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SURVEY AND SURVEILLANCE OF MAJOR INSECT-PESTS OF BASMATI RICE IN WESTERN UTTAR PRADESH (INDIA)

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ABSTRACT

A survey was conceded on the insect-pests incidence in Basmati rice ecosystem in western Uttar Pradesh of India. In Western U. P. mainly Pusa Basmati-1121, Pusa Basmati-1, Pusa Basmati-6, Pusa Basmati-1509 and Vallabh-22 Basmati varieties are cultivated in which about 60 % area is covered by PB-1121. The crop is infested by many insect-pests which play a significant role in limiting Basmati rice production. Insect-pests infest all parts of the plant at all growth stages, and a few transmit viral diseases such as leafhoppers and plant hoppers. In Basmati rice ecosystem some defender *viz.* dragon fly, spiders and praying mentis also were noticed. In Western Uttar Pradesh some other insect-pests as gundhi bug, rice hispa, brown plant hopper, grasshopper etc. were also found at Rice field. During the survey it was observed that the leaf folder and stem borer were found to be at significance level. A large number of insecticides have been tried for insect-pests management; indiscriminate use of pesticides has led to severe ecological consequences, residues in consumable products and ultimately resistance to the pesticides. The increasing concern for environmental safety and global demands for pesticide residue free food evoked keen interest in pest control through eco-friendly methods.

KEYWORDS: Basmati rice, Survey, Insect-Pests, Residue and Pesticides

INTRODUCTION

Rice is the staple diet for more than two billion people in Asia and for a few hundreds of millions in Africa and Latin America **(IRRl, 1985; Pillalyar, 1988).** Rice is grown wide areas in Western Uttar Pradesh and Uttarakhand. The crop is highly sensitive and a potential host for several insect pests **(Prasad *et. al.*, 2005).** Two major factors are responsible for low yields in Basmati rice crops i.e. adverse weather (floods, drought, temperature and wind velocity etc.) and pest epidemics. Insect-pests attack the rice crop from the time of nursery bed is prepared until harvest. Rice field is managed ecosystems in which a large diversity of floral, faunal, and microbial species provides a wide range of services for human well-being **(MEA 2005).** However, a few species become pests; they are responsible for crop losses exceeding acceptable thresholds. When they occur in high densities, then can affect production and threaten food security. After the introduction of high yielding varieties of rice, distinct changes have been occurred in insect-pests complex in rice

ecosystem in western Uttar Pradesh, in these areas which once were considered as minor pests, now are considered as major pests and causes significant losses. For example leaf folder, brown leaf hopper and green leaf hopper. The stem borer was considered as the most destructive pests of rice, however in recent years, damage from then has decline. The insect-pests not only direct losses for the rice crop but it occurs indirectly as vector of some diseases such as green plant hopper transmit viral disease. Yet, in several rice growing areas some new pests are recorded *viz.*, sugarcane leafhopper *Pyrilla perpusilla* Walker this pest was recently recorded to have attacked the crop in these areas.

The average loss caused by insect-pests was estimated at about 18% of the expected rice crop yield per year **(Alam, 1983).** A study carried out by Rockfeller foundation **(Herdt, 1991)** reveals that seven out of 20 major challenges in rice production are insect-pests. Over 100 of species of insect-pests found in rice crops but only few are potential threat, so only the most common and specific insect pests of rice are discussed here. At National level, stem borers accounted for 30% of the losses while plant hoppers (20%), gall midge (15%), leaf folder (10%) and other pests (25%). The rest are either beneficial in the form of a wide range of predators (such as bugs and spiders) and parasitoids (mostly parasitic wasps). In Western Uttar Pradesh, no systematic survey was carried out in recent past. Therefore, the present study was undertaken in the Basmati rice growing area during crop season 2013 to get the information about the incidence of rice crop pests, their nature of damage economic importance that their proper management tactics be evolved.

METHODOLOGY

For the survey about monitoring on insect-pests in Basmati rice ecosystem were selected different Basmati rice growing areas of Western (U. P). The information regarding pest succession, pesticides application in rice ecosystem and farmer's practices for insect-pests management mentioned during survey. Insect-pests different areas were present at variable level but some areas were not followed of same situation. Randomly data were taken regarding pests succession, pesticides application from each location. Finally, maximum pest succession, and pesticides application were accepted for each location.

