

Occurrence of insect pests on frenchbean, *Phaseolus vulgaris* L. in Darjeeling hills

S. Pal and T.S. Ghimiray

Regional Research Station, Uttar Banga Krishi Viswavidyalaya, Kalimpong, Darjeeling, West Bengal-734301, India

E-mail: palsento@gmail.com

Frenchbean (*Phaseolus vulgaris* L.) is an important leguminous vegetable grown extensively in the hilly region of Darjeeling, West Bengal. In this region, the crop is sown in the month of March and harvested in June to escape low temperature as well as hot or rainy weather. With the introduction of high yielding varieties and intensive cultivation practices, the pest problem in this crop might undergo spectacular changes. Several workers have studied the pest complex of frenchbean in various parts of the country (1, 2, 3). Information on the occurrence of pest complex is an essential pre-requisite for developing a suitable pest management strategy. However, such information in the context of changing pest scenario is meagre particularly from this region. Hence the present investigation was carried out to generate information on the diversity and abundance of insect pests infesting frenchbean.

Pest surveillance studies was carried out at various locations as one time roving/monitoring in the medium hilly region of Darjeeling district from 2006-09. The insect pests encountered during the survey were collected and preserved as dry specimen. Some of the specimens were identified by the Zoological Survey of India, Kolkata. Others were identified at the Department of Agricultural Entomology, Uttar Banga Krishi Viswavidyalaya (UBKV), Pundibari with the help of available insect collections and published literatures. Apart from survey, a field trial was laid out at the farm of the Regional Research Station (Hill Zone), UBKV, Kalimpong during the spring season of

2009. Variety 'Lakshmi' was sown during middle of March in a spacing of 45 X 10 cm in the field plot of 200 square meter. Recommended agronomic practices were followed to raise the crop except the use of any plant protection chemicals. Observations on pest populations were recorded at weekly interval from fifty plants at random selecting five locations in the field one each in each quarter and one in the middle of ten plants each starting one week after sowing till maturity of the crop. The number of jassid and whitefly was counted visually by observing the lower surface of the leaf (trifoliate) after selecting three leaves from upper, middle and lower crop canopy. Number of leaf folder larvae, leaf beetles and *Epilachna* beetles were counted from each plant. Simple correlations were worked out between various pests after calculating their weekly mean incidence. The data on different abiotic parameters like maximum and minimum temperature, relative humidity (RH) as well as total rainfall were collected from the meteorological unit of UBKV, RRS (Hill-Zone), Kalimpong. The impact of various weather parameters on the pest incidence was assessed through correlation studies.

During the survey, twenty three insect pests were recorded infesting frenchbean in the hilly region of West Bengal (Table 1). Amongst the insect pests observed, five were categorized as major pests based on the magnitude of economic loss inflicted by them; three were grouped as moderate and the remaining as pests of minor importance. The economic threshold

levels considered for Jassid, whitefly, leaf folder and leaf/hadda beetles were at 2 nymphs or adults/trifoliolate, 1 nymph or adult/trifoliolate, 1 larva/plant and 2 adults/plant respectively. Earlier pod borer, *Etiella zinckenella* Treitschke and blister beetle, *Mylabris phalerata* Pallas were reported as major pest of frenchbean in Terai region of Uttar Pradesh (3). Both the pests were found to maintain a low profile during the crop growing season in this region. Early sowing of frenchbean in this region probably escapes the onslaught of blister beetle during flowering period of the crop as supported by the reports of Pathak (2). The periodic mean incidence of major insect pests of frenchbean during spring season of 2009 is presented in the Table 2. From the table, it is clear that the leaf beetle is the first pest to invade the crop right from the coteledonary leaf stage of frenchbean and attained its peak (7.80 beetles/plant) population level 5 weeks after sowing of the crop. The leaf folder and *Epilachna* beetle restricted their damage upto the vegetative stage of the crop. The populations of jassid and whitefly abounded the field from the grand growth stage till maturity of the crop reaching peak population level of 3.11 and 1.23 per leaf (trifoliolate) 6 and 8 weeks after sowing, respectively. This pattern of succession of insect pests of frenchbean is probably attributable to the nature of competition amongst themselves and the feeding habit of the pests coinciding with a particular growth stage of the crop as well as the prevailing abiotic factors of environment. Table 3 evidently showed that the insect pests of

