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## Species Diversity and abundance of Grasshopper fauna (Orthoptera) in rice ecosystem

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### ABSTRACT

Grasshoppers fauna were surveyed from Uttar Pradesh state of India during the consecutive years 2010 and 2011 from rice fields of both Rabi and Kharif season respectively. 26 species of grasshoppers representing 14 genera belonging to 2 families, 8 sub families and 12 tribes have been recorded. Maximum diversity shown by family Acrididae (85%) followed by pyrgomorphidae (15%). All the species of genera *Oxya*, *Hieroglyphus* and *Acrida* collected from field were found feeding on rice foliage. Severe damage shown in the later stage of the crop growth by these species and hence may be considered as major pest of rice.

**Key words:** Diversity, Ecosystem, Rice, Grasshopper, Rabi, Kharif.

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### INTRODUCTION

Rice is the seed of the monocot plants *Oryza sativa* (Asian rice). As a cereal grain, it is the most important staple food for a large part of the world's human population, especially in Asia and the West Indies. India is one of the world's largest producer of white rice, accounting for 20% of all world rice production. Rice is India's preeminent crop, and is the staple food of the people of the eastern and southern parts of the country. Paddy fields are a common sight throughout India, be they be northern gangetic plains or southern peninsular plateaus. Paddy is cultivated at least twice a year in most parts of India, the two seasons being known as Rabi and Kharif respectively. The former cultivation is dependent on irrigation, while the latter depends on Monsoon. The paddy cultivation plays a major role in socio-cultural life of rural India.

Uttar Pradesh is the fifth largest state of India, and can be divided into three regions by different geographical conditions: North- Himalayan region, Middle- Gangetic plains and South- Vindhyan hills and plateau. It shares Nepal and Tibet in northeast, Himachal Pradesh in northwest, Haryana, Rajasthan & Delhi in West, Madhya Pradesh in south and Bihar in southeast. The climate varies from moderately temperate in the Himalayan region to tropical monsoon in the central plains and southern upland regions. In the plains, the average temperatures vary from 54.5 to 63.5 F (12.5 to 17.5 C) in January to 81.5 to 90.5 F (27.5 to 32.5 C) in May and June. Rainfall in the state ranges from 40-80 inches in the east to 24-40 inches in the west. The western region of the state is more advanced in terms of agriculture. Majority of the population depends upon farming as its main occupation. Wheat, rice, sugar cane, pulses, oil seeds and potatoes are its main products.

Grasshoppers belong to the super family Acridoidea and Pyrgomorpoidea of the order Orthoptera and suborder Caelifera. Acridoidea shows maximum diversity and constitutes only one family i.e., Acrididae whereas

pyrgomorphae also has only one family i.e., Pyrgomorphidae, widely distributed in India. Grasshoppers are of great economic importance, because they constitute an important group of pests and pose a constant threat to cereal crops, pulses, vegetables, orchards, grassland and forest plantations all over the world. Grasshoppers cause significant damage to tree seedlings and agricultural crops (Joshi *et al.*, 1999), hence considered as oligophagous and according to host preferences classified as graminivorous, forbivorous and ambivorous or mixed feeders (Mulkern 1967). Grasshopper can damage rice in all stage of crop growth. Both nymphs and adults can feed on leaves by cutting the edges of leaves. When found in greater number can feed even midribs and total leaves and cause extensive defoliations.

However, no detailed work on the diversity of grasshopper in the paddy field of Uttar Pradesh has been done to date. Keeping in view this fact here an attempt has been made to study the diversity and distribution of grasshoppers in the area with a view to replace the pest incidence and increasing the rice productivity.

### MATERIALS AND METHODS

Grasshoppers were collected from rice fields of Uttar Pradesh in the year 2010 and 2011 through sweeping net in the morning and evening time. Collected insects by sweep netting were transferred in bottles for killing that contains cotton soaked with ethyl acetate covered with paper. Later on specimens were sorted out into different taxonomic groups. All the specimens were stretched, pinned, labelled and left for 72 h to prevent decomposition. Identification of the specimens has been done with the help of binocular stereoscopic microscope upto species level. Finally for confirmation morphological slides of the genetical organ (Supra anal plate, Sub genital plate, Epiphallus, Aedeagus, Ovipositor and Spermatheca) were prepared.

