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Incidence of spotted pod borer, *Maruca vitrata* (Geyer) in Indian bean, *lablab purpureus* var. *Typicus* in unprotected conditions

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Abstract

An experiment was carried out to screen nine determinate Indian bean varieties *viz.*, Arka Vijay, Arka Jay, Arka Amogh, Arka Soumya, Arka Sambharam, NIB-1, Konkan Bhushan, Tirupathi Local and West Godavari Local were screened to know the infestation of spotted pod borer, *M. vitrata* under open field conditions revealed that among the nine determinate Indian bean varieties NIB-1 (17.75 %) considered as highly resistant. Tirupathi Local was categorized as moderately resistant with 33.00 per cent flower damage. The other seven varieties *viz.* Arka Soumya, Arka Vijay, Arka Amogh, Arka Sambhram, West Godavari Local, Arka Jay and Konkan Bushan were rated as intermediate resistant to *M. vitrata* which recorded flower infestation percentage of 52.60, 51.94, 50.21, 47.25, 42.64, 42.2 and 41.45 per cent, respectively with respect to the inflorescence damage due to spotted pod borer *Maruca vitrata* (Geyer).

Keywords: *Maruca vitrata*, *lablab purpureus*, Indian bean

Introduction

Indian bean (*Lablab purpureus* var. *typicus* (L.) Sweet) also called as Indian butter bean, lablab bean, dolichos bean, waby bean is mainly grown for fresh whole pod and dry seeds as pulse grain. Its demand is excellent in local markets. Commercial cultivation of this vegetable increases day by day but, the average production is low at farmer's level. Govindhan (1974) recorded as many as 55 species of insects and a species of mite feeding on Indian bean from seedling stage to harvest. The poor yield is mainly attributed to the attack of a wide range of insect pests among them spotted pod borer, *Maruca vitrata* (Geyer) (Crambidae, Lepidoptera) is a serious polyphagous pest attacking various legumes *viz.*, cowpea, green gram, black gram, red gram, yam bean, field bean *etc.*, Screening of available cultivars helps to know the resistant variety available for cultivation by farmers which gives higher yield even after pest infestation. So far, a great deal of reliance have been put in the chemical control of the pest using compounds such as DDVP, flubediamide, Indoxacarb, spinosad, chlorpyrifos *etc.* Indiscriminate dose of toxic insecticides lead to increased problems because of their adverse effects on non-target organisms and pollution to the environment. Completely organic pest control formulations cause no harm to people, animals and environment. The present study undertaken to evaluate the Indian bean varieties for identifying the possible resistant varieties against infestation of *M. vitrata*.

Materials and Methods

Field studies were carried out to evaluate the Indian bean varieties against spotted pod borer at College of Horticulture, Venkataramannagudem, West Godavari Dist. Andhra Pradesh during *Kharif*, 2017-18. The screening experiment was laid out in Simple Randomized Block Design with nine determinate Indian bean varieties replicated thrice. Indian bean seeds were sowed in a plot of size 30 x 20 m with a spacing of 60 cm between rows and 30 cm between plants. Recommended package of practices were adopted for raising the crop excluding the plant protection measures. Randomly selected five plants in each replication were tagged and were used for data collection.

Results and Discussion**Incidence of spotted pod borer *M. vitrata* in different Indian bean varieties**

Incidence of spotted pod borer, *M. vitrata* in different Indian bean varieties in different Standard Meteorological Weeks (SMW) are presented in Table 1 and Figure 1. The crop was sown at 34 SMW (22nd August 2017). The larval population was not observed during the first two weeks when the crop was in vegetative stage.

Larval population started at 3rd week (37 SMW) when there was an initiation of flower bud formation. Thereafter, the larval population was found throughout the crop season. Population level kept increasing and peak larval population was observed in 44 SMW (8.88 larva/plant), coinciding with 50 % flower initiation stage. Later on, a decrease in larval population was observed.

Of the nine varieties planted, overall mean larval population per plant was statistically similar and found highest in all varieties viz. Arka Vijay (6.15), Konkan Bhushan (6.03), Arka Soumya (5.84), Arka Jay (5.69), Tirupathi Local (5.48), Arka Sambaram (5.30), Arka Amogh (4.69), and West Godavari Local (4.66) except NIB-1. NIB-1 recorded the lowest mean larval population (3.07).

