



Biodiversity of Insect Pests in Wheat Ecosystem in Mid Hills of Meghalaya

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ABSTRACT

Studies on biodiversity of insect pests in wheat ecosystem in mid hills of Meghalaya was conducted in 2018-19 Rabi season at the experimental farm at College of Post Graduate Studies in Agricultural Sciences (CPGSAS), CAU (I), Umiam, Meghalaya. Wheat crop was raised in 9 different plots with three sowing dates. Field surveys, observations, collection, identification and preservation of insect species was done throughout the cropping season. A total number of 32 species of insects were identified as pests, out of which two were identified as major pests (*Rhopalosiphum padi* (Linnaeus) and *Sitobion avenae* (Fabricius)) of wheat based on their infestation and damage on the crop. The remaining 30 insect species were minor pests comprising of 5 orders, viz. Hemiptera, Diptera, Coleoptera, Orthoptera and Lepidoptera; and belonged to 16 families. The collected insect species were categorized into major and minor pests based on their incidence on the wheat crop.

1. Introduction

Wheat (*Triticum aestivum*, Linnaeus) is a main cereal crop among other food grains. Wheat belongs to family *Poaceae* (*Gramineae*). It is a staple among diets of about at least 2 billion people (36%) of the world's population. Wheat contains around 60-80% carbohydrates, 11-15% proteins and around 1.5-2% fats. In the world, it comes next to rice and maize in importance. Wheat ranks leads in area and production with a production of 749.5 million tonnes and yield of 3.4 t/ha from 220.1 million hectares worldwide (FAOSTAT, 2018). In India, wheat production is 93.5 mt and yield of 3.1 tonnes per hectare with a cultivated area of 30.2 million hectares (FAOSTAT, 2018). In Meghalaya, wheat crop occupies an average annual area of 398 Ha, production of 732 metric tonnes with a yield of 1.84 t/ha during 2012-13 (DoA, GoM, 2014). Wheat fields are attacked and infested by a variety of different insects. Majority of insects associated with wheat belong to the orders Hemiptera, Diptera, Coleoptera, Hymenoptera, Orthoptera, and Lepidoptera. Aphids, cereal leaf beetle, wheat stem sawfly, wheat midge and Hessian fly were major insect pests of wheat (Kamran *et al.*, 2013). Yield loss has been reported

to be around 60-70%, whereby in India, agriculture is suffering around 8.7 million rupees loss due to the attack of insect pests (Dhaliwal *et al.*, 2010). In India, wheat crop loss and damage is caused by aphids causing a direct yield loss (35-40%) or affect indirectly (20-80%) through transmission of fungal diseases and viral infections (Rossling *et al.*, 1994).

2. Materials and Methods

The experiment was conducted at the experimental farm at College of Post Graduate Studies in Agricultural Sciences (CPGSAS), CAU (I) Umiam, Meghalaya during Rabi season of 2018-19. Wheat crop, variety "RAJ 3765" was raised following recommended agronomic practices in 9 plots. Each plot size measured 1.6m x 1.6m with spacing of 5 cm plant to plant and 20 cm row to row of crop. Weekly observations and collection of insects was done from wheat variety RAJ 3765. Insect pests based on their damage and infestation were observed and collected. Collection was done through hand picking, insect sweep net and aspirators. Adult and immature stages of insects were collected and immature stages of the insects were reared for emergence of adult for easier and proper identification. Identification of collected

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insects were done based on established taxonomic keys and on available literature on biodiversity of insects in wheat crop and were examined thoroughly for identification at the entomological laboratory at CPGSAS, Umiam, Meghalaya. The insects collected were spread and pinned. Staging and pinning of small insects and their preservation was done in 70% ethanol. Cataloguing and documentation of the insects were done and images and photographs of the insects were also maintained.

3. Results

The data pertaining to the biodiversity of insect pests of wheat are viewed in Table 1. A Total of 32 insect species were recorded to be associated with wheat crop. These insect species belonged to 6 orders and 21 families. These insect species were categorized as either major pests or minor pests in reference to their infestation on the wheat crop (Figure 1).

Table 1. Biodiversity of insect Pests associated with wheat crop during *Rabi* season 2018-19 in Umiam, Meghalaya