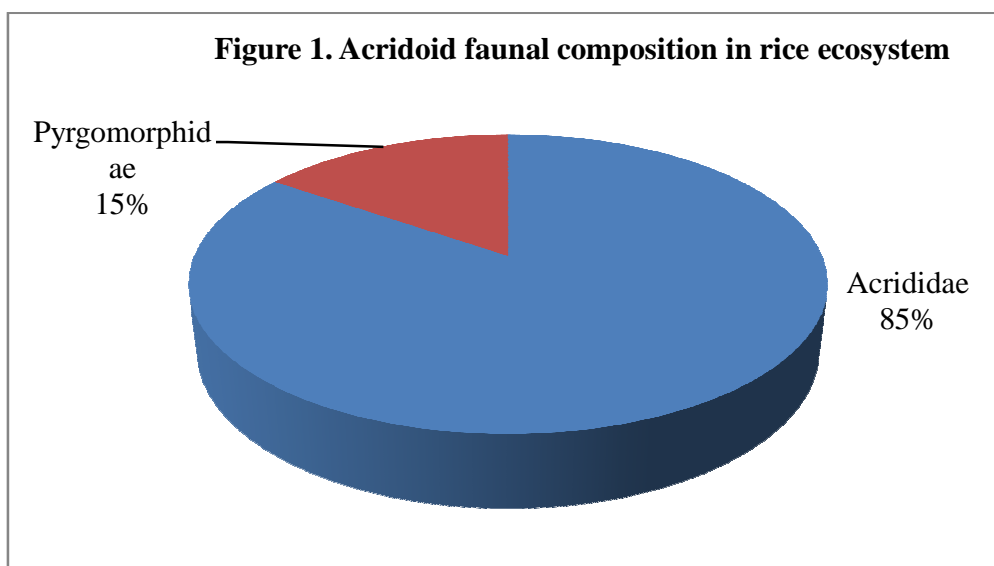
### RESULTS

26 species of grasshoppers representing 14 genera belonging to 2 families, 8 sub families and 12 tribes have been recorded (Table 1). This correlate with result of Chitra *et al.*, (2000) who reported 28 species of short horned grasshoppers from rice field of Coimbatore. Maximum diversity shown by family Acrididae (22 species-85 %) followed by pyrgomorphidae (4 species- 15 %) (Figure 1) whereas maximum species represented by subfamily Oedipodinae followed by Oxyinae, Pyrgomorphinae, Hemiacridinae, Acridinae, Catantopinae, Eypreocnemidinae and Spathosterninae (Figure 2). This is the first report from Uttar Pradesh as no notable work has been done on this aspect. Thirty three species of locusts and grasshoppers have been reported by Usmani *et al.*, (2010) from Western Uttar Pradesh. Jadho & Khurad (2011) described only one species of grasshoppers i.e., *Hieroglyphus banian* out of 23 species of insect pest of rice ecosystem from Maharashtra. Bhatia *et al.*, (1965) recorded *Hieroglyphus nigrorepletus* from the desert part of Rajasthan and Charan Singh (1972) from Kutch district of Gujarat. Das *et al.*, (2002) that confirmed *Hieroglyphus banian* is a major pest of paddy as *Oryza sativa* were found highly acceptable food in terms of preference and weight gain. Haldar, *et al.*, (1995) found, paddy is the most preferred food by *Acrida exaltata* hence may be considered as a pest of rice. Six species of grasshopper have been reported by Irshad *et al.*, (1956) in paddy field of Pakistan and among that *Hieroglyphus nigrorepletus*, *H. banian* and *H. oryzivorus* are the most serious pest causing loss upto 20 %. Suhail *et al.*, (1999), reported *Spathsternum prasiniferum*, *Hieroglyphus nigrorepletus*, and *H. banian* from rice field of Pakistan. *Ailopus thalassinus* from Pakistan (Januja, 1957), *Acrida exaltata* from Rajasthan (Khan, *et al.*, 1963) and *Eypreocnemis alacris* from India (Cotes, 1893) has been reported as pest of paddy.

**Table 1. Grasshopper species diversity in rice ecosystem of Uttar Pradesh**

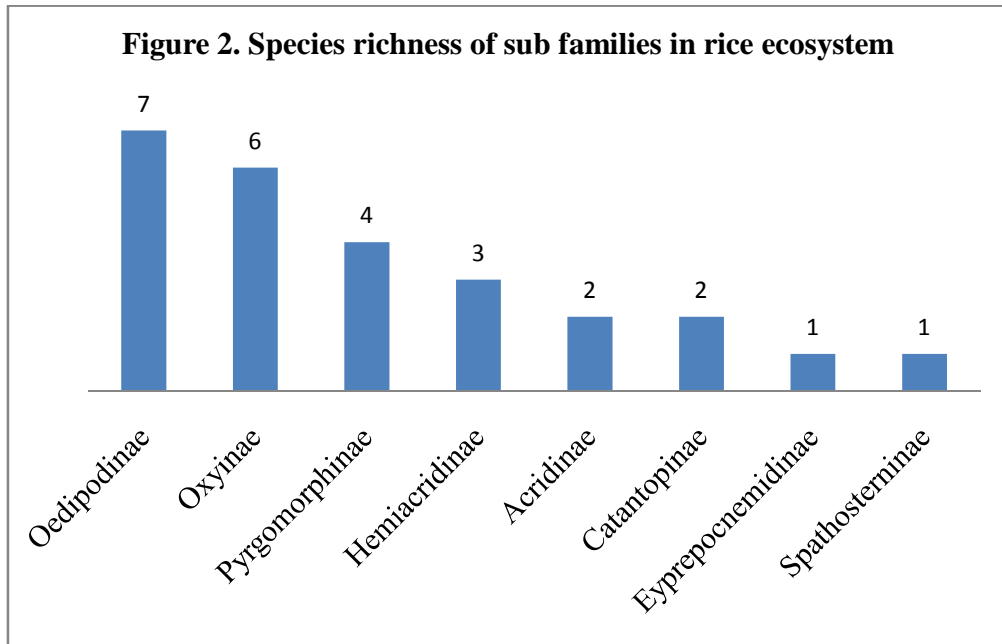
S. No.	Species	Family	Sub family	Tribe
1	<i>Acrida exaltata</i>	Acrididae	Acridinae	Acridini
2	<i>Acrida gigantea</i>	Acrididae	Acridinae	Acridini
3	<i>Trilophidia anuulata</i>	Acrididae	Oedipodinae	Trilophidiini
4	<i>Oedaleus abruptus</i>	Acrididae	Oedipodinae	Locustini
5	<i>Oedaleus seneglenis</i>	Acrididae	Oedipodinae	Locustini
6	<i>Ailopus simulatrix</i>	Acrididae	Oedipodinae	Epacromiini
7	<i>Ailopus thalassinus</i>	Acrididae	Oedipodinae	Epacromiini
8	<i>Heteropternis respondens</i>	Acrididae	Oedipodinae	Epacromiini
9	<i>Acrotylus humbertianus</i>	Acrididae	Oedipodinae	Acrotylini