Surveys and collections were carried out at weekly interval from rice fields. Samples were collected and estimated by sweeping, aspirators, picking up insects by hand, pitfall traps, sticky traps set up in the study site from rice fields of all life stages of insects. For immature stage it is then necessary to rear them to the adult stage to obtain a precise identification. The collected specimens were brought to the laboratory for specimen preservation, mounting. Most of the pestiferous insects were identified at the specific level by using keys **(Barrion and Litsinger, 1994),** photographs available **(Pathak and Khan, 1994),** and by taking the help of the subject experts. The insects of less economic importance was not identifies as 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).

RESULTS

During the survey of Basmati growing areas of Western U. P. following insect-pests were observed in Basmati rice field.

Table 1: Insect-Pests Found During the Survey

S. No.	Common Name	Scientific Name	Order: Family
1	Yellow stem borer	*Scirpophaga incertulas*	Lepidoptera : Pyraustidae
2	Striped rice stem borer	*Chilo suppressalis*	Lepidoptera: Pyralidae
3	Leaf folder	*Cnaphalocrosis medinalis*	Lepidoptera: Crambidae
4	Brown plant hopper	*Nilaparvata lugens*	Hemiptera: Delphacidae
5	White-backed plant hopper	*Sogatekka furcifera*	Hemiptera: Delphacidae
6	Rice gundhi bug	*Leptocorisa oratorius*	Hemiptera:Coreidae
7	Rice hispa	*Dicladispa armigera*	Coleoptera: Chrysomelidae
8	Rice grasshopper	*Hieroglyphus banian Fb.*	Orthoptera: Acrididae
9	Rice root weevil	*Echinocnemus oryzae*	Coleoptera :Curculionidae
10	Rice caseworm	*Nymphula depunctalis*	Lepidoptera :Pyralidae

- **Yellow Stem Borer**

Yellow stem borer is monophagus pest of rice, the stem borers, generally considered the most serious pests of Basmati rice and infest plants from seedling stage to maturity **(Salim and Masih, 1987)**. The annual damage causes this 5-10 % of the rice crop with occasional localized outbreaks of up to 60 %. Female lays their eggs near the tip of leaf blade and they are covered with buff colored hairs, tiny pale yellow larvae hatch out from the eggs, enter in leaf sheath, and feed then bore into the stem near the node. Usually only one larva is found inside the stem. The adults do not feed on Basmati plants. Dead heart is produced when the insect attacks at vegetative stage while white ear/head occurs when the stem borers attack at the time of ear development. The plants can compensate for a low percentage of early dead hearts, but for every 1% of whiteheads, 1-3% loss in yield may be expected.

- **Rice Strip Borer**

The striped stem borer is one of the most important rice pests in Asia. Larvae borer into the plant stems and feed on plant nutrients causing, in many cases, severe crop loss **(Beevor *et al.* 1990).** In a transplanted crop, strip stem borer larvae cut off the growing points of tillers causing them to die. When the plants are attacked later, during the flowering stage, larvae feed on the meristem and empty, whitish-looking panicles called white heads appear. In the infested fields these white heads stand erect and contain empty and unfilled glumes.

- **Leaf Folder**

Leaf folder has inflicted severe losses on rice crop. It has one of the major rice insect. In normal years, the pest causes 15-25% yield losses in basmati rice fields. The moths are nocturnal; they hide during the day and usually emerge at night. The freshly hatched larva has a shiny translucent body and a light-brown head but the body of larvae turns green after the feeding. The larvae of leaf folder, folds leaves and remains inside and shield against the environment, scraping the green tissues between the veins making the leaves white and papery and can give scorched appearance on drying up. It eats the green parts of the leaf until only the skeletal white parts are left. Feeding greatly reduces the general vigor and photosynthetic ability of an infested rice plant. If larvae feeds on flag leaf then it cause maximum damage of rice yield Moreover; the infected plants are predisposed to bacterial and fungal infection **(Bashir *et al.* 2004a).**

- **Brown Plant Hopper**

The brown plant hopper is serious pests of rice. Populations reduce rice yields but when insects congregate in large numbers, causing hopper burn in circular patches and enough to cause complete drying of the crop. High temperature

and high humidity responsible for abundance of leafhoppers attribution and their population fluctuates according to the availability of host plants, presence of natural enemies, and environmental conditions. Plant hoppers damage plants by sucking the sap and by plugging xylem and phloem with their feeding sheaths and pieces of tissue pushed into these vessels during exploratory feeding due to this plants become yellow and die. *Nilaparvata lugens* transmits grassy stunt and ragged stunt viral diseases. Under favorable climatic conditions, such as high N application, high humidity (90%), optimum temperature (27-28 °C), and little air movement, the population of BPH increases rapidly and causing hopper burn in rice field.

