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Effect of insecticides against pod borer *Maruca vitrata* of French bean

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Abstract
Field experiment was conducted in *Rabi* 2017-18 on French bean with nine treatment, replicated thrice in the 'Randomized Block Design' with gross plot size 4×3 m and net plot size 3×2.5 m. The treatment Spraying of Flonicamide 50% WG @ 0.3 gm/lit +spraying of Fluebendamide 39.35% *SC* @ 0.1ml/ha. (11.40%) was found as the best treatment against pod borer with 63.60 per cent reduction over control. The next promising treatment in increasing order were Trap crop of two rows of Marigold + spraying of *NSE* 5%+spraying of *Beauveria bassiana* @ 5gm /lit+ spraying of chlorantraniliprole @ 0.25 ml/ha. (15.07%), spraying of 5gm /lit *Metarhizium anisopliae*+ Spraying of Spinosad 48% SC @ 0.2 gm/lit. (17.83%) which were found equally effective in the order of efficacy against pod borer.

Keywords: pod borer, French bean

Introduction
French bean, *Phaseolus vulgaris* belongs to family Leguminosae and locally known as "Rajmah" French bean is nutritionally superior to other pulses. It is consumed as tender pods. Its tender green pod is highly nutritious, rich in protein, carbohydrates and vitamins, which is used as a delicious vegetable. It contains protein (1.7 gm), calcium (50 mg), phosphorous (28 mg), iron (1. 7 mg), carotene (132 mg), thiamine (0.08 mg), riboflavin (0.06 mg) and vitamin C (24.0 mg) per 100 gm of edible part (Dixit and Naimuddin, 2003). Pod borer causes 31-35% losses of the crop (Ghoshal 2013), Hence, present investigation was undertaken to study the effect of insecticides against pod borer *Maruca vitrata* of French bean.

Materials and Methods
Field experiment was conducted in Rabi 2017-18 on French bean with nine treatment, replicated thrice in the 'Randomized Block Design' with gross plot size 4×3 m and net plot size 3×2.5 m on horticulture field, RCSM College of Agriculture, Kolhapur (Maharashtra).

Table 1: Treatment details

Treatments	Treatment Details
T-1	Spraying of *NSE 5%* +spraying of fenvalerate @ 0.6ml/lit.
T-2	Spraying of 5gm /lit *Metarhizium anisopliae*+ Spraying of Spinosad 48% SC @ 0.2 G/lit.
T-3	Spraying of imidacloprid 17.8% *SL* @ 0.5 ml/lit + spraying of *NSE* 5%
T-4	Spraying of 5gm /lit *Metarhizium anisopliae* + flubendamide 39.35% SC @ 0.1 ml/L.
T-5	Spraying of lamda cyhalothrin 1% EC @ 1ml/lit+ spraying of imidacloprid 17.8% SL 0.5 ml/L
T-6	Trap crop of two rows of Marigold + spraying of *NSE* 5%+spraying of *Beauveria bassiana* @ 5 G /lit+ spraying of chlorantraniliprole @ 0.25 ml/L.
T-7	Spraying of imidacioprid 17.8% SL @ 1ml/lit + spraying of *Metarhizium* @ 5G/lit
T-8	Spraying of flonicamide 50% WG @ 0.3 gm/lit +spraying of fluebendamide 39.35% *SC* @ 0.1ml/ha.
T-9	Untreated control.

Method of recording observations
The efficacy of the different treatments against pod borer was judged on the basis of the percent pod infestation at each picking on number basis. For recording pod infestation, during harvesting pods from each plot were separated as infested and healthy pods at each picking. The pods showing exit holes of insect will considered as infested pods. Total three pickings were carried out starting from 45 days after planting.

These healthy and infested pods were counted separately. Further the percent of pod infestation was worked out on the basis of number of the pod at each picking for different treatments. The data recorded on percent pod infestation was then subjected to angular transformation for statistical analysis.

Results and Discussion

The present investigations were carried out on pests of French bean to evaluate the efficacy of insecticides against pod borer (*Maruca vitrata*).

