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Insect-pests complex associated with basmati rice in Western Uttar Pradesh

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Abstract

Present investigation was carried out at Crop Research Centre (CRC) of Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut during *Kharif* season, 2019 and 2020 to assess the insect-pests complex associated with basmati rice in Western Uttar Pradesh. Results revealed that in total eleven different insect species were found infesting the basmati cultivar PB-1509. Insect-pests includes borers *viz.* yellow stem borer (*Scirpophaga incertulas* Walker), sucking pests *viz.* brown plant hopper (*Nilaparvata lugens* Stal.), green leaf hopper (*Nephotettix virescens* Distant), white backed plant hopper (*Sogatella furcifera* Horvath) and earhead bug (*Leptocorisa acuta* Thunberg), defoliators *viz.* leaf folder (*Cnaphalocrocis medinalis* Guenee), rice Hispa (*Diadisa armigera* Olivier), kharif grasshopper (*Hieroglyphus banian* Fabricius), army worm (*Mythimna separata* Walker) and caseworm (*Nymphula depunctalis* Walker) and root feeders *viz.* termites (*Odontotermes obesus* Rambur) were found damaging the crop during both the seasons. Severity of pests varies due to the environmental and other factors.

Keywords: Insect-pests, basmati, PB-1509, borers, defoliators, root feeders

Introduction

Rice (*Oryza sativa* L.), known as king of cereals, is one of the most important cereal crops and is the staple food for 50% of the global population. Rice is grown under diverse growing conditions such as irrigated, rainfed lowland, rainfed upland and flood prone ecosystems. Basmati rice are a special group of rice cultivars having long grain size, good quality and aroma. India is considered as the largest exporter of Basmati Rice in the world. Basmati rice are grown mainly in Himalayan regions, Haryana, Punjab and Western regions of Uttar Pradesh.

The paddy plant is attacked by more than 100 species of insects; some of them are considered to be more notorious causing significant yield loss as compared to other minor pests. The major insect pests that attack the crop includes yellow stem borer, *Scirpophaga incertulas* (Walker), leaf folder, *Cnaphalocrocis medinalis* (Guenee), white backed plant hopper, *Sogatella furcifera* (Horvath), brown plant hopper, *Nilaparvata lugens* (Stal.), gundhi bug, *Leptocorisa acuta* (Thunberg) and others. In general, yield loss due to insect pests of rice has been estimated at about 25 per cent in different rice ecosystems (Sachan *et al.*, 2006; Dhaliwal *et al.*, 2010 and Saini *et al.*, 2015)^[6, 3, 7].

Several species of insects attack the rice at different stages although most of them are not truly noxious to the crop. For instance, some 500 species of insects and spiders may appear in a rice field in a particular season, of these only few are of potential threat. The rest are either beneficial in the form of a wide range of predators (such as coccinellids and spiders) and parasitoids (mostly parasitic wasps) that keeps the population of insect pests in check or some species living on weeds or on other organisms and some serves as a prey for beneficial insects. The present study was undertaken in order to assess the different species of insects attacking the basmati rice and also to check the level of threat they are posing to the crop.

Materials and Methods

Field experiment were carried out at Crop Research Centre (CRC) of Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut during *Kharif* season, 2019 and 2020. Insect pests associated with basmati rice cultivar PB-1509, an early maturing variety, were recorded right from transplanting of seedlings till the harvesting of the crop at weekly intervals. Observations were taken on randomly selected 5 hills from incidence plot. The insects were collected by adopting the methods of light trapping, netting, sweeping or hand picking depending upon the insect types.

Collected insects are reared up to adult stage whenever necessary. Adult insects were preserved dry or in 70% alcohol and identified. Most of them were observed to feed the rice plant at least some stages of its development whereas few seem to casual visitor. Most of the insects were identified at the specific level by using keys (Barrion and Litsinger, 1994)^[1], photographs available (Pathak and Khan, 1994)^[5], and by taking the help of the subject experts. The nature and extent of damage caused by various insect pests were recorded to assess the severity of pest.

Other insects of less economic importance as pest of rice plant could not be identified at specific level. Most of them belong to Lepidoptera, Diptera, Hemiptera and Hymenoptera. Few of them seem to be casual visitor in search of food or hosts (parasitic wasps). These insects may also serve as prey for spiders as few of them were collected from the spider-webs.

