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Research Article

Diversity of insect pests in the dwarf country bean BARI Shim 5 grown during summer season in Barisal

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ABSTRACT

A study was carried out to record the prevalence and abundance of insect pests in the dwarf country bean (BARI shim-5) at Bangladesh Institute of Nuclear Agriculture, Barisal during March to June 2025. For this, seedlings were planted in the plastic plant growing pots. Insect pests were observed at four days interval in all leaves of all plants from seedling to fruiting stage and total thirteen (13) insects were recorded which were identified by matching with pictures, literature study and taking help from expert. The recorded insect pests were: bean armyworm, *Spodoptera litura* (Noctuidae: Lepidoptera); bean pod borer, *Maruca vitrata* (Crambidae: Lepidoptera); bean leaf folder, *Omiodes indicata* (Crambidae: Lepidoptera); red pumpkin beetle, *Aulacophora foveicollis* (Chrysomelidae: Coleoptera); spotted bean beetle, *Pagria signata* (Chrysomelidae: Coleoptera); pear-shaped weevil, *Apion sp.* (Apionidae: Coleoptera); bean leaf miner fly, *Liriomyza sativae* (Agromizidae: Diptera); bean thrips, *Caliothrips fasciatus* (Thripidae: Thysanoptera); kudzu bug, *Megacopta cribraria* (Plataspida: Hemiptera); black bean aphid, *Aphis fabae* (Aphididae: Hemiptera); jassids, *Amrasca biguttula* (Cicadellidae: Hemiptera); whitefly, *Bemisia tabaci* (Aleyrodidae: Hemiptera); and white leafhopper, *Cofana spectra* (Cicadellidae: Hemiptera). Among these, 3 insect belongs to Lepidoptera, 3 insect belongs to Coleoptera, 5 insect belongs to Hemiptera, 1 insect belongs to each Diptera and Thysanoptera order. Aphid was the most abundant (3.02 insects plant^{-1} observation^{-1}) which was followed by whitefly (0.81 insects plant^{-1} observation^{-1}) and bean thrips (0.57 insects plant^{-1} observation^{-1}) while white leafhopper was least abundant (0.08 insects plant^{-1} observation^{-1}) and was followed by bean leafhopper (0.08 insects plant^{-1} observation^{-1}), and bean leaf miner (0.13 insects plant^{-1} observation^{-1}). Therefore, the sucking pests were relatvely more abundant in the dwarf bean (BARI Shim-5) grown in Barisal.

Introduction

Country bean (*Lablab purpureus* Lin.) is a widely cultivated vegetable in Bangladesh. Seeds of country bean are rich in nutrients and bioactive compounds including polyphenol, flavonoid and isoflavones (Suborna et al., 2024) like the cereal grains (Khatun and Mollah, 2024) and legumes (Khatun and Kim, 2021). These bioactive compounds have the anti-obesity and anti-inflammatory role in human body (Khatun *et al.,* 2023). Thus, consumption of country bean is crucial to maintain our sound health. Being legume crop, country bean plants helps nitrogen fixation in the soil (Ali *et al.,* 2019).

This important and popular vegetable is well known as a winter vegetable. However, now a days, country bean is being cultivated in the summer season with sufficient and notable yield potential (Mollah *et al.,* 2013a) due to development of some day-lengh and light insensitive varieties. Favourable environment for reproduction and survival caused the increased infestation of insect pests in the summer season than the winter (Khan *et al.,* 2020). Intercropping, mix cropping, plant-rich field margin also control the prevalence and abundance of insect pests and natural enemies in the field by introducing push-pull stratery (Mala *et al.,* 2020a, b). In the summer, country bean was reported to be infested by black bean aphid, *Aphis craccivora* Koch; bean pob borer, *Maruca vitrata* Gey; cotton ball worm, *Helicoverpa armigera* Hub.; leaf eating caterpillar, *Plusia oricalchea* Fab.; hairy caterpillar, *Spilarchia*