The overall mean larval population per plant in different Indian bean varieties showed that Arka Vijay, Konkan Bhushan, Arka Soumya, Arka Jay, Tirupathi Local, Arka Sambharam, Arka Amogh and West Godavari Local recorded 6.15, 6.03, 5.84, 5.69, 5.48, 5.30, 4.69 and 4.66 larvae/ plant, respectively. Which were statistically on par with each other. Variety NIB-1 recorded least the least mean larval population of 3.07 larvae/ plant.

Studies on screening of different genotypes by various workers showed that the infestation per cent of spotted pod borer *M. vitrata* in different crops in different varieties (Patel and Singh, 1976 [2]. Singh and Allen, 1980 [3]. Lalsangi, 1988 [4]. Ganapathy, 1996 [5]. Girddi *et al.*, 2000 [6] and Saxena, 2002 [7]. This may be due to difference in biophysical and biochemical composition of the crop varietal characters as well as due to the various abiotic and biotic components of the area which influences the crop growth.

Results show that the incidence of larval population was observed on the initiation of flower bud formation, later there was an increase in population of the borer in flowering stage and thereafter, there was a reduction in number of larvae during pod maturity. Bindra (1968) [10], Ogunwolu (1990) [9] and Karel (1985) [8] also observed the incidence of more number of larvae (52.3 %) on flowers than on pods (37.8 %). Flower infestation in different Indian bean varieties ranged from 17.75 to 52.60 per cent. Flower infestation was high in

the variety Arka Soumya (52.60 %). In varieties Arka Vijay, Arka Amogh, Arka Sambhram, West Godavari Local, Arka Jay, Konkan Bhushan and Tirupathi Local the flower infestation percentage was 51.94, 50.21, 47.25, 42.64, 42.28, 41.45 and 32.41 per cent, respectively. Low flower infestation was observed in NIB-1 (17.75 %).

Pod infestation in different Indian bean varieties ranged from 20.00 to 50.00 %. Pod infestation was high in the variety West Godavari Local (50.00 %). Varieties Arka Jay, Arka Sambhram, Arka Soumya, Konkan Bhushan, Tirupathi Local, Arka Amogh and Arka Vijay registered the pod infestation was 44.90, 43.60, 37.70, 36.30, 32.10, 25.30 and 24.60, respectively. Variety NIB-1 (20.00) recorded the lowest pod infestation per cent age among the varieties.

Yield per plant in different Indian bean varieties varied from 53.72 to 121.00 g/ plant. High yield per plant was observed in Tirupathi Local, Konkan Bhushan and which recorded 121.00 and 102.46 g per plant respectively, and were statistically on par with each other. Variety Arka Amogh (86.80g/ plant) followed by Arka Jay, West Godavari Local, Arka Vijay and Arka Sambhram recorded 76.54, 64.80, 64.40, 61.75 g/ plant, respectively and were statistically on par with each other. Low yield per hectare was observed in Arka Soumya and NIB-1 the plant yield was 59.30 and 53.72 g/ plant.

Variety NIB-1 was graded as highly resistant to pod borer Infestation, whereas variety Tirupathi Local was considered as moderately resistant. Varieties Arka Amogh, Arka Jay, Arka Vijay, Arka Sambhram, Arka Soumya Konkan Bhushan and West Godavari Local were considered as intermediate varieties for pod borer infestation.

Of the nine determinate Indian bean varieties screened no variety is grades as resistant or moderately resistant. Variety NIB-1 was grades as tolerant variety with 20.00 per cent pod infestation. Varieties Arka Vijay, Arka Amogh, Arka Soumya, Konkan Bhushan and Tirupathi Local were graded as moderately susceptible. In varieties Arka Sambhram, Arka Jay and West Godavari Local considered as highly susceptible to the pod infestation.

