Diversity of insect pests and natural enemies of rice bean (*Vigna umbellata*) from Manipur

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Abstract: Rice bean is considered as underutilized grain legume crop in India and is hampered by several insect pests. It has a good nutritional value and regarded as one of valuable crop in Manipur. Recently a survey was undertaken to document insect pests and natural enemies of rice bean in Manipur. The results revealed that *Paracoccus marginatus* having the highest relative abundance among the insect pests species (10.91%), followed by *Aleurodicus disperses* (10.81%) and in case of natural enemies, *Solenopsis* sp (15.19%) having the highest relative abundance followed by *Oxyopes* sp (10.91%).

Key words: Rice bean, *Paracoccus marginatus*, *Aleurodicus disperses*, *Solenopsis* sp, *Oxyopes* sp

Rice bean (*Vigna umbellata*) (Thunb.), belonging to the family Fabaceae is considered as underutilized grain legume crop in India. It is mostly cultivated in hilly areas in India and parts of Southeast Asia. Rice bean majorly grown as intercrop or mixed crop with maize (*Zea mays*), sorghum (*Sorghum bicolor*) and cowpea (*V. unguiculata*). It is distributed from Southern China through the north of Vietnam, Laos and Thailand into Burma and India (Tomooka *et al.,* 1991). In India, rice bean is cultivated mainly in the Himachal Pradesh and Uttaranchal and NE hills (Manipur, Assam, Arunachal Pradesh, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura), as well as in Central India in Madhya Pradesh and Chhattisgarh. It can be full-grown in diverse conditions and familiar among farmers for its wide adaptation and production even in marginal lands and drought-prone sloping areas. These species are also termed as 'orphan' crops as there is scanty research and development, and as such there is no scientific knowledge about them (Eyzaguirre *et al.,* 1999). The wild forms are mainly cultivated in Kerala, Eastern and Western Ghats to the Himalayas and there is unlimited variability, particularly in the NE hill region. The wild types of rice bean occur in natural and disturbed habitats and forest clearings, and most of the plants with small seeds. Bisht *et al.,* (2005) reported that within-species variation in rice bean was higher than in related species. It is well adjusted to the humid tropics and does well on many soil types, with most varieties are highly photoperiod sensitive, late flowering and have strong vegetative growth. It can adapt to drought, excessive rain, and resistance to viral, bacterial and fungal diseases, good anti-inflammatory properties (Singh *et al.,* 2020). It is a rich source of protein and contains high levels of essential fatty acids, essential amino acids, minerals and vitamins

(Mohan & Janardhanan, 1994). Although rice bean is considered as underutilized crop, it has a good nutritional value and regarded as one of valuable crop in Manipur. Rice bean is hampered by several insect pests in Manipur and there is scanty research about the insect pest complex in Manipur. Hence, it is important to study the relative abundance, pest status and crop stage of insect pest and natural enemies of rice bean in Manipur.

Materials and Method:

The study was conducted at Farmers field, Imphal District, Manipur, India 24º47'26.3"N 93º55'22.2"E during 2020-21. The experiment was laid out in a Randomized Block Design (RBD). A population of insect pests and natural enemies on ricebean was surveyed during 2020-21 by regular observation of weekly intervals after transplanting with10 randomly plants for the experiment. The specimen which came along were collected by hand picking and sweeping net and were brought for identification. The microscopic insect specimen was observed by microscope (Leica stereo zoom, SZM, S9i).

$$\text{Relative Abundance (RA) of a species} = \frac{\text{No. of individuals of the species}}{\text{No. of individuals of all species}} \times 100$$

Results and Discussion:

Occurrence of insect pests and natural enemies in rice bean crop:

The occurrence of insect pests and natural enemies of rice bean was studied from different crop stages i.e. vegetative, flowering + fruiting (reproductive) and maturity. Study revealed that seven insect pest species and six species of natural enemies were observed at different stages of crop (Table 1&2).

