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INSECT PEST SPECTRUM OF FRENCH BEAN *PHASEOLUS VULGARIS* (POLE TYPE) GROWN UNDER NETHOUSE

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ABSTRACT

Pole bean (*Phaseolus vulgaris* L.) is an annual herb grown vertically on a support. The present study asseses the insect pests infesting this bean along with their natural enemies under nethouse conditions. The study was done at the Hi-tech Horticulture Unit, UAS, Dharwad. The results revealed five species of insects and one mite species infesting pole bean at various phases of crop growth. These include- the serpentine leaf miner (*Liriomyza trifolii*), pod fly (*Melanagromyza obtusa*), seed fly (*Anthomyia* sp.), leafhopper (*Ianagallia bifurcate*), tobacco caterpillar (*Spodoptera litura*), and red spider mite (*Tetranychus urticae*). The natural enemies include- *Brachymeria* sp. (Chalcididae), *Ichneumon* sp. (Ichneumonidae) and *Microplitis* sp. (Braconidae).

Key words: *Phaseolus vulgaris*, nethouse, insects, mites, natural enemies, crop stages, Braconidae, Chalcididae, leaf miner, tobacco caterpillar, leafhopper, seed fly

India is the world's leading producer of pulses and accounts for 26% of world production and 30% of consumption. French bean *Phaseolus vulgaris* L. is a herbaceous plant that belongs to the legume family Fabaceae. Vegetable cultivation under protective structures like the nethouse has become very popular now (Kaur et al., 2004). But, growing vegetable crops under nethouse makes them more susceptible to pests due to warm and humid conditions, and it is necessary to know the pest diversity, their abundance and the associated natural enemies, in these. The major pests of green beans as reported by Mondal et al. (2018) are bean stem fly (*Ophiomyia phaseoli* Tryon), aphids (*Aphis craccivora* Koch), mites (*Tetranychus* sp.), whitefly (*Bemisia tabaci* Gennadius), leaf miner, (*Liriomyza trifolii* Burgess), pod borers like *Helicoverpa armigera* (Hubner) and bean gall weevil (*Alcidodes signatus* Boheman), under open field conditions. Since, pole type French bean is being newly introduced in North Karnataka, the present study assessed its insect pest spectrum along with their natural enemies under net house conditions.

MATERIALS AND METHODS

Insect pests and natural enemies of French bean (pole type) under nethouse was analysed during rabi 2019-20, at the Hi-tech Horticulture Unit, UAS, Dharwad (15.4889 °N,74.9813 ° E). Experiment with variety Indus IZ Polo with a plot size of 500 m^2 and spacing of 30x 45cm was laid out, kept free from chemicals, and there were 10 subplots of 5 m^2 each. To know the pest spectrum, scouting was done by looking at the plants in all its growth stages, from the bottom to top i.e. older leaves to new flush. For calculating the abundance, Gupta et al. (2016) was followed; in case of leaf miner, the number of larvae/ five leaves from five tagged plants, and from each subplot was recorded. The leafhoppers (including nymphs) and mites were counted on three leaves, collected from top, middle and bottom portion of the randomly tagged five plants. For tobacco caterpillar, number of larvae/ m length in five randomly selected spots/ subplot was recorded. Insects and natural enemies prevailing from sowing to harvest were observed at weekly intervals. Collected insects were observed, sorted, and counted under a stereozoom microscope. Standard procedures were followed for collection and preservation of specimens (Gullan and Cranston, 2014).

RESULTS AND DISCUSSION

Results revelaed occurrence of five insect pests and one mite viz. serpentine leafminer *Liriomyza trifolii* Burgess, bean pod fly *Melanagromyza obtusa* Malloch, bean seed fly *Anthomyia* sp., leafhopper *Ianagallia bifurcate* Sawai Singh and Gill, tobacco caterpillar *Spodoptera litura* (F) and red spider mite *Tetranychus urticae* Koch. Allen et al. (1996) and Mehta et al. (2001) reported bean flies, cut worms, serpentine leaf miner,