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obliqua Wal.; green semilooper, *Chrysodeixis acuta* Fab.; bean shoot borer, *Crocidosema aporema* Wals; lablab bug, *Coptosoma cribrarium* Fab.; bean bug, *Riptortus pedestris* Fab.; southern green stink bug, *Nezara viridula* Lin.; brown stink bug, *Euschistus servus Say*; hooded hopper, *Leptocentrus Taurus* Fab.; leaf beetle, *Madurasia obscurella* Jacoby and leaf weevil, *Blosyrus oniscus* Oliv. in Gazipur (Mollah *et al.,* 2017; Mollah, 2022). In Sylhet region, five insect pests including aphid, pod borer, epilachna beetle, shoot borer and field cricket were recorded during summer season (Khan *et al.,* 2019). A survey conducted by Rahman *et al.* (2022) reported seven insect pests including aphid, pod borer, green semilooper, field cricket, bean bugs, thrips, and jute weevil in country bean from Jessore, Pabna, Bogura, Sunamgonj and Sylhet. However, predators including lady bird beetle, dragonfly, damselfly, brown marmorated stink bug, hover fly, spider, etc. (Karimi et al., 2024; Alkhafaji and Ahmed, 2023; Rahman et al., 2022; Mollah and Rahman 2012; Mollah *et al.,* 2012a), and parasitoids like Braconid wasp and Tachinid fly were also prevalent and active in the country bean field (Karimi *et al.,* 2024; Alkhafaji and Ahmed, 2023; Mollah and Khatun, 2023). Among the insect pests, black bean aphid and pod borer were most prevalent, abundant and major pest in all localities (Rahman et al., 2022; Knan et al., 2019; Mollah *et al.,* 2013b; Mollah *et al.,* 2012b) causing significant yield loss (Hossain *et al.,* 2025; Nur *et al.,* 2020). In contrast, stink bugs, bean bugs and hairy caterpillars are relatively less prevalent and considered as minor insect pests (Mollah *et al.,* 2017; Mollah *et al.,* 2022). The above-mentioned informations represent the insect pest status of country bean in Gazipur, Sylhet, Bogura, Jessore, Pabna, and Sunamgonj district of Bangladesh. Insufficient or no informations are available regarding the insect pests, their abundance and diversity associated with summer-grown country bean in the ago-ecosystem of coastal region of Bangladesh including Barisal. Therefore, this study aimed to document the diversity, prevalence patterns, and relative abundance of insect pests associated with summer-grown BARI Shim-5 in the Barisal agro-ecosystem.

Materials and Methods

This study was conducted in the research area of Bangladesh Institute of Nuclear Agriculture (BINA), Barisal substation during March to June 2024. This area was located at the latitude and longitude of 22.8162 ^{o}N and 90.3137 ^{o}E, respectively with an elevation of 2 m from the sea level (Khatun and Mollah, 2023). This area was under the Agro-Ecological Zone of active Ganges Floodplain (AEZ 10) possessing calcareous, alluvium, calcareous brown floodplain silty clay loam textured soil (Mollah and Khatun, 2024). BARI developed dwarf bean variety BARI shim 5 was selected for this study. Speciality of this variety is that flowering and fruiting starts at early stage of plant growth (Figure 1).

Figure 1. Different growth stages of dwarf bean (BARI Shim-5).

The seeds were sawn in the nine (9) plastic plant growing tub (30 x 30 cm) following overnight soaking. Before seed sawing, the tubs were filled with soil mixing with cowdung. After germination, one seedling in each tub was confirmed by removing or uprooting the additional seedlings. The growing tubs containing one seedling were arranged in the field following completely randomized design (CRD) with three replications. The growing tubs were arranged in three rows. Plant to plant distance were maintained one meter and row to row distance were two meters. Irrigation, fertilization, mulching and weeding were provided as required followed by Ali *et al.* (2019). Investigation on insect pests was started from the very early stage of seedlings (two leaf stage) and continued upto the fruit harvesting stage. Prevalence and abundance of insect pests were observed by visual search from each leaf of every plants and recorded following Mollah (2024) at four days interval. For this, the both side of the leaves and all leaves of each plant was checked. Both adult and immature insects were conted together. During observation, very few spiders were observed and their

informations were not recorded. During observation picture of the insects were taken and the unknown insects were captured using 50 ml falcon tube and brought to the laboratory for identification. The collected insects were identified following detailed morphological study in the laboratory, searching literature, matching with pictures or taking help from experts. The collected data were inputted and anylysed using MS excel software for working out the number of insects plant^{-1}, number of insects observation^{-1} or number of insects plant^{-1} observation^{-1}. Graphs were prepared using Sigma plot 12.5. Relative abundance of insect pests were calculated following Mollah and Arifuzzaman (2024;) with some modifications as:

Relative abundance (%) of insect pests = $\frac{Number\,of\ specificinse-ct\ pest}{Total\,number\,of\,insect\ pests}\times 100$

Results

Prevalence of insect pests in the plants

Insects pests were observed from the early stage of the plants grown during summer season. The prevalent insect pests were: bean armyworm, bean pod borer, bean leaf folder, red pumpkin beetle, spotted bean beetle, pear-shaped weevil, leaf miner fly, bean thrips, black bean aphid, white leafhopper, kudzu bug, jassid and white fly (Figure 2). Among these, bean armyworm, bean leaf folder, spotted bean beetle, leaf miner fly, white planthopper, jassid and whiteflies were found to damage only the bean leaves (Figure 2). Bean pod borer were observed both in leaves and inflorescence; red pumpkin beetle and pear-shaped weevils were found both in leaf and pod; bean thrips were recorded from flowers only (Figure 2).