10	<i>Spathosternum prasiniferum</i>	Acrididae	Spathosterninae	Spathosternini
11	<i>Hieroglyphus banian</i>	Acrididae	Hemiacridinae	Hieroglyphini
12	<i>Hieroglyphus nigrorepletus</i>	Acrididae	Hemiacridinae	Hieroglyphini
13	<i>Hieroglyphus oryzivorus</i>	Acrididae	Hemiacridinae	Hieroglyphini
14	<i>Eyrepocnemis alacris</i>	Acrididae	Eyrepocnemidinae	Eyrepocnemidini
15	<i>Oxya fuscovittata</i>	Acrididae	Oxyinae	Oxyini
16	<i>Oxya hyla hyla</i>	Acrididae	Oxyinae	Oxyini
17	<i>Oxya hyla intricata</i>	Acrididae	Oxyinae	Oxyini
18	<i>Oxya japonica japonica</i>	Acrididae	Oxyinae	Oxyini
19	<i>Oxya velox</i>	Acrididae	Oxyinae	Oxyini
20	<i>Gesonula punctifrons</i>	Acrididae	Oxyinae	Oxyini
21	<i>Catantops karnyi</i>	Acrididae	Catantopinae	Catantopini
22	<i>Catantops pinguis</i>	Acrididae	Catantopinae	Catantopini
23	<i>Chrotogonus trachypterus</i>	Pyrgomorphidae	Pyrgomorphinae	Chrotogonini
24	<i>Chrotogonus oxypterus</i>	Pyrgomorphidae	Pyrgomorphinae	Chrotogonini
25	<i>Atractomorpha psittacina</i>	Pyrgomorphidae	Pyrgomorphinae	Atractomorphini
26	<i>Atractomorpha crenulata</i>	Pyrgomorphidae	Pyrgomorphinae	Atractomorphini



### DISCUSSION AND CONCLUSION

Not all pests are prevalent in one locality at the same time, as the abundance of a pest and the extent of damage caused depends on the meteorological factors and cultural practices. Grasshoppers feed on foliage and sometimes panicles. Irregular feeding on seedlings and leaf blade, cutting of stem at panicle stage, completely defoliate the plants leaving only the mid ribs. Defoliation reduces the photosynthetic capacity of the rice plant and thereby decreases yields. However, when feeding damage occurs early in rice growth, plants have an ability to compensate for damage by producing new tillers. Thus, rice plants in the actively tillering stage of growth can tolerate a certain level of leaf damage without any yield loss. But the population of *Oxya fuscovittata*, *Oxya hyla hyla*, *Oxya hyla intricata*, *Oxya japonica japonica*, *Oxya velox*, *Hieroglyphus banian*, *H. nigrorepletus*, *H. oryzivorus*, *Acrida exaltata* and *Acrida gigantea* found feeding on rice foliage causing severe damage in later stage of the crop growth and hence decreases the total yield of rice so may be considered as major pest of rice. *Hieroglyphus nigrorepletus* occurs in desert area fed first on the grasses and later entered the paddy field and cause considerable damage, Sultana *et al.*, (2007). *Oedaleus senegalensis* preferentially attack on foliage of cultivated Pearl, millet and also attacked paddy foliage to a lesser extent. *Trilophodia annulata* found not damaging the rice upto certain extent and found preferably in pastures (Banu & Kushwaha, 1974). Population of rest of the species usually found highest near the margins of fields and not damaging the crop upto threshold level and hence may not be considered as major pest.



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