Result and Discussion

Field experiment were carried out at Crop Research Centre (CRC) of Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut during *Kharif* season, 2019 and 2020. The results obtained from the present investigation revealed that total of 11 insects were observed majorly during both the seasons as showed in table 1. Three insects were found severely attacking the crop *viz.* Yellow stem borer (*Scirpophaga incertulas*), leaf folder (*Cnaphalocrocis medinalis*) and brown plant hopper (*Nilaparvata lugens*). Three number of insects were found to be moderate *viz.* Green leaf hopper (*Nephotettix virescens*), earhead bug (*Leptocorisca acuta*) and termites (*Odontotermes obesus*) while five were

posing low damage to the crop *viz.* White backed plant hopper (*Sogatella furcifera*), rice hispa (*Diadisa armigera*), kharif grasshopper (*Hieroglyphus banian*), army worm (*Mythimna separata*) and caseworm (*Nymphula depunctalis*).

Borers

Yellow stem borer (*Scirpophaga incertulas*)

This insect was found to be the most notorious during the course of study. It was active throughout the crop period. The larva soon after emergence bore inside the stem and feeds internally causing death of the shoot during vegetative stage in turn results in “dead hearts”. In later stages i.e. during panicle emergence it causes “white earhead” which results in chaffy grains. Infested shoots were easily pulled by hand. The highest infestation by this pest was recorded during mid-august. These results are confirmed from the studies of Sachan *et al.* (2006)^[6], Singh and Singh (2014)^[8], Saini *et al.* (2015)^[7], Gangwar *et al.* (2015)^[4], Deshwal *et al.* (2019)^[2], Singh *et al.* (2020)^[9].

Sucking pests

Brown plant hopper (*Nilaparvata lugens*)

This pest was found to be severely affecting the growth and development of the crop. The pest was active from August to September. Both nymphs and adults feeds at the base of the tillers by sucking the cell sap resulting in yellowing of plants. Later the plant turns brownish in colour due to which it dries up. This condition is called as “hopper burn”. Highest population were recorded at the end of August.

Table 1: Insect-pests complex associated with basmati rice cultivar PB-1509 during *Kharif* 2019 and 2020

S. No.	Common Name	Scientific Name	Family	Order	Damaging stage	Plant parts affected	Activity period	Severity of pests
1.	Yellow stem borer	<i>Scirpophaga incertulas</i>	Pyralidae	Lepidoptera	Caterpillar	Stem and panicles	July- October	Severe
2.	Leaf folder	<i>Cnaphalocrocis medinalis</i>	Pyralidae	Lepidoptera	Caterpillar	Leaves	July- September	Severe
3.	Brown plant hopper	<i>Nilaparvata lugens</i>	Delphacidae	Hemiptera	Nymphs and adults	Stem and leaves	August- September	Severe
4.	Green leaf hopper	<i>Nephotettix virescens</i>	Cicadellidae	Hemiptera	Nymphs and adults	Stem and leaves	August- September	Moderate
5.	White backed plant hopper	<i>Sogatella furcifera</i>	Delphacidae	Hemiptera	Nymphs and adults	Stem and leaves	August- September	Low
6.	Earhead bug	<i>Leptocorisca acuta</i>	Alydidae	Hemiptera	Nymphs and adults	Panicles	August- September	Moderate
7.	Rice hispa	<i>Diadisa armigera</i>	Chrysomelidae	Coleoptera	Grubs and adults	Leaves	July- September	Low
8.	Kharif grasshopper	<i>Hieroglyphus banian</i>	Acrididae	Orthoptera	Nymphs and adults	Leaves and panicles	July- October	Low
9.	Armyworm	<i>Mythimna separata</i>	Noctuidae	Lepidoptera	Caterpillar	Leaves	August- September	Low
10.	Termites	<i>Odontotermes obesus</i>	Termitidae	Blattodea	Nymphs and adults	Roots	July- September	Moderate
11.	Caseworm	<i>Nymphula depunctalis</i>	Pyralidae	Lepidoptera	Caterpillar	Leaves	August- September	Low

Green leaf hopper (*Nephotettix virescens*)

It is evident from the table 1, that this pest was not too severe as compared to BPH. This pest was active during the month of August-September. Both nymphs and adults of this insect sucked the sap from the leaves and other tender parts of plant which turns them yellow. In this region it is considered to be a minor pest.

White backed plant hopper (*Sogatella furcifera*)

During the study, this pest was found to be low in numbers and didn't cause any economic loss to the crop. The pest was active from August to September. Both nymphs and adults suck the sap of the leaves which results in yellowing of the leaves. This eventually results in stunted growth and reduced vigour.

The damage caused by the brown plant hopper, green leaf hopper and white backed plant hopper were also reported by Sachan *et al.* (2006)^[6], Singh and Singh (2014)^[8], Saini *et al.*

(2015)^[7], Gangwar *et al.* (2015)^[4], Deshwal *et al.* (2019)^[2], Singh *et al.* (2020)^[9].