frenchbean mostly registered significant positive correlation between themselves. It signifies that the activity of an insect pest in the field remained uninterrupted with the increased presence of other insect pests. Further, table 4 shows that the ecological factors mostly registered non- significant correlation with the infestation of insect pests of frenchbean. Only the whitefly population was significantly influenced by the maximum and minimum temperature as well as minimum RH. Similarly, jassid population exhibited significant positive association with the minimum RH. However, taking lower pest population and shorter crop period with smaller range of weather parameters into account, the correlation studies may not give useful information for pest forecasting or prediction purpose.

Acknowledgement

The authors are thankful to the Zoological Survey of India, Kolkata for identifying some of the insect specimens.

Literature Cited

1. Nair MRGK. 1986 *Insects and Mites of crops in India*, 2nd Ed. ICAR, New Delhi, 408 pp.
2. Pathak KA. 2004 Insect pests of crops in north eastern hills region of India and their management, pp 93-130. In *Frontier Areas of Entomological Research* (Eds Subramanyam B Ramamurthy VV Singh VS). Indian Agricultural Research Institute, New Delhi, 506 pp.
3. Sachan SK Singh DV Singh Hem. 2008 Insect pests of frenchbean, *Phaseolus vulgaris* L. in terai region of Uttar Pradesh. *Indian Journal of Entomology* **70**: 397-98.

Table 1.
Diversity of insect pests of frenchbean in Darjeeling hills, West Bengal

Common Name	Scientific Name	Order	Family	Pest Status	Crop growth stage
Jassid	<i>Empoasca kerri</i> Pruthi	Hemiptera	Cicadellidae	Major	Vegetative-Pod development
Whitefly	<i>Bemisia tabaci</i> Gennadius	Hemiptera	Aleyrodidae	Major	Vegetative-Pod development
Leaf folder	<i>Nacoleia</i> spp.	Lepidoptera	Pyalidae	Major	Vegetative
Leaf beetle	<i>Madurastia obscurella</i> Jacoby	Coleoptera	Chrysomelidae	Major	Seedling-Pod development
Hadda beetle	<i>Epilachna</i> spp.	Coleoptera	Coccinellidae	Major	Vegetative
Aphid	<i>Aphis craccivora</i> Koch.	Hemiptera	Aphididae	Moderate	Vegetative-Pod development
Leaf miner	<i>Phytomyza horticola</i> Gour.	Diptera	Agromyzidae	Moderate	Seedlings-Vegetative
Cutworm	<i>Agrotis</i> spp.	Lepidoptera	Noctuidae	Moderate	Seedling
Flea beetle	<i>Phyllotreta striolata</i> (Fab.)	Coleoptera	Chrysomelidae	Minor	Seedling-Pod development
Flea beetle	<i>Phyllotreta cruciferae</i> (Goeze)	Coleoptera	Chrysomelidae	Minor	Seedling-Pod development
White spotted flea beetle	<i>Monolepta signata</i> Oliv.	Coleoptera	Chrysomelidae	Minor	Seedlings-Vegetative
Red pumpkin beetle	<i>Aulacophora foveicollis</i> (Lucas)	Coleoptera	Chrysomelidae	Minor	Vegetative
Blister beetle	<i>Mylabris</i> spp.	Coleoptera	Meloidae	Minor	Flowering
Shield bug	<i>Dolichoris baccarum</i> (Linn.)	Hemiptera	Pentatomidae	Minor	Pod development
Green stink bug	<i>Nezara viridula</i> (Linn.)	Hemiptera	Pentatomidae	Minor	Pod development
Coreid bug	<i>Cletus bipunctatus</i> (Westw.)	Hemiptera	Coreidae	Minor	Pod development
Coreid bug	<i>Riptortus linearis</i> (Fab.)	Hemiptera	Coreidae	Minor	Pod development
Stem fly	<i>Ophiomyia phaseoli</i> Tryon	Diptera	Agromyzidae	Minor	Vegetative
Tobacco caterpillar	<i>Spodoptera litura</i> (Fab.)	Lepidoptera	Noctuidae	Minor	Seedlings-Vegetative
Green semilooper	<i>Plusia orichalcea</i> (Fab.)	Lepidoptera	Noctuidae	Minor	Vegetative
Gram pod borer	<i>Helicoverpa armigera</i> (Hub.)	Lepidoptera	Noctuidae	Minor	Pod development
Grasshopper	Unspecified	Orthoptera	Acrididae	Minor	Seedlings-Vegetative
Thrips	Unspecified	Thysanoptera	Thripidae	Minor	Flowering

