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Field observations on the incidence of Grasshopper fauna (Orthoptera) as a pest of Paddy and pulses

Mohammad Kamil Usmani, Md. Rashid Nayeem, and Md. Humayoon Akhtar

Department of Zoology, Aligarh Muslim University, Aligarh 202002,Uttar Pradesh, India

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ABSTRACT

The consecutive survey of two states of India i.e. Bihar and Jharkhand are based on paddy and pulses cultivars of the areas during 2009 and 2011. Bihar's economy is agrarian while in Jharkhand, agriculture is the mainstay of tribal population. During the survey it was observed that the paddy and pulses grown in the area were highly infested with grasshoppers. Samples collected were sorted out to yield 34 grasshopper species belonging to 25 genera, 2 families, 10 subfamilies and 19 tribes. Maximum number of grasshoppers collected belongs to subfamily Oedipodinae (9 species) followed by Oxyinae (4 species), Acridinae (4 species), Gomphocerinae (3 species), Catantopinae (3 species), Cyrtacanthacridinae (3 species), Pyrgomorphinae (3 species), Tropidopolinae (2 species), Hemiacridinae (2 species) with least number in case of Spathosterninae (1 species).

INTRODUCTION

Pulses are important source of protein for majority of the world populations. The high protein value of legumes makes them of great importance to the world already experiencing massive protein calorie malnutrition, with even greater food deficits on the horizon. India imparts 25 per cent of total global pulses production. Both adults and nymphs feed on flower buds and early pods of green plant posing the greatest threat resulting yield loss to pulse production. Rice is the staple food of at least half of the world's population and is grown in approximately 148 million ha of land globally. Nearly 90 per cent of this area falls in the Asian region. India accounts for 20% rice production of the world and the cultivation is very prominent in eastern and southern parts of the country. Both nymph and adult grasshoppers damage rice crop by feeding on leaves. When found in greater number can feed even on midribs and cause extensive defoliations.

Orthoptera is one of the largest order of insect having two suborder *i e.*, Cealifera (short horned grasshoppers and Ensifera (Long horned grasshoppers). Super family Acridoidea and Pyrgomorphoidea comes under suborder Caelifera and members of these superfamilies are commonly known as locusts and grasshoppers. Acridoidea consists of eleven families while Pyrgomorphoidea has only one family. Family Acrididae and Pyrgomorphidae exhibit wide distribution in India. Grasshoppers cause significant damage to tree seedlings and agricultural crops (Joshi *et al.*, 1999), hence considered as oligophagous and according to host preference classified as graminivorous, forbivorous and ambivorous or mixed feeders (Mulkern 1967).

MATERIALS AND METHODS

The author surveyed various agricultural areas of Bihar and Jharkhand during the period 2009-2011 for the collection of grasshoppers and locusts. Grasshoppers were collected through net sweeping, by forceps and hand picking method and killed by keeping in cyanide bottles. The specimens were first relaxed, stretched and later, they were pinned and labeled. Identification of the specimen upto species level has been done with the help of binocular stereozoom microscope. Collections of pinned specimens were kept in store boxes and cabinets for further studies on their morphological structures. For a detailed study of the various components of genitalia, slides were prepared and examined under the microscope in order to make a detailed study of the genitalic structures. Drawings were initially made with the help of a camera lucida. Details were filled in by conventional microscopic examination.