Sl. No.	Common Name	Scientific Name	Family	Order	Status
1	Bird Cherry Oat Aphid	<i>Rhopalosiphum padi</i> (L.)	Aphididae	Hemiptera	Major pest
2	English Grain Aphid	<i>Sitobion avenae</i> (F.)	Aphididae	Hemiptera	Major pest
3	Plant Bug	<i>Cletus punctiger</i> (Dallas)	Coreidae	Hemiptera	Minor pest
4	Whit plant hopper	<i>Cofana spectra</i> (Distant)	Cicadellidae	Hemiptera	Minor pest
5	Green Leaf Hopper	<i>Nephotettix virescens</i> (Distant)	Cicadellidae	Hemiptera	Minor pest
6	Plant hopper	<i>Javesella pellucida</i> (F.)	Delphacidae	Hemiptera	Minor pest
7	False Chinch Bug	<i>Nysius raphanus</i> (Howard)	Lygaeidae	Hemiptera	Minor pest
8	Stink Bug	<i>Nezara viridula</i> (L.)	Pentatomidae	Hemiptera	Minor pest
9	Earhead Bug	<i>Menida versicolor</i> (Gmelin)	Pentatomidae	Hemiptera	Minor pest
10	Dump fly	<i>Hydrotaea diabolus</i> (Harris)	Muscidae	Diptera	Minor pest
11	Muscid fly	<i>Orchisia costata</i> (Meigen)	Muscidae	Diptera	Minor pest
12	Crane Fly	<i>Nephrotoma flavescens</i> (L.)	Tipulidae	Diptera	Minor pest
13	Crane Fly	<i>Tipula oleracea</i> (L.)	Tipulidae	Diptera	Minor pest
14	Midge	<i>Chironomus riparius</i> (Meigen)	Chironomidae	Diptera	Minor pest
15	Cereal Fly	<i>Opomyza florum</i> (Fabricius)	Opomyzidae	Diptera	Minor pest
16	March Fly	<i>Penthetria heteroptera</i> (Say)	Bibionidae	Diptera	Minor pest
17	Fungus Gnats	<i>Sciara sp.</i>	Sciaridae	Diptera	Minor pest
18	Fruit Flies	<i>Bactrocera dorsalis</i> (Hendel)	Tephritidae	Diptera	Minor pest
19	Leaf beetle	<i>Aulacophora hilaris</i> (Boisduval)	Chrysomelidae	Coleoptera	Minor pest
20	Flea beetle	<i>Hespera sericea</i> (Weise)	Chrysomelidae	Coleoptera	Minor pest
21	Flea beetle	<i>Oulema obscura</i> (Stephens)	Chrysomelidae	Coleoptera	Minor pest
22	Flea leaf beetle	<i>Psylliodes chrysocephala</i> (Linnaeus)	Chrysomelidae	Coleoptera	Minor pest
23	Flea beetle	<i>Monolepta signata</i> (Motsch)	Chrysomelidae	Coleoptera	Minor pest
24	Flea beetle	<i>Altica caerulescens</i> (Baly)	Chrysomelidae	Coleoptera	Minor pest
25	Ground Beetle	<i>Gonocephalum depressum</i> (Fabricius)	Carabidae	Coleoptera	Minor pest
26	Cerambycid beetle	<i>Purpuricenus temminckii</i> (Guérin-Méneville)	Cerambycidae	Coleoptera	Minor pest
27	Grasshopper	<i>Trilophidia cristella</i> (Stal)	Acrididae	Orthoptera	Minor pest
28	Grasshopper	<i>Atractomorpha crenulata</i> (Fabricius)	Pyrgomorphidae	Orthoptera	Minor pest
29	Grasshopper	<i>Stenocatantops splendens</i> (Thunberg)	Acrididae	Orthoptera	Minor pest
30	Katykid	<i>Euconocephalus pallidus</i> (Redtenbacher)	Tettigoniidae	Orthoptera	Minor pest
31	Tiger Moth	<i>Caeneressa sp.</i>	Arctiidae	Lepidoptera	Minor pest
32	Hairy Caterpillar	<i>Nyctemera adversata</i> (Schaller)	Arctiidae	Lepidoptera	Minor pest

Table 1 reveals that out of the 32 insect species infesting the wheat crop, only two species were recorded as the major pests and the remaining 30 insect species as minor pests. The major insect pests, viz. *Sitobion avenae* (Fabricius) (English grain aphid) and *Rhopalosiphum padi* (Linnaeus),

(bird cherry oat aphid) were the dominant species in terms of their incidence on the wheat crop and comprised of 6% of the insect biodiversity (Figure 1). Insect pests of the order Hemiptera had 7 insect species belonging to 5 families and comprised of 22% of the pest diversity. The insects were

plant bug, *Cletus* sp., white plant hopper, *Cofana spectra* (Distant), green leaf hopper, *Nephotettix virescens* (Distant), plant hopper, *Javesella pellucida* (Fabricius), false chinch bug, *Nysius raphanus* (Howard), stink bug, *Nezara viridula* (L.), and ear head bug, *Menida versicolor* (Gmelin). The investigation on the insect biodiversity on wheat crop also revealed that among the 30 minor pests, the order Diptera comprised of 9 species belonging to 7 families, comprising 28% of the pest diversity. The order comprised of the following insect species, viz. dump fly, *Hydrotaea diabolus* (Harris), Muscid fly, *Orchisia costata* (Meigen), Crane flies, *Nephrotoma flavescens* (L.) and *Tipula oleracea* (L.), Midge, *Chironomus riparius* (Meigen), Cereal fly, *Opomyza florum* (Fabricius), March fly, *Penthetria heteroptera* (Say), Fungus gnat, *Sciara* sp., and fruit fly *Bactrocera dorsalis* (Hendel). The pests belonging to Coleoptera comprised of 8 species in 3 families. These insects comprised of 25% of the pest diversity, with insect species, Leaf beetle, *Aulacophora hilaris* (Boisduval), Flea beetles, *Hespera sericea* (Weise), *Oulema obscura* (Stephens), *Psylliodes chrysocephala* (L.), *Monolepta signata* (Motsch) and *Altica caerulescens* (Baly), Ground beetle, *Gonocephalum depressum* (Fabricius) and Ceramid beetle, *Purpuricenus temminckii* (Guérin-Méneville). Orthoptera was comprised of 13% diversity with 4 numbers of insect species belonging to 3 families. These comprised of the insects, viz. Grasshoppers, *Trilophidia cristella* (Stal), *Atractomorpha crenulata* (Fabricius), and *Stenocatantops splendens* (Thunberg) and Katykid, *Euconocephalus pallidus* (Redtenbacher). Pests of the order Lepidoptera were comprised of 6% in 2 species and 1 family, viz. Tiger moth, *Caeneressa* sp. and hairy caterpillar, *Nyctemera adversata* (Schaller).