Table 2.
Succession of major insect pests of French bean in relation to weather parameters

Weeks after sowing	Date of observation	Mean population of insect pests				Weather parameters			
		Jassid (no/trifoliolate)	Whitefly (no/trifoliolate)	Leaf folder (no/plant)	Leaf beetle (no/plant)	Hadda beetle (no/plant)	Temp °C	R.H.(%)	Rainfall (mm)
							Max.	Min.	Max.
1.	24.03.09	0.00	0.00	0.00	0.26	0.00	21.9	5.2	84.7
2.	31.03.09	0.00	0.00	0.00	0.56	0.00	24.4	5.7	80.7
3.	07.04.09	0.40	0.00	0.00	2.84	0.00	25.1	5.8	87.9
4.	14.04.09	1.17	0.00	0.24	4.90	0.30	23.9	6.7	90.3
5.	21.04.09	1.49	0.77	0.64	7.80*	0.96	24.4	7.6	89.8
6.	28.04.09	3.11*	0.68	1.34	5.52	2.22	24.7	8.4	90.7
7.	05.05.09	2.23	1.16	2.72*	5.70	2.14	25.5	9.6	90.0
8.	12.05.09	2.08	1.23*	2.32	6.92	3.44*	26.0	9.7	90.5
9.	19.05.09	2.17	0.95	0.88	4.80	1.68	26.9	10.6	88.1
10.	26.05.09	1.13	1.08	0.00	3.36	0.48	24.9	9.7	88.0
11.	02.06.09	1.07	1.03	0.00	2.20	0.00	28.2	11.2	90.7
12.	09.06.09	0.91	0.82	0.00	1.56	0.00	23.2	9.7	97.5

* Peak level of population

Table 3.
Correlation among different insect pests of frenchbean

Insect pest	Jassid	Whitefly	Leaf folder	Leaf beetle	Hadda beetle
Jassid	1.000				
Whitefly	0.649*	1.000			
Leaf folder	0.741**	0.566	1.000		
Leaf beetle	0.770**	0.501	0.684*	1.000	
Hadda beetle	0.825**	0.603*	0.914**	0.748**	1.000

* Significant at 5 per cent level of significance ($r = \pm 0.576$)

** Significant at 1 per cent level of significance ($r = \pm 0.708$)

Table 4.
Correlation studies between insect pests of frenchbean and weather parameters

Insect pest	Maximum Temp °C	Minimum Temp °C	Maximum RH (%)	Minimum RH (%)	Rainfall (mm)
Jassid	0.411	0.590*	0.437	0.127	0.048
Whitefly	0.578*	0.915**	0.502	0.603*	0.296
Leaf folder	0.280	0.360	0.187	-0.028	0.037
Leaf beetle	0.308	0.325	0.326	-0.111	-0.018
Hadda beetle	0.328	0.413	0.185	0.030	0.036

* Significant at 5 per cent level of significance ($r = \pm 0.576$)

** Significant at 1 per cent level of significance ($r = \pm 0.708$)