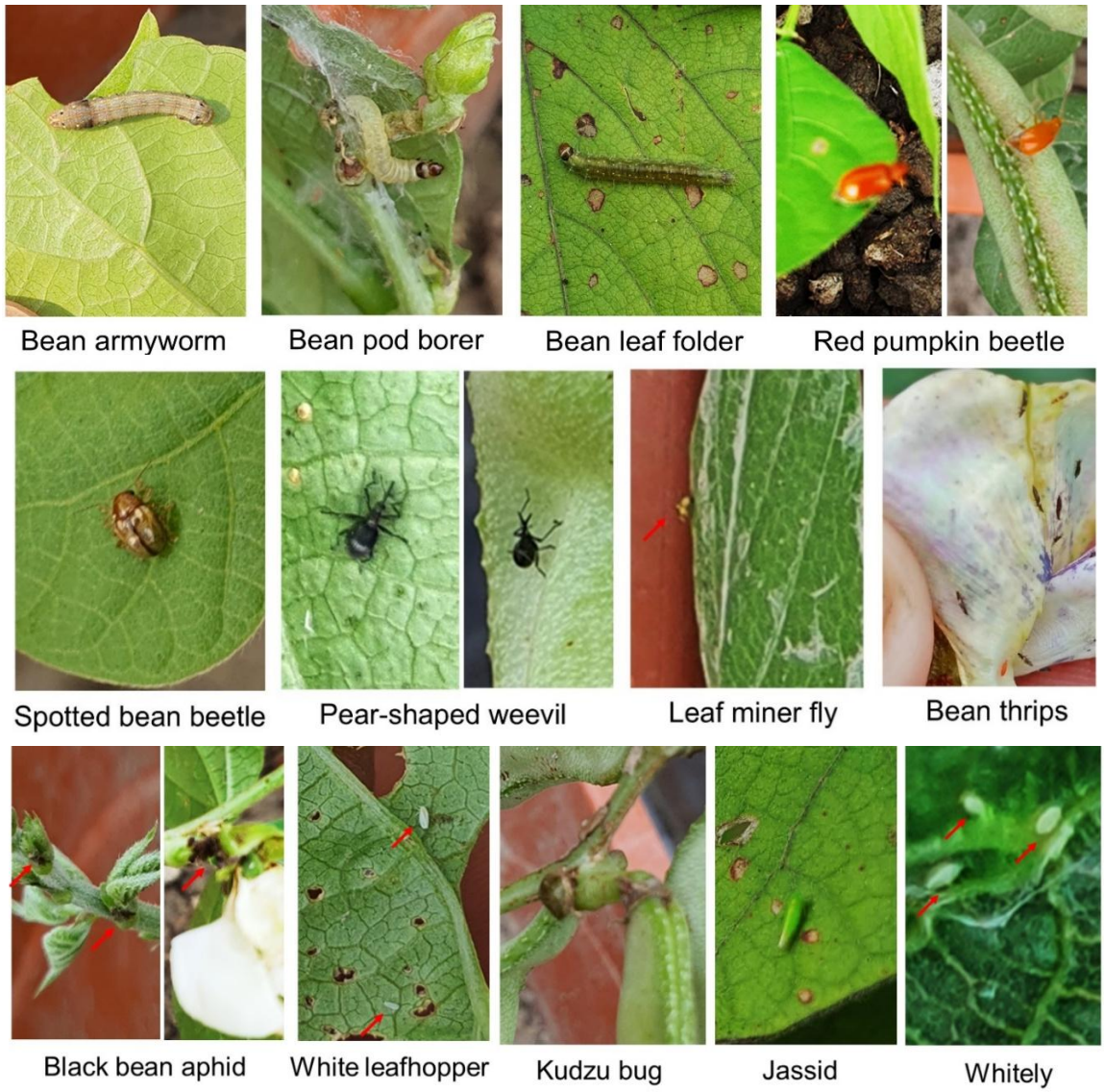

Figure 2. Pictorial representation of the insect pests found in dwarf bean (BARI shim 5) plants. The picture of the insects were captured through out the growing and fruiting period.