Table 1: Incidence of spotted pod borer, *M. vitrata* in different Indian bean varieties (Kharif, 2017-18)

S. No.	Varieties	Mean larval population/ plant during different Standard Meteorological Weeks (SMW)												Overall mean larval population/ plant	
		37 (10Sep-16Sep)	38 (17Sep-23Sep)	39 (24Sep-30Sep)	40 (01Oct-07Oct)	41 (08Oct-14Oct)	42 (15Oct-21Oct)	43 (22Oct-28Oct)	44 (29Oct-04Nov)	45 (05Nov-11Nov)	46 (12Nov-18Nov)	47 (19Nov-25Nov)	48 (26Nov-02Dec)		49 (03Dec-09Dec)
1	Arka Amogh	0.33 (1.14)	3.67 (2.16)	4.00 (2.30)	4.33 (2.31)	5.33 (2.51)	7.33 (2.87)	8.33 (3.05)	8.67 (3.11)	7.33 (2.88)	5.00 (2.44)	3.67 (2.16)	2.33 (1.82)	0.67 (1.24)	4.69 (2.30)
2	Arka Jay	1.00 (1.41)	2.67 (1.91)	4.33 (2.30)	6.00 (2.64)	7.33 (2.88)	8.33 (3.05)	9.00 (3.16)	9.33 (3.21)	8.67 (3.11)	7.33 (2.88)	5.00 (2.44)	3.33 (2.08)	1.67 (1.63)	5.69 (2.51)
3	Arka Sambhram	2.00 (1.73)	4.00 (2.24)	4.67 (2.37)	6.33 (2.70)	7.00 (2.82)	8.00 (2.99)	9.33 (3.21)	8.33 (3.05)	6.33 (2.70)	5.33 (2.51)	4.33 (2.31)	2.67 (1.91)	0.67 (1.24)	5.30 (2.45)
4	Arka Soumya	1.67 (1.62)	4.00 (2.22)	4.67 (2.37)	6.67 (2.76)	6.33 (2.70)	8.00 (2.99)	9.00 (3.16)	9.67 (3.26)	8.00 (3.00)	6.33 (2.71)	6.00 (2.64)	3.00 (1.99)	2.67 (1.91)	5.84 (2.56)
5	Arka Vijay	1.33 (1.48)	4.67 (2.38)	5.00 (2.44)	6.00 (2.64)	6.33 (2.71)	7.67 (2.94)	9.00 (3.14)	11.33 (3.50)	10.00 (3.31)	7.33 (2.88)	6.33 (2.71)	4.00 (2.23)	1.00 (1.38)	6.15 (2.59)
6	NIB-1	1.00 (1.41)	2.67 (1.9)	3.00 (2.00)	4.00 (2.23)	4.33 (2.30)	4.33 (2.30)	4.67 (2.36)	3.67 (2.16)	4.00 (2.23)	3.00 (1.98)	2.67 (1.91)	1.67 (1.63)	1.00 (1.41)	3.07 (1.98)
7	Konkan Bhushan	0.33 (1.14)	1.33 (1.52)	1.67 (1.63)	4.33 (2.30)	5.33 (2.51)	7.33 (2.88)	11.33 (3.50)	12.67 (3.69)	11.67 (3.56)	9.00 (3.16)	7.33 (2.89)	3.67 (2.16)	2.33 (1.81)	6.03 (2.40)
8	Tirupathi Local	1.00 (1.41)	3.67 (2.16)	4.33 (2.30)	5.67 (2.58)	7.00 (2.82)	8.00 (3.00)	8.67 (3.11)	9.00 (3.16)	8.33 (3.05)	6.33 (2.71)	5.33 (2.51)	2.00 (1.71)	2.00 (1.71)	5.48 (2.47)
9	West Godavari Local	0.67 (1.27)	1.33 (1.52)	3.00 (2.00)	5.00 (2.43)	6.00 (2.64)	7.33 (2.88)	9.00 (3.16)	7.33 (2.88)	6.67 (2.77)	5.67 (2.58)	5.00 (2.44)	2.33 (1.81)	1.33 (1.52)	4.66 (2.29)
	Mean larval population	1.04	3.11	3.85	5.37	6.10	7.36	8.70	8.88	7.88	6.14	5.07	2.77	1.48	5.21
	SE(m)+	0.12	0.12	0.01	0.11	0.10	0.08	0.13	0.09	0.06	0.30	0.08	0.12	0.18	0.11
	C.D at 5%	0.37	0.36	0.30	0.32	0.31	0.25	0.38	0.29	0.19	0.30	0.25	0.35	0.53	0.31