Pod borer infestation

The result of experiment conducted during kharif 2017-18 are summerized in Table 1.

At different picking

Data pertaining to the per cent infestation of pod borer of French bean on number basis at each picking presented in Table 2. All the treatments were found to be significantly superior in reducing population of pod borer when observation were recorded at 1st 2nd, 3rd picking. Among the treatments, Spraying of Flonicamide 50% WG @ 0.3 gm/lit + spraying of Fluebendamide 39.35% *SC* @ 0.1ml/ha. Was found most effective (11.07%, 12.19%, 11.40% infestation respectively) and significantly superior to all other treatments. Treatment T6 i.e. Trap crop of two rows of Marigold + spraying of *NSE* 5%+spraying of *Beauveria bassiana* @ 5gm /lit+ spraying of chlorantraniliprole @ 0.25 ml/ha. (15.20%, 14.07%respectivly), spraying of 5gm /lit *Metarhizium anisopliae*+ Spraying of Spinosad 48% SC @ 0.2 gm/lit. (17.87%, 19.10%, 16.54% respectively) were found to be equally effective and next in the order of efficacy. Maximum per cent infestation of pod borer was found in the treatment Spraying of *NSE* 5% +spraying of Fenvalerate @ 0.6ml/lit. (28.87%) among the treatments as compared to untreated control (30.50%).

Table 2: Percent pod borer infestation at harvesting

Sr. No.	Treatment	1st Picking	2nd picking	3rd Picking	Mean	Per cent mortality over control
1	T1	28.87 (32.50)	29.95 (33.18)	28.77 (32.84)	29.19 (32.89)	6.89
2	T2	17.87 (25.01)	19.10 (25.91)	16.54 (24.00)	17.83 (25.26)	43.12
3	T3	26.95 (31.27)	27.95 (31.92)	26.50 (30.98)	27.03 (31..93)	13.77
4	T4	20.38 (26.84)	22.30 (28.18)	18.96 (25.81)	20.54 (27.11)	34.48
5	T5	22.95 (28.62)	24.65 (29.77)	23.31 (27.67)	23.63 (28.87)	24.62
6	T6	15.20 (22.95)	15.96 (23.54)	14.07 (22.03)	15.07 (23.20)	51.92
7	T7	25.10 (30.07)	26.10 (30.72)	24.87 (29.91)	25.35 (30.32)	19.13
8	T8	11.07 (19.43)	12.19 (20.43)	10.96 (19.33)	11.40 (20.09)	63.60
9	Untreated control	30.50 (33.52)	32.77 (34.92)	30.80 (33.71)	31.35 (34.62)	-
10	SE	0.8197	0.8676	0.9035		
11	CD	2.4575	2.6011	2.7086		
12	CV	7.0602	6.2201	6.7036		

Figures in parenthesis are arcsine transformed values

From overall performance of all the treatments, it was found that all the treatments were significantly superior over control in reducing pod borer infestation. The treatment Spraying of Flonicamide 50% WG @ 0.3 gm/lit +spraying of Fluebendamide 39.35% *SC* @ 0.1ml/ha. (11.40%) was found as the best treatment with 63.60 per cent reduction over control. The next promising treatment in increasing order were Trap crop of two rows of Marigold + spraying of *NSE* 5%+spraying of *Beauveria bassiana* @ 5gm /lit+ spraying of chlorantraniliprole @ 0.25 ml/ha. (15.07%), spraying of 5gm /lit *Metarhizium anisopliae*+ Spraying of Spinosad 48% SC @ 0.2 gm/lit. (17.83%) which were found equally effective in the order of efficacy. Present findings are in conformity with Pattapu *et al.*, (2016) reported that higher mortality was recorded in the population treated with spinosad 75 g a.i./ha followed by chlorantraniprole 30 g ai.i/ha, flubendamide 100 g a.i./ha and imidacloprid 518 g a.i./ha which showed a per cent mortality of 97.28.

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