Taxonomic diversity of the insect pests

The insect pests were with different taxonomic status. All the insect pests were divided into 10 families under 5 orders namely Lepidoptera, Coleoptera, Diptera, Thysanoptera and Hemiptera (Table 1). Bean armyworm, *Spodoptera litura* belongs to the family Noctuidae; bean pod borer, *Maruca vitrata* and bean leaf folder, *Omiodes indicata* belongs to the family Crambidae (Table 1). Both the Noctuidae and Crambidae are family under the order Lepidoptera. Red pumpkin beetle, *Aulacophora foveicollis* and spotted bean beetle, *Pagria signata* belongs to the family Chrysomelidae while pear-shaped weevil, *Apion sp*. belongs to the family Apionidae. Both the Chrysomelidae and Apionidae are family of Coleoptera order (Table 1). Bean leaf miner fly, *Liriomyza sativae* belongs to the Dipteran family Agromizidae and bean thrips, *Caliothrips fasciatus* belongs to the family Thripidae of the order Thysanoptera (Table 1). Kudzu bug, *Megacopta cribraria*; bean whitefly, *Bemisia tabaci* and black bean aphid, *Aphis fabae* belongs to the family Plataspidae, Aleyrodidae and Aphididae, respectively while jassid, *Amrasca biguttula* and white leafhopper, *Cofana spectra* belongs to the Hemipteran family Cicadellidae (Table 1). Therefore, Hemipteran insects (5 insects under 4 families) were most prevalent followed by Lepidopteran and Coleopteran (3 insects under 2 families), Dipteran and Thysanopteran insects (1 insect under 1 family).

Table 1. Taxonomic information of the prevalent insect pests in the bean plants.

Sl. No.	Common name	Species name	Family name	Order name	Feeding habit
01	Bean army worm	*Spodoptera litura*	Noctuidae		Leaf & fruit feeder
02	Bean pod borer	*Maruca vitrata*	Crambidae	Lepidoptera	Twig, flower & fruit feeder
03	Bean leaf folder	*Omiodes indicata*	Crambidae		Leaf feeder
04	Red pumpkin beetle	*Aulacophora foveicollis*	Chrysomelidae		Leaf & fruit feeder
05	Spotted bean beetle	*Pagria signata*	Chrysomellida		Leaf feeder
06	Pear-shaped weevil	*Apion sp.*	Apionidae	Coleoptera	Leaf & fruit feeder
07	Bean leaf miner fly	*Liriomyza sativae*	Agromyzidae	Diptera	Leaf chlorophyl feeder
08	Bean thrips	*Caliothrips fasciatus*	Thripidae	Thysanoptera	Sap sucker from tender leaf & flower
09	Kudzu bug	*Megacopta cribraria*	Plataspidae		Sap sucker from stem, leaf & fruit
10	Black bean aphid	*Aphis fabae*	Aphididae	Hemiptera	Sap sucker from leaf, stem, twig & fruit
11	Bean whitefly	*Bemisia tabaci*	Aleyrodidae		Sap sucker from leaf
12	Jassids	*Amrasca biguttula*	Cicadellidae		Sap sucker from leaf
13	White leafhopper	*Cofana spectra*	Cicadellidae		Sap sucker from leaf

Abundance of the insect pests in the bean plants

For detailed information and understanding on abundance of the insect pests, data have been presented in different formates like insets plant^{-1}, insects observation^{-1} and insects plant^{-1} observation^{-1}. However, variation in the abundance of the insect pests were observed. In the nine plants, black bean aphid was most abundant (21.11 insects plant^{-1}) which was followed by whitefly (5.67 insects plant^{-1}), bean thrips (4.0 insects plant^{-1}), pear-shaped weevil (3.78 insects plant^{-1}), kudzu bug (3.56 insects plant^{-1}), spotted bean beetle (1.33 insects plant^{-1}) and bean pod borer (1.33 insects plant^{-1}), jassid (1.22 insects plant^{-1}) and bean armyworm (1.0 insects plant^{-1}) while the bean leaf folder (0.56 insects plant^{-1}) and white leafhopper (0.56 insects plant^{-1}) was least abundant which was followed by red pumpkin beetle (0.78 insects plant^{-1}) and leaf miner fly (0.89 insects plant^{-1}) (Figure 2).