4. Discussion

The biodiversity of insect pests attacking on wheat crop comprised of 32 species belonging to 6 orders and 21 families. Similar studies were made by Singh *et al.* (2014), in their work, where they found out that wheat crop in India is infested by many insect pest species belonging to several different orders, viz. Hemiptera, Coleoptera, Isoptera, Lepidoptera, Thysanoptera and Orthoptera. Aslam *et al.* (2005) reported eleven species of aphids have been found associated with wheat but only four species viz. *Sitobion avenae* (F.), *S. miscanthi* (Takahashi), *Rhopalosiphum maidis* and *R. padi* (L.) are causing sizeable reduction in yield. Bhagat *et al.* (1990) observed that in Jammu and Kashmir, wheat aphid (*Sitobion avenae*) has attained a status of major pest in the region although previously it was not considered so. Riedell *et al.* (1999) also reported that *Rhopalosiphum padi* (Linnaeus) caused a considerable yield loss, where it attacked during the young

stages of the crop. Ranjith *et al.* (2015) reported that from Haryana, a total of thirteen (13) insect species were identified from wheat fields. Macharia *et al.* (2016) reported that insects prevalent in wheat fields in eastern Africa included 11 species of pests. Studebaker *et al.* (1990) observed that the major pests of wheat include armyworms, green bugs, bird cherry oat aphid, corn leaf aphid, Hessian fly and grasshoppers.

5. Conclusion

From the present investigation, it can be concluded that a total of 32 insect species were pests recorded to be associated with wheat crop, where two wheat aphid species, viz. *Rhopalosiphum padi* (Linnaeus) and *Sitobion avenae* (Fabricius), were recorded as major pests, based upon their infestation on wheat crop throughout the cropping season and remaining 30 insect species were categorized as minor pests belonging to 6 orders and 21 families.

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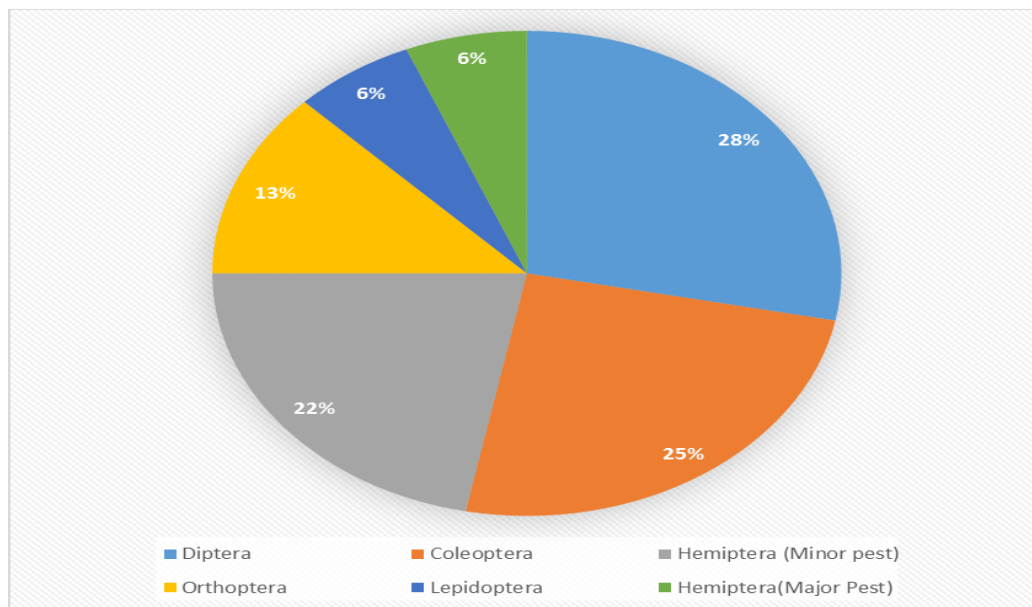


Figure 1. Distribution of insect pest biodiversity in wheat crop during *Rabi* season 2018-19