Figures in parenthesis are Square root transformed values

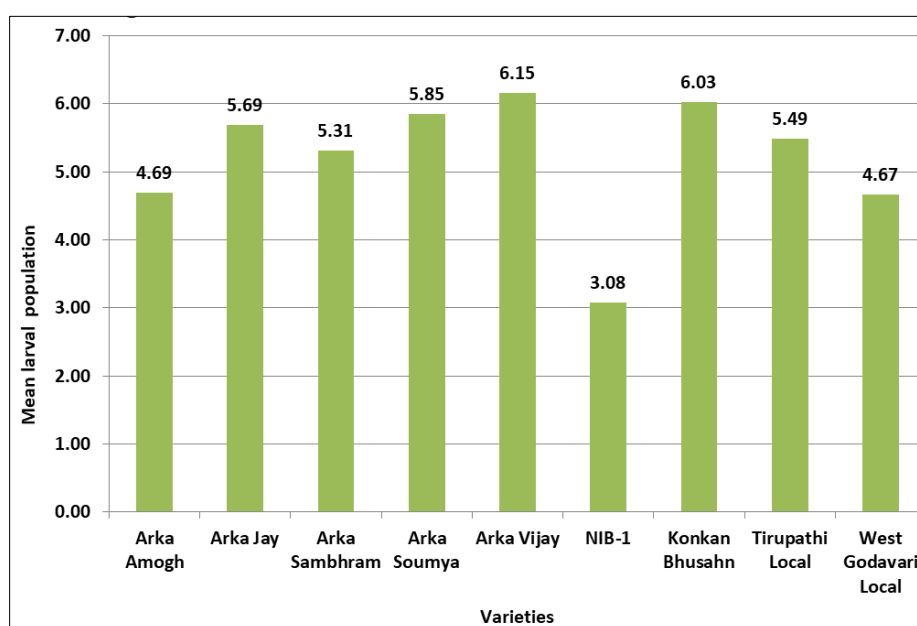
-Data based on average of 10 observation

Table 2: Varietal preference of spotted pod borer, *M. vitrata* in different Indian bean varieties (Kharif, 2017-18)

S. No.	Varieties	mean larval population/ plant	Flower infestation percentage	Pod infestation (%)	Yield per Plant (g)	Yield per Ha (tonns)
1	Arka Amogh	4.69 (2.30)	50.21	25.30	86.80	6.83
2	Arka Jay	5.69 (2.51)	42.28	44.90	76.54	5.87
3	Arka Sambhram	5.30 (2.45)	47.25	43.60	61.75	4.71
4	Arka Soumya	5.84 (2.56)	52.60	37.70	59.30	4.46
5	Arka Vijay	6.15 (2.59)	51.94	24.60	64.40	4.83
6	NIB-1	3.07 (1.98)	17.75	20.00	53.72	3.79
7	Konkan Bhushan	6.03 (2.40)	41.45	36.30	102.46	7.29
8	Tirupathi Local	5.48 (2.47)	32.41	32.10	121.00	8.11
9	West Godavari Local	4.66 (2.29)	42.64	51.00	64.80	4.66
	SE(m)±	0.11	2.72	0.47	8.44	0.66
	C.D at 5%	0.31	8.23	1.14	25.53	1.99

Table 3: Categorization of Indian bean varieties based on per cent infestation by *M. vitrata* (Geyer)

Score	Flowers infestation			Pod infestation		
	Percent infestation/plant	Reaction	Varieties	Percent infestation/plant	Reaction	Varieties
1	0 – 20%	Highly resistant	NIB – 1	No damage	Resistant	-
2	21-40%	Moderately resistant	Tirupathi Local	< 10% pod damage	Moderately resistant	-
3	41-60%	Intermediate	Arka Amogh, Arka Jay, Arka Sambhram, Arka Soumya, Arka Vijay, Konkan Bhushan, West Godavari Local	11-20% pod damage	Tolerant	NIB -1
4	61-80%	Susceptible	-	21-40% pod damage	Moderately susceptible	Arka Amogh, Arka Soumya, Arka Vijay, Konkan Bushan, Tirupathi Local
5	81-100%	Highly susceptible	-	> 40% pod damage	Highly susceptible	Arka Jay, Arka Sambhram, West Godavari Local

**Fig 1:** Incidence of *M. vitrata* in different Indian bean varieties**Acknowledgment**

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