From seven (7) observation, maximum was recorded for black bean aphid (27.14 insects observation^{-1}) which was followed by whitefly (7.29 insects observation^{-1}), bean thrips (5.14 insects observation^{-1}), pear-shaped weevil (4.86 insects observation^{-1}), kudzu bug (4.57 insects observation^{-1}), bean pod borer (1.71 insect observation^{-1}) and spotted bean beetle (1.71 insects observation^{-1}), jassid (1.57 insects observation^{-1}), bean armyworm (1.29 insects observation^{-1}) and leaf miner fly (1.14 insects observation^{-1}) while bean leaf folder (0.71 insects observation^{-1}) and white leafhopper (0.71 insects observation^{-1}) was least abundant in the field (Figure 4).

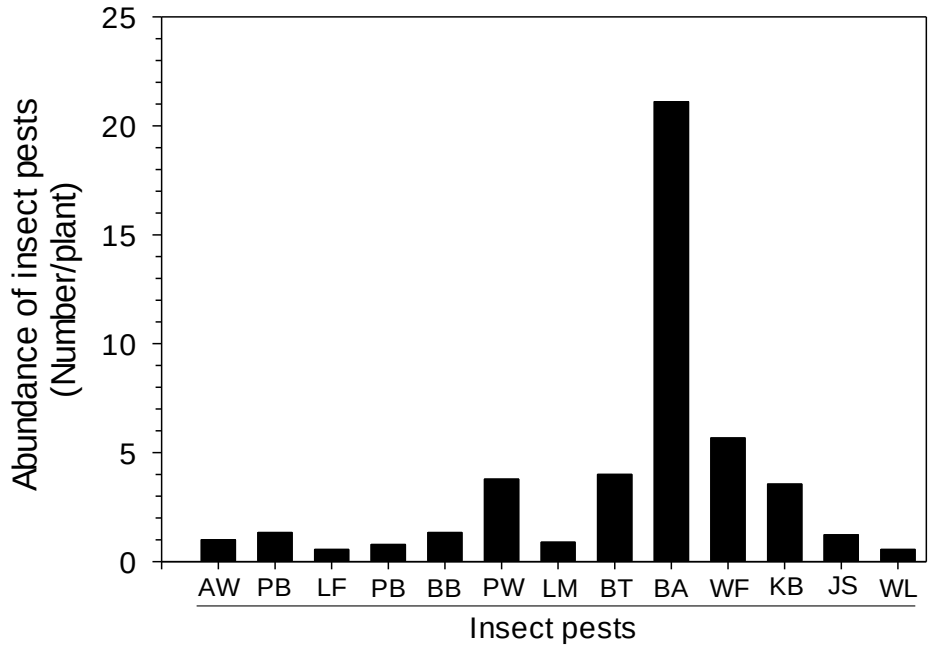

Figure 3. Abundance of insect pests in the bean plant based on number of insects plant^{-1}. The prevalent insects were bean armyworm (AW), bean pod borer (PB), bean leaf folder (LF), red pumpkin beetle (PB), spotted bean beetle (BB), pear-shaped weevil (PW), bean leaf miner fly (LM), bean thrips (BT), black bean aphid (BA), bean whitefly (WF), kudzu bug (KB), jassid (JS) and white leafhopper (WL).

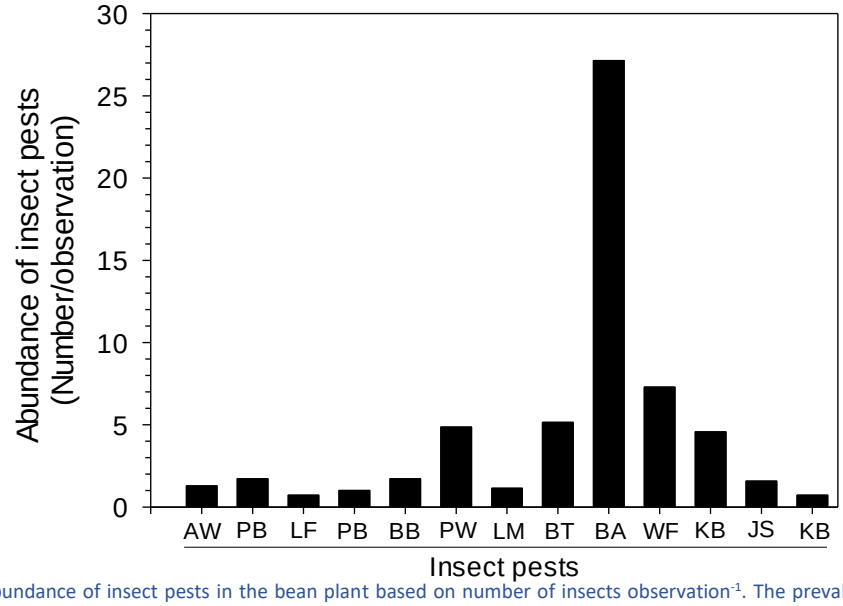

Figure 4. Abundance of insect pests in the bean plant based on number of insects observation^{-1}. The prevalent insects were bean armyworm (AW), bean pod borer (PB), bean leaf folder (LF), red pumpkin beetle (PB), spotted bean beetle (BB), pear-shaped weevil (PW), bean leaf miner fly (LM), bean thrips (BT), black bean aphid (BA), bean whitefly (WF), kudzu bug (KB), jassid (JS) and white leafhopper (WL).