RESULTS AND DISCUSSION

34 species of grasshoppers recorded belonging to 25 genera, 2 families, 10 subfamilies and 19 tribes, from paddy and pulses cops of Bihar and Jharkhand (Table 1). 26% diversity of grasshoppers shown by subfamily Oedipodinae followed by Acridinae (12%), Oxyinae (11%), Gomphocerinae (9%), Catantopinae (9%), Cyrtacanthacridinae (6%), Pyrgomorphinae (6%), Tropidopolinae (6%), Hemiacridinae (6%) with least diversity (3%) in case of Spathosterninae, (Figure 1), whereas maximum four grasshoppers belongs to tribe Oxyinae followed by three in case of Locustini, Epacromiini, two in case of Atractomorphini, Catantopini, Hieroglyphini, Acridini, and one in case of Chrotogonini, Tropidopolini, Tristriini, Cyrtacanthacridini, Spathosternini, Arcypterini, Dociostaurini, Trilophidiini, Acrotylini, Oedipodini, Truxalini and Phlaeobini respectively (Figure 2). Maximum number of grasshoppers species (Twenty eight) explored from paddy field followed by eight species in pigeon pea, three species in Mung bean, Lentil, followed by two species in Chickpea and Urd bean respectively (Figure 3). This result is par with the result of Usmani *et al.,* (2012), who described fourteen species of grasshoppers from pulses of Uttar Pradesh but correlate with Akhtar *et al.,* (2012), result who reported twenty six species of grasshoppers from Uttar Pradesh, India. Fourty one species of grasshoppers have been recorded from Jharkhand by Nayeem and Usmani (2012) and thirty one species recorded by Nayeem and Usmani (2012) from Bihar.

Mandal *et al.,* (2009) studied twenty one insect pests on pigeon pea, whereas Mandal and Roy (2010), studied many insect of pests of chick pea of Bihar but they did not described any grasshoppers species. Srilaxmi & Paul (2010) studied pest of pigeon pea of Karnataka and Agrawal *et al.,* (2010) reported twenty insect pest of pulses from eastern and central Uttar Pradesh but also did not reported any acridoid fauna as a pest of pulses. Singh & Singh (1978), Reddy *et al.,* (1998) and Sekhar *et al.,* (1991) also studied pest of pigeon pea from different regions of India without describing any grasshoppers as a pest. Subharani & Singh (2004) have described pest of pulses without any grasshoppers in Manipur.

This result is in conformity of Chitra *et al*., (2000) who explored twenty eight species of grasshoppers from paddy of Coimbatore. *Hieroglyphus banian* has been reported as a pest of paddy from Maharashtra by Jadho and Khurad (2011) and this species also reported by Das *et al*., (2002) from paddy field of Gujarat. Bhatia *et al*., (1965) recorded *Hieroglyphus nigrorepletus* from the desert part of Rajasthan and Singh, Charan. (1972) from Kutch district of Gujarat. *Acrida exaltata* confirmed as pest of Indian rice by Haldar, *et al*., (1995) and also confirmed by (Khan, *et al.,* 1963) from Rajasthan.

Table 1. Grasshoppers species recorded from *Paddy* and pulse crops of Bihar and Jharkhand.