- **White Backed**

White backed plant hopper, is also one of the important pests of rice. It cause 7-10% paddy yield losses every year but in the years of severe devastations, the pest may destroy the crop completely by causing hopper burns. The pest inflicts more damage on coarse rice varieties than on basmati rice

Rice Gundhi Bug

The adult insect is long and slender. Newly hatch nymphs are tiny and green, but become brownish as they grow. Both nymphs and adults of gundhy bug are difficult to recognize in the rice fields because they camouflage easily on plants due to their green or brownish color resembles that of rice plants. Infested fields can be detected, from a distance, because they emit a typical rice bug odor produced by scent glands on the abdomen of the insect. Adults are active in early morning and evening time. The bugs are most abundant at 27-28 °C and 80-82% RH.

Rice HISPA

The rice is one of the major pests of rice **(Palaszek *et al.*, 2002; Hazarika *et al.* 2005).** Linear patches along the veins. The yellowish grubs mine into the leaves presenting blister spots. It causes considerable damage to vegetative stages of rice resulting in yield loss of 28% **(Nath & Dutta 1997).**

- **Rice Grass Hoper**

Damage is caused by both adults and nymphs. They are polyphagous pest. The greatest amount of damage is caused during august- September when both adults and nymphs feed on Basmati and causing defoliation. The leaves are completely eaten by nymphs and adults, leaving the midrib and stalk. In the ear head stage, the adults attack the ears, nibble at the tender florets or gnaw into the base of the stalks, leading to the formation of **'white ears'.** In recent years this pest has generally been kept well under its economic injury level in India, hence no more recent loss estimates are available. *H. banian* has been shown to be involved in the mechanical transmission of *Xanthomonas oryzae* pv. o*ryzae*, although it does not survive within the insect.

- **Rice Root Weevil**

Rice root weevil has recently become one of the most destructive rice pests in lowland areas where water lodging condition occurs. Adults feed on leaves of newly transplanted rice, but seldom cause economic damage, grubs feeding on the roots and rootlets of young rice plants, resulting in stunting and non formation of tillers. The leaves turn yellow and develop a rusty appearance, and the plants eventually die. Presence of dead plants in large patches is a typical symptom.

- **Rice Caseworm**

The rice caseworm is an important insect pest of rice **(Pathak & Khan, 1994).** The damaging stage is the larvae that live in sections of leaves cut from young rice plants and rolled into tubes called cases **(Fei *et al.* 1995**) found that climatic factors like relative humidity, total rainy days and temperature were responsible for population build-up of caseworm. The peak incidence of the insect also varied depending on the climatic factors.

CONCLUSIONS

During the survey, it was observed that the arthropods in the Basmati rice ecosystem including predator and visitor insects are not albeit harmful and noxious to Basmati rice varieties some are beneficial and some predated over insect-pests population. The observation on predator's population is necessary because predators could keep the insect-pests populations under check where the framers avoided indiscriminate use of pesticides. Although, pesticides still remains the first line of defense against many rice insect-pests. Presently IPM practices adopted by many of farmers because continuous uses of pesticides have caused many side effects including loss of biodiversity, residual toxicity, the resurgence of insect-pests and environmental pollution **(Heinrich and Mochida, 1984; Ganesh Kumar and Velusamy, 1996; Holland *et al.*, 2000; Amalin *et al*., 2001; Lu Zhong-Xian, 2007).** The presence of pesticide residues in Basmati rice is a concern for consumers because pesticides are known to have potential harmful effects to other non-targeted organisms than pests and diseases. Insect predators of rice pests occur in almost all the rice growing areas and play a significant role in reducing the pest population. Beetles, predatory grasshoppers, and crickets may consume 80-90% of the eggs of certain insect pests **(Ramzan *et. al.*, 2006).** The wolf spider ***Pardosa pseudoannulata*** **(Pathak, S. and Saha, N. N. 1999.)** is polyphaous predator in rice ecosystem in most of Asia. These natural enemies account for more than 69 % of insect mortalities **(Shepard *et. al.*, 1987).**

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