Earhead bug (*Leptocorisca acuta*)

This pest caused some significant damage to the crop and was active just after the panicle emergence i.e. end of August. Both nymphs and adults suck the sap from developing grains during milky stage thus making them chaffy. Whole panicle becomes white in colour (chaffy) under severe infestation. The occurrence of this pest had been reported by Sachan *et al.* (2006)^[6], Singh and Singh (2014)^[8], Saini *et al.* (2015)^[7], Gangwar *et al.* (2015)^[4], Deshwal *et al.* (2019)^[2].

Defoliators

Leaf folder (*Cnaphalocrocis medinalis*)

It is evident from the given table that this pest causes severe damage to the crop. This pest was active throughout the crop season. Larvae folds the growing paddy leaves longitudinally

and fed by scraping the chlorophyll content of leaves which results in longitudinal white lines. In severe damage the field exhibit scorched appearance. The highest infestation was recorded during end of August month. This study is in accordance with the findings of Sachan *et al.* (2006)^[6], Singh and Singh (2014)^[8], Saini *et al.* (2015)^[7], Gangwar *et al.* (2015)^[4], Deshwal *et al.* (2019)^[2], Singh *et al.* (2020)^[9], who also reported this pest.

Rice Hispa (*Dicladispa armigera*)

Observations on rice hispa revealed that due to low population, the pest was not able to cause any significant loss to the crop during both the seasons. The pest was active from the month of July to September. Damage is caused by both the grubs and adults. Grubs feed by tunnelling lower and upper epidermis resulting in regular translucent white patches like leaf-miners. This pest was also recorded in studies done by Singh and Singh (2014)^[8], Gangwar *et al.* (2015)^[4].

Kharif grasshopper (*Hieroglyphus banian Rambur*)

The population of grasshopper was low during both the seasons because of which it does not cause major economic losses. The pest remains active throughout the crop season. Both nymphs and adults feeds irregularly on leaves, leaving only midrib. It also results in the formation of chaffy grains. This pest has earlier been reported by Sachan *et al.* (2006)^[6], Singh and Singh (2014)^[8], Saini *et al.* (2015)^[7], Gangwar *et al.* (2015)^[4], Deshwal *et al.* (2019)^[2], Singh *et al.* (2020)^[9].

Army worm (*Mythimna separata*)

It is noticeable in the table 1, that this pest was found low in number and in turn causes less infestation. The pest was active during the month of August and September. Early instar larvae feed on dried leaves and later move on to green leaves for feeding. Older larvae are gregarious and voracious feeder at night, they cut off rice panicles from the peduncle, causing the most serious losses to the rice crop. This pest was also recorded and documented by Singh and Singh (2014)^[8].

Caseworm (*Nymphula depunctalis*)

Observation on incidence of caseworm population revealed that the infestation by this pest was very low as compared to other pests. This pest was active during the month of August and September. Larvae feed on leaves and leaves become dry and papery. Young larvae cut the leaf blade into small bits and construct tubular cases and remains inside the case. Leaf cases hanging from rice leaf and tubular cases can be seen floating in water. The result is similar to the findings of Singh and Singh (2014)^[8], who also reported this pest.

Root feeders

Termites (*Odontotermes obesus*)

This is evident from the table 1 that moderate population of this pest was present in the field and was clearly causing some damage to the crop. They were observed feeding on the roots and germinating seeds. This pest was active throughout the crop period. This pest have been reported by Singh and Singh (2014)^[8], Saini *et al.* (2015)^[7], Deshwal *et al.* (2019)^[2].

Conclusion

The crop was found infested by eleven number of pests that attacked at different growth stages. Among eleven insect-pests three were found severely attacking the crop *viz.* Yellow stem borer (*Scirpophaga incertulas*), leaf folder

(*Cnaphalocrocis medinalis*) and brown plant hopper (*Nilaparvata lugens*). Three number of insects were found to be moderate *viz.* Green leaf hopper (*Nephotettix virescens*), earhead bug (*Leptocorisca acuta*) and termites (*Odontotermes obesus*) while five were posing low damage to the crop *viz.* White backed plant hopper (*Sogatella furcifera*), rice hispa (*Dicladispa armigera*), kharif grasshopper (*Hieroglyphus banian*), army worm (*Mythimna separata*) and caseworm (*Nymphula depunctalis*). Out of these pests, yellow stem borer, leaf folder and brown plant hopper causes significant damage to the crop while others were found to be minor pests.

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