Therefore, from seven (7) observations in nine (9) plants, black bean aphid (3.02 insects plant^{-1} observation^{-1}) was most abundant which was followed by whitefly (0.81 insects plant^{-1} observation^{-1}), bean thrips (0.57 insects plant^{-1} observation^{-1}), pear-shaped weevil (0.54 insects plant^{-1} observation^{-1}), kudzu bug (0.51 insects plant^{-1} observation^{-1}), bean pod borer (0.19 insects plant^{-1} observation^{-1}) and spotted bean beetle (0.19 insects plant^{-1} observation^{-1}), jassid (0.17 insects plant^{-1} observation^{-1}), bean armyworm (0.14 insects plant^{-1} observation^{-1}) and leaf miner fly (0.13 insects plant^{-1} observation^{-1}) while bean leaf folder (0.08 insects plant^{-1} observation^{-1}) and white leafhopper (0.08 insects plant^{-1} observation^{-1}) was least abundant in the field (Figure 5).

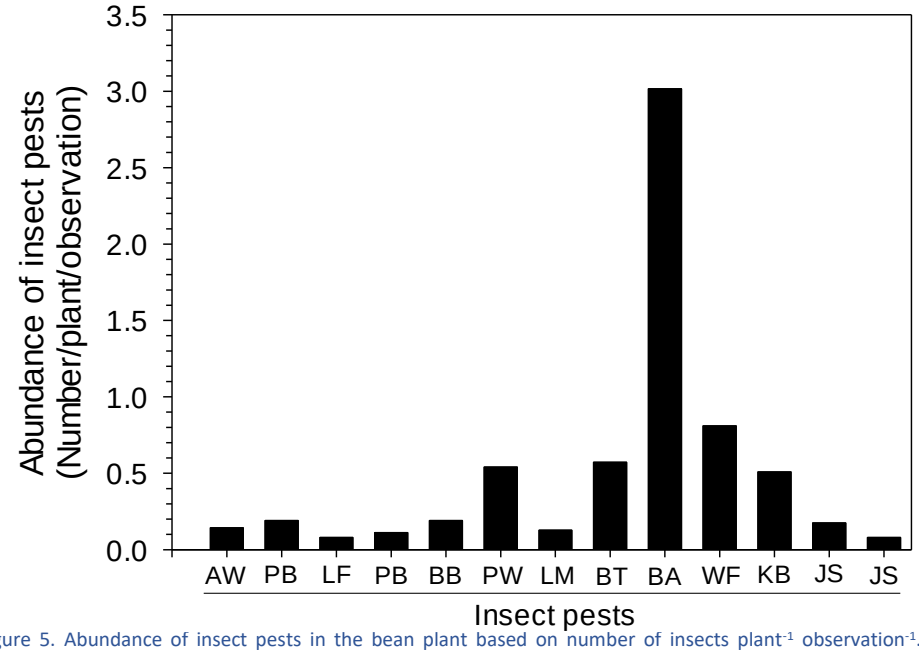

Figure 5. Abundance of insect pests in the bean plant based on number of insects plant^{-1} observation^{-1}. The prevalent insects were bean armyworm (AW), bean pod borer (PB), bean leaf folder (LF), red pumpkin beetle (PB), spotted bean beetle (BB), pear-shaped weevil (PW), bean leaf miner fly (LM), bean thrips (BT), black bean aphid (BA), bean whitefly (WF), kudzu bug (KB), jassid (JS) and white leafhopper (WL).

insect pests were present except bean pod borer. In the 4th day, bean armyworm, bean leaf folder, red pumpkin beetle, bean thrips and jassid were not recorded and in the 5th day, bean leaf folder, leaf miner fly and white leafhopper were not recorded (Figure 6). On the 6th and 7th days, all the insect pests were present in the field (Figure **6**).