Among seven insect pest species four species such as *Aleurodicus dispersus* (Russel), *Aphis gossypii* (Glover), *Bemisia tabaci* (Gennadius), *Paracoccus marginatus* (Williams and Granara de Willink) belong to the order Hemiptera, *Phragmatobia fuliginosa* (Linnaeus) and *Phalanta phalantha* (Drury) belong to the order Lepidoptera, *Ophiomyia phaseoli* (Tryon) belong to the order Diptera. Among six species of natural enemies two species viz., *Coccinella transversalis* (Fabricius) and *Chilocoris nigrita* Fabricius belong to the order Coleoptera, *Oxyopes* sp (Latreille) belong to the order Araneae, *Crocothemis servilia* Drury belong to the order Odonata, *Solenopsis* sp Buren belong to the order Hymenoptera and *Rhynocoris iracundus* Latreille belong to the order Hemiptera were recorded as natural enemies in rice bean ecosystem (Table 1). The order Hemiptera and Coleoptera is found to be the most dominant insect pest and natural enemies which is similar with the finding of (Thokchom *et al.,* 2019). *Aleurodicus dispersus* was first time reported from brinjal in Manipur (Thokchom and Akoijam, 2022). Also, *A. disperses* will be the first report on rice bean in Manipur. It was observed from November to December during reproductive stage (Table 1). Nymphs and adults of *A. gossypii* were observed during vegetative stage from October to January (Table 1). *Ophiomyia phaseoli* was found during reproductive stage from February to March (Table 1). *Phragmatobia fuliginosa* was seen during reproductive stage from March to April.

Table 1. List of insect pests of rice bean during 2020-21

Insect Pest	Scientific name	Order	Family	Damaging stage	Crop stage	Period of activity	Pest status	Relative abundance %
Spiralling whitefly	*Aleurodicus dispersus* Russel	Hemiptera	Aleyrodidae	Nymph & Adult	Reproductive	Nov to Feb	High	10.81
Aphids	*Aphis gossypii* Glover	Hemiptera	Aphididae	Nymph & Adult	Vegetative	Oct to Jan	High	9.32
Bean fly	*Ophiomyia phaseoli* Tryon	Diptera	Agromyzidae	Adult	Reproductive	Feb-March	Low	5.19
Ruby Tiger moth caterpillar	*Phragmatobia fuliginosa* Linnaeus	Lepidoptera	Erebidae	Larva	Reproductive	March-April	Low	4.32
Leopard butterfly	*Phalanta phalantha* Drury	Lepidoptera	Nymphalidae	Larva	Reproductive	Feb-March	Low	4.19
Whitefly	*Bemisia tabaci* Gennadius	Hemiptera	Aleyrodidae	Nymph & Adult	Vegetative	Oct to Jan	High	9.58
Mealy bug	*Paracoccus marginatus* Williams and Granara de Willink	Hemiptera	Pseudococcidae	Nymph & Adult	Reproductive	Dec to Feb	High	10.91

Table 2. List of natural enemies of rice bean during 2020-21

Insect pest	Scientific name	Order	Family	Crop stage	Period of activity	Relative abundance %
Transverse Ladybird beetle	*Coccinella transversalis* Fabricius	Coleoptera	Coccinellidae	Vegetative	Nov - Feb	10.81
Ladybird beetle	*Chilocoris nigrita* Fabricius	Coleoptera	Coccinellidae	Reproductive	Jan-Feb	1.19
Dragon fly	*Crocothemis servilia* Drury	Odonata	Libellulidae	Reproductive	Oct - March	6.13
Assassin bug	*Rhynocoris iracundus* Latreille	Hemiptera	Reduviidae	Reproductive	Feb- March	1.39
Spider	*Oxyopes sp* Latreille	Araneae	Oxyopidae	Reproductive	Feb - March	10.91
Fire Ants	*Solenopsis sp* Buren	Hymenoptera	Formicidae	Vegetative	Nov-April	15.19

