% at 7 days after first

spray which were at par with Indoxacarb 14.5 SC @ 0.014% (4.63 per cent), Profenofos 50EC @ 0.075% (4.80 per cent), Lambda cyhalothrin 5EC @ 0.003% (5.29 per cent) and Deltramethrin 2.8 EC @ 0.0025% (6.19 per cent). Data recorded on per cent pod damage of *M. vitrata* at 10 DAS revealed that the lowest per cent pod damage (3.74 per cent) was recorded in the plots treated with Indoxacarb 14.5 SC @ 0.014 per cent which were at par with Emamectin benzoate 5 SG @ 0.002% (4.83 per cent), Profenofos 50 EC @ 0.075% (5.21 per cent), Lambda cyhalothrin 5 EC @ 0.003% (6.02 per cent) and at 14DAS minimum per cent pod damage recorded in the treatment Emamectin benzoate 5 SG @ 0.002% (3.43 per cent), which was significantly superior over rest of the treatments. The treatment Indoxacarb 14.5 SC @ 0.014% was the next best treatment was recorded (6.41 per cent) pod damage.

At 3DAS of second spray, the treatment of Emamectin benzoate 5 SG @ 0.002% was noticed to be the most effective and recorded (1.63 per cent) pod damage which were at par with Indoxacarb 14.5 SC @ 0.014% (4.07 per cent) and Profenofos 50 EC @ 0.075% (4.28 per cent). At 7DAS the minimum pod damage (0.83 per cent) was recorded in the treatment of Emamectin benzoate 5 SG @ 0.002% was significantly superior over rest of the treatments. The next best treatment was Profenofos 50EC @ 0.0075% (3.03 per cent), Indoxacarb 14.5 SC @ 0.014% (3.49 per cent) which was at par with the treatments, Dichlorovos 76EC @ 0.02% (4.20 per cent) and Deltamethrin 2.8EC @ 0.0025% (5.97 per cent). At 10DAS, minimum pod damage was recorded in the plots treated with Emamectin benzoate 5 SG @ 0.002% (0.67 per cent) and was at par with the treatments were Indoxacarb 14.5 SC @ 0.014% and Profenofos 50 EC @ 0.075% which showed (1.18 per cent) and (2.23 per cent) pod damage, respectively. The next best treatments were Dichlorvos 76 EC @ 0.11% (3.05 per cent) and Lambda cyhalothrin 5 EC @ 0.003% (4.56 per cent) and At 14 DAS no pod damage was observed in the treatment Emamectin benzoate 5 SG @ 0.002%. The next best treatment is Indoxacarb 14.5 SC @ 0.014% recorded (0.83 per cent) damage.

From the overall mean per cent of pod damage with Cumulative average of two sprays revealed that the treatment of Emamectin benzoate 5 SG @ 0.002% (2.57 per cent) was effective in reducing the pod damage and was at par with Indoxacarb 14.5 SC @ 0.014% (3.51 per cent). The next best treatment was Profenofos 50EC @ 0.075% (4.38 per cent), Lambda cyhalothrin 5 EC @ 0.003% (6.33 per cent), Dichlorovos 76EC @ 0.02% (6.37 per cent), Deltamethrin 2.8EC @ 0.0025% (8.06 per cent), Azadirachtin 0.003% (9.16 per cent). The highest (17.80 per cent) pod damage was recorded in the untreated control.

The data regarding yield recorded from the different insecticidal treatment showed that Emamectin benzoate 5 SG @ 0.002% was recorded the highest green pod yield (86.61 q ha-1) and it was at par with Indoxacarb 14.5 SC @ 0.014% which recorded (84.10 q ha-1) green pod yield. The next best treatment was Profenofos 50 EC @ 0.075% (81.80 q ha-1), Lambda cyhalothrin 5 EC @ 0.003% (77.01 q ha-1) it was at par with Dichlorvos 76 EC @ 0.11% (76.42 q ha-1) and Deltamethrin 2.8 EC @ 0.0025% (74.70 q ha-1). The next best treatment was Azadirachtin 1% @ 0.003% (73.52 q ha-1). Among all the treatments untreated control recorded lowest yield (50.53 q ha-1).

It can be concluded from the present investigation that, the overall results revealed that even though *M. vitrata* is a serious pest of lablab bean, it can be managed very effectively by following spray schedule as experienced in the present findings. The insecticides Emamectin benzoate 5 SG @ 0.002%, Indoxacarb 14.5 SC @ 0.014% and Profenofos 50EC @ 0.075% were found to be the best insecticides in protecting pods and can be included in the spray schedule for the effective management of lablab bean pod borer.

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