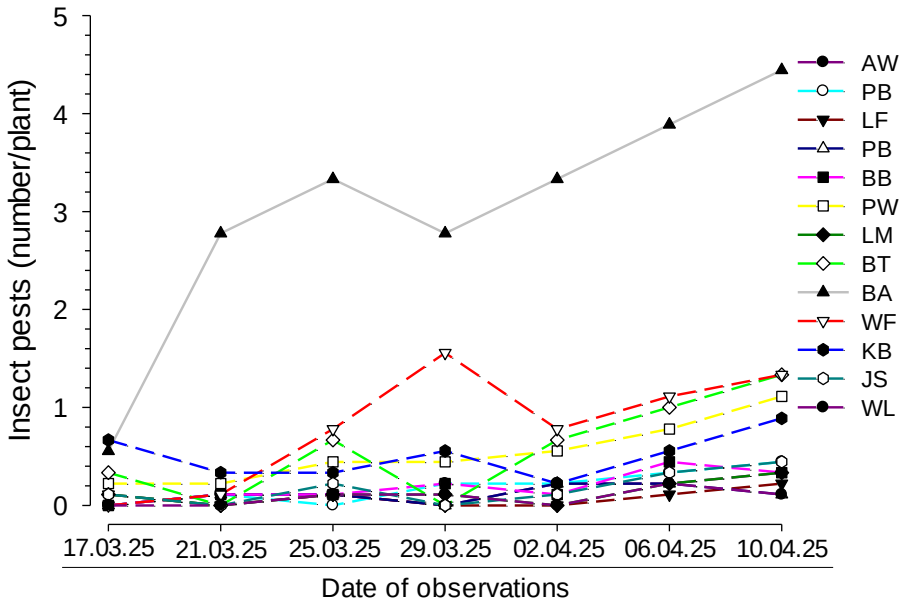

Figure 6. Distribution pattern of insect pests in the bean plant throughout the observation period. The insects were bean armyworm (AW), bean pod borer (PB), bean leaf folder (LF), red pumpkin beetle (PB), spotted bean beetle (BB), pear-shaped weevil (PW), bean leaf miner fly (LM), bean thrips (BT), black bean aphid (BA), bean whitefly (WF), kudzu bug (KB), jassid (JS) and white leafhopper (WL).

Relative abundance of insect pests

Variation in the relative abundance was observed among the insect pests. Black bean aphid was highly abundant (46.12%) which was followed by whitefly (12.38%), bean thrips (8.74%), pear-shaped weevil (8.25%), kudzu bug (7.77%), bean pod borer (2.91%) and spotted bean beetle (2.91%) (Figure 7). In contrast,

the least abundance was recorded for bean leaf folder (1.21%) and white leafhopper (1.21%) which was followed by red pumpkin beetle (1.70%), leaf miner fly (1.94%), bean armyworm (2.18%) and jassid (2.67%) (Figure 7). Therefore, the relative abundance can be shown as: Black bean aphid> whitefly > bean thrips > pear-shaped weevil > kudzu bug > bean pod borer > spotted bean beetle > jassid > bean armyworm > leaf miner fly > red pumpkin beetle > white leafhopper > bean leaf folder (Figure 7).