Larvae of *P. phalantha* were observed from February to March during reductive stage (Table 1). *B. tabaci* was seen from October to January during vegetative stage (Table 1). Nymph and adult *P. marginatus* were found from December to February during reproductive stage (Table 1). The highest relative abundance of insect pests was recorded for *Paracoccus marginatus* (10.91%), followed by *Aleurodicus disperses* (10.81%), *Bemisia tabaci* (9.58%), *Aphis gossypii* (9.32%), *Ophiomyia phaseoli* (5.19%), *Phragmatobia fuliginosa* (4.32%) and *Phalanta phalantha* (4.19%) (Table 1). Natural enemies such as *C. transversalis* were observed during vegetative stage from November to February (Table 2). *Chilocoris nigrita* was seen during reproductive stage from January to February (Table 2). *Crocothemis servilia* was observed during reproductive stage from October to March (Table 2). *Rhynocoris iracundus* and *Oxyopes* sp were seen during reproductive stage from February to March (Table 2). *Solenopsis* sp was seen during vegetative stage from November to April (Table 2). The highest relative abundance of natural enemies was found for *Solenopsis* sp (15.19%) followed by *Oxyopes* sp (10.91%), *Coccinella transversalis* (10.81%), *Crocothemis servilia* (6.13%), *Rhynocoris iracundus* (1.39%) and *Chilocoris nigrita* (1.19%) (Table 2). The results were similar with the findings of Kumar *et al.*, 2017 who reported aphids, jassids, pod borer and **c**occinellids as the insect pests and natural enemies in mungbean with the highest relative abundance in aphids and coccinellids.

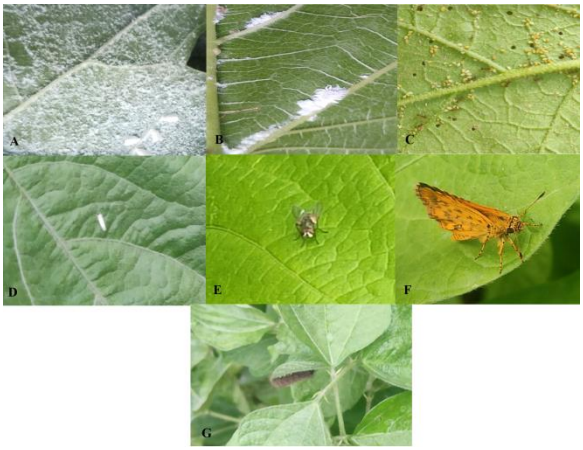

Fig. 1. Insect pests of rice bean: A. *Aleurodicus dispersus* Russel, B. *Paracoccus marginatus* Williams and Granara de Willink, C. *Aphis gossypii* Glover, D. *Bemisia tabaci* Gennadius, E. *Ophiomyia phaseoli* Tryon, F. *Phalanta phalantha* Drury and G. *Phragmatobia fuliginosa* Linnaeus.

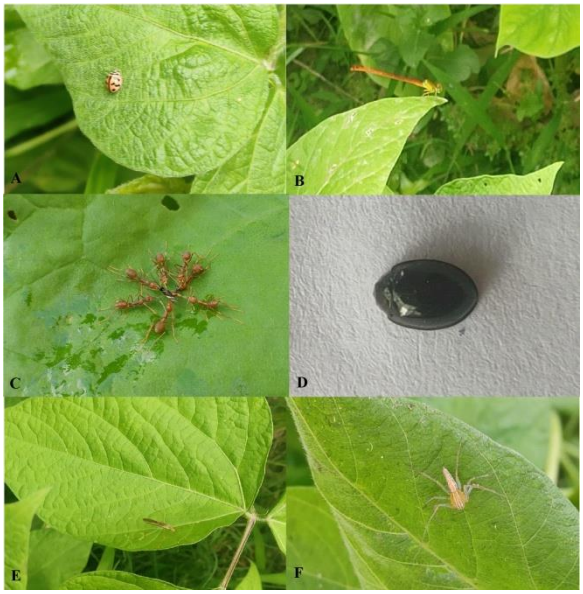

Fig. 1. *N*atural enemies *recorded in* rice bean*:* A. *Crocothemis servilia* Drury, B. *Coccinella transversalis* Fabricius, C. *Solenopsis* sp Buren, D. *Chilocoris nigrita* Fabricius, E. *Rhynocoris iracundus* Latreille, and F. *Oxyopes* sp Latreille.

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