S. No.	Grasshopper species	Sub family	Tribe	Host plant	Distribution
		Family Acrididae			
1.	*Acrida exaltata* (Walker, 1859)	Acridinae	Acridini	*Paddy, Lentil*	Bihar, Jharkhand
2.	*Acrida gigantea* (Herbst, 1794)	Acridinae	Acridini	*Paddy*	Bihar, Jharkhand
3.	*Phlaeoba infumata (*Brunner, 1893)	Acridinae	Phlaeobini	*Paddy*	Bihar, Jharkhand
4.	*Truxalis viridifasciata* (Krauss, 1902)	Acridinae	Truxalini	*Paddy*	Bihar
5.	*Oedipoda miniata miniata* (Pallas, 1771)	Oedipodinae	Oedipodini	*Pigeonpea, Paddy*	Bihar, Jharkhand
6.	*Aiolopus simulatrix simulatrix* (Walker, 1870)	Oedipodinae	Epacromiini	*Paddy, Lentil, Chickpea*	Bihar, Jharkhand
7.	*Aiolopus thalassinus thalassinus* (Fabricius, 1781)	Oedipodinae	Epacromiini	*Paddy, Lentil*	Bihar, Jharkhand
8.	*Aiolopus thalassinus tamulus* (Fabricius, 1798)	Oedipodinae	Epacromiini	*Paddy*	Bihar, Jharkhand
9.	*Acrotylus insubricus* (Scopoli, 1786)	Oedipodinae	Acrotylini	*Paddy*	Bihar, Jharkhand
10.	*Oedaleus senegalensis* (Krauss, 1877)	Oedipodinae	Locustini	*Paddy*	Bihar, Jharkhand
11.	*Oedaleus abruptus* (Thunberg, 1815)	Oedipodinae	Locustini	*Paddy*	Bihar, Jharkhand
12.	*Locusta migratoria migratoria* (Linnaeus, 1758)	Oedipodinae	Locustini	*Pigeonpea, Paddy*	Bihar, Jharkhand
13.	*Trilophidia annulata* (Thunberg, 1815)	Oedipodinae	Trilophidiini	*Paddy*	Bihar, Jharkhand
14.	*Stenohippus mundus* (Walker, F., 1871)	Gomphocerinae	--	*Paddy*	Jharkhand
15.	*Dociostaurus apicalis* (Walker, 1871)	Gomphocerinae	Dociostaurini	*Paddy*	Bihar, Jharkhand
16.	*Aulacobothrus luteips* (Walker, 1871)	Gomphocerinae	Arcypterini	*Paddy*	Jharkhand
17.	*Oxya japonica japonica* (Thunberg, 1815)	Oxyinae	Oxyini	*Paddy*	Bihar, Jharkhand
18.	*Oxya hyla hyla* (Serville, 1831)	Oxyinae	Oxyini	*Paddy*	Bihar, Jharkhand
19.	*Oxya fuscovittata* (Marschall, 1836)	Oxyinae	Oxyini	*Paddy*	Bihar, Jharkhand
20.	*Oxya velox* (Fabricius, 1787)	Oxyinae	Oxyini	*Paddy*	Bihar, Jharkhand
21.	*Hieroglyphus banian* (Fabricius, 1798)	Hemiacridinae	Hieroglyphini	*Paddy*	Bihar, Jharkhand
22.	*Hieroglyphus nigrorepletus* (Bolivar, I., 1912)	Hemiacridinae	Hieroglyphini	*Paddy*	Bihar, Jharkhand
23.	*Spathosternum prasiniferum prasiniferum* (Walker, 1871)	Spathosterninae	Spathosternini	*Paddy, Mungbean,Urdbean Chickpea*	Bihar, Jharkhand
24.	*Diabolocatantops innotabilis* (Walker, 1870)	Catantopinae	Catantopini	*Pigeonpea, Mungbean*	Bihar, Jharkhand
25.	*Xenocatantops karnyi* (Kirby, 1910)	Catantopinae	Catantopini	*Pigeonpea*	Bihar, Jharkhand
26.	*Acorypha glaucopsis* (Walker, 1870)	Calliptaminae	--	*Paddy*	Bihar, Jharkhand
27.	*Schistocerca gregaria gregaria* (Forskal, 1775)	Cyrtacanthacridinae	Cyrtacanthacridini	*Pigeonpea*	Bihar, Jharkhand
28.	*Chondacris rosea* (De Geer, 1773)	Cyrtacanthacridinae	--	*Pigeonpea*	Bihar
29.	*Cyrtacanthacris tatarica tatarica* (Linnaeus, 1758)	Cyrtacanthacridinae	--	*Pigeonpea*	Bihar, Jharkhand
30.	*Tristria pulvinata* (Uvarov, 1921)	Tropidopolinae	Tristriini	*Paddy*	Bihar, Jharkhand
31.	*Tropidopola longicornis* (Fieber, 1853)	Tropidopolinae	Tropidopolini	*Paddy*	Bihar, Jharkhand
		Family Pyrgomorphidae			
32.	*Chrotogonus trachypterus* (Blanchard, 1836)	Pyrgomorphinae	Chrotogonini	*Paddy, Pigeonpea*	Bihar, Jharkhand
33.	*Atractomorpha psittacina psittacina* (Haan, 1842)	Pyrgomorphinae	Atractomorphini	*Mungbean, Urdbean*	Bihar, Jharkhand
34.	*Atractomorpha burri* (Bolivar, 1905)	Pyrgomorphinae	Atractomorphini	*Paddy*	Bihar, Jharkhand

Figure 1. Species richness of grasshoppers in paddy and pulses with reference to subfamily in Bihar and Jharkhand