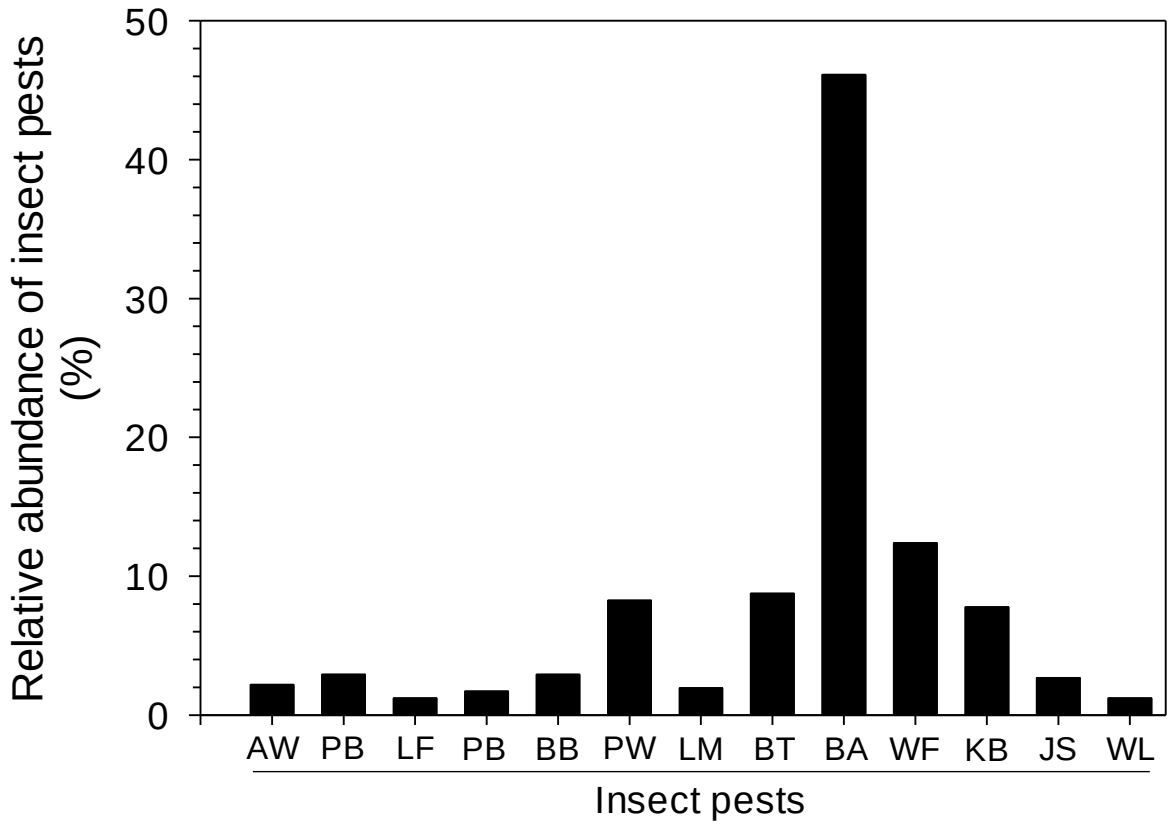

Figure 7. Relative abundance of insect pests in the bean plant during the observation period. The insects were bean armyworm (AW), bean pod borer (PB), bean leaf folder (LF), red pumpkin beetle (PB), spotted bean beetle (BB), pear-shaped weevil (PW), bean leaf miner fly (LM), bean thrips (BT), black bean aphid (BA), bean whitefly (WF), kudzu bug (KB), jassid (JS) and white leafhopper (WL).

Discussion

In the summer season, 13 insect pests namely black bean aphid, whitefly, bean thrips, kudzu bug, bean armyworm, bean pod borer, bean leaf folder, pear-shaped weevil, red pumpkin beetle, leaf miner fly, spotted leaf beetle, jassids and white leafhoppers were recorded in Barisal. All these insects were distributed into 10 different families of 5 orders. Another study by Mollah *et al.* (2017) recorded nine insect pests namely black bean aphid, bean bug, leaf eating caterpillar, green semi looper, hooded hopper, leaf beetle, pod borer, coreid bug and hairy caterpillar in the country bean field from Gazipur. These insects were distributed in 7 families under 3 order. Khan et al. (2018) recorded five insect pests namely aphid, shoot borer, pod borer, epilachna beetle and field cricket from Sylhet. These insects were distributed in 5 families under 4 orders. The above informations denote the clear differences in the prevalence of insect pests among the locations including Barisal, Sylhet as well as Gazipur and Barisal recorded maximum insect pests among the localities. This variation in prevalence of insect pests might came from cropping pattern and existing crops in the study area. Mala *et al.* (2020a) reported that intercropping increased the prevalence and diversity of pests and beneficial insects. Adoption of non-chemical pest control or integrated pest management also control the prevalence and abundance of insect pests. Another reason might be the diffrences in environmental conditions like temperature, relative humidity or moisture content in the air and rainfall. Khan *et al.* (2020) reported that aphid and pod borer are directly corelated with the temperature while epilachna betle and shoot borer are not dependent on temperature. Afroz *et al.* (2019) reported that prevalence and abundance of red pumpkin beetle had significant positive correlation with temperature, epilachna beetle had significant positive correlation with rainfall while fruitfly prevalence and abundance depends on

temeperature, relative humidity and rainfall. Being in the coastal area, relative humidity is more, air temperature was relatively less in Barisal and very few vegetables are grown in Barisal which impose less or no application of chemical insecticides. Moreover, in the study area biopesticides and IPM strategies were being used since 2022 which may also be a reason for prevalence of more insects. Thus, more humidity, relatively less temperature, less application of chemical insecticides and adoption of IPM strategy might be the reason of more insect pests in the bean plant in Barisal.

Authors contribution

Md. Mahi Imam Mollah: Conceive the idea, Methology, Project administration, Observation, Data collection, Data curation, Data analysis, Writing-Draft manuscript and edition. Soyema khatun: Observation, Data curation, Data analysis, Software, Resource, Writing-manuscript editiing.

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