and spider mites as pests on common beans *Phaseolus vulgaris* L. under field conditions. Similar observations were made by Sood (2010) on beans under the greenhouse. Manjesh et al. (2017) reported incidence of *L. trifolii* and *T. urticae* on yard long beans under shade-nethouse. The activity of *L. trifolii* started at four-leaf stage (two weeks after sowing) and continued throughout the cropping season; peak incidence (6.32 larvae/ 5 leaves) was observed in the pod initiation stage and minimum (2.16 larvae/ 5 leaves) during the early vegetative stage (Table 1). Mondal et al., (2018) observed a peak abundance of leaf miner (4.13 larvae/ plant) on French bean; and Manjy (2019) on cowpea that it was in peak incidence with 10.5 larvae/ leaf. Incidence of *T. urticae* started three weeks after sowing (3.52 mites/ 3 leaves) with peak (10.48 mites/ 3 leaves) during reproductive stage (Table 1); Anuradha (2013) observed peak incidence at 30 days after sowing, under polyhouse on pole bean; Saloni (2018) observed *T. urticae* in nethouse with capsicum; Khatak et al. (2020) observed these on tomato leaves under screen house.

Leafhoppers (*I. bifurcata*) were first noticed at vegetative stage (0.4 to 0.84/ 3 leaves) with peak at reproductive stage (Table 1). Sharma (2008) observed maximum incidence at the late vegetative stage on French bean; mean incidence of *Empoasca fabae* Harris was between 0.41 and 0.73 individuals/ 6 leaves on Indian bean (Chouragade et al., 2018). The infestation of *S. litura* commenced two weeks after sowing, in the early vegetative stage, it was @0.16 larvae/ m with a peak of 0.75 larvae/ m during the flowering stage (Table 1). Manjesh et al. (2017) reported 0.91 larvae/ plant on yard long beans under polyhouse; while with by beet army worm (*S. exigua*) a peak of 1.47 larvae/ plant was during the late vegetative stage on capsicum under shade-net house (Gupta et al., 2016). Earlier findings suggested spider mites and leafhoppers as major sucking pests on French bean (Jakhar and Choudhary, 2013). Saha et al. (2015) observed *L. trifolii* and mites as important pests on beans under protected conditions; and *L. trifolii* was observed maximum on yard long beans under shade-net (Manjesh et al., 2017). The observations on the natural enemies revealed *Brachymeria* sp. (Chalcididae), *Ichneumon* sp. (Ichneumonidae) and *Microplitis* sp. (Braconidae). Xu et al. (2007) found *Opius caricivorae* Fischer, a braconid endoparasitoid on leaf miner. Saha et al. (2015) observed *Dacnusa sibirica* (braconid wasp) on leaf miner. French bean harbours predators like *Coccinella septumpunctata* and *C. dimitida,* syrphid fly, *Chrysoperla carnea* Stephens, rove beetle, and spiders along with parasitoids *Aphidius* sp., *Eretmocerus* sp. and *Campoletes chloridea* Uchida (Mondal et al., 2018). Braconid and eulophid parasitoids were recorded on caterpillar pests under greenhouse (Rathee et al., 2018).

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Table 1. Population abundance of insect pests on pole bean

S. No.	Stage of the crop	Mean incidence			
		Leaf miner/ 5 leaves	Mites/ 3 leaves	Leafhoppers/ 3 leaves	Tobacco caterpillar/ m
1.	Vegetative	2.16	0.00	0.00	0.16
2.	Vegetative	3.16	3.52	0.00	0.38
3.	Vegetative	4.20	4.96	0.00	0.45
4.	Vegetative	4.84	5.80	0.40	0.48
5.	Flowering	5.08	7.52	0.40	0.55
6.	Flowering	5.24	8.84	0.48	0.75
7.	Pod setting	5.88	8.84	0.64	0.60
8.	Pod setting	6.32	9.08	0.68	0.40
9.	Maturity	6.12	10.40	0.84	0.30
10.	Harvesting	6.04	10.48	0.84	0.28
Mean		4.90	7.71	0.61	0.43
S.D±		1.30	3.18	0.32	0.16

AUTHOR CONTRIBUTION STATEMENT

All authors equally contributed.

CONFLICT OF INTEREST

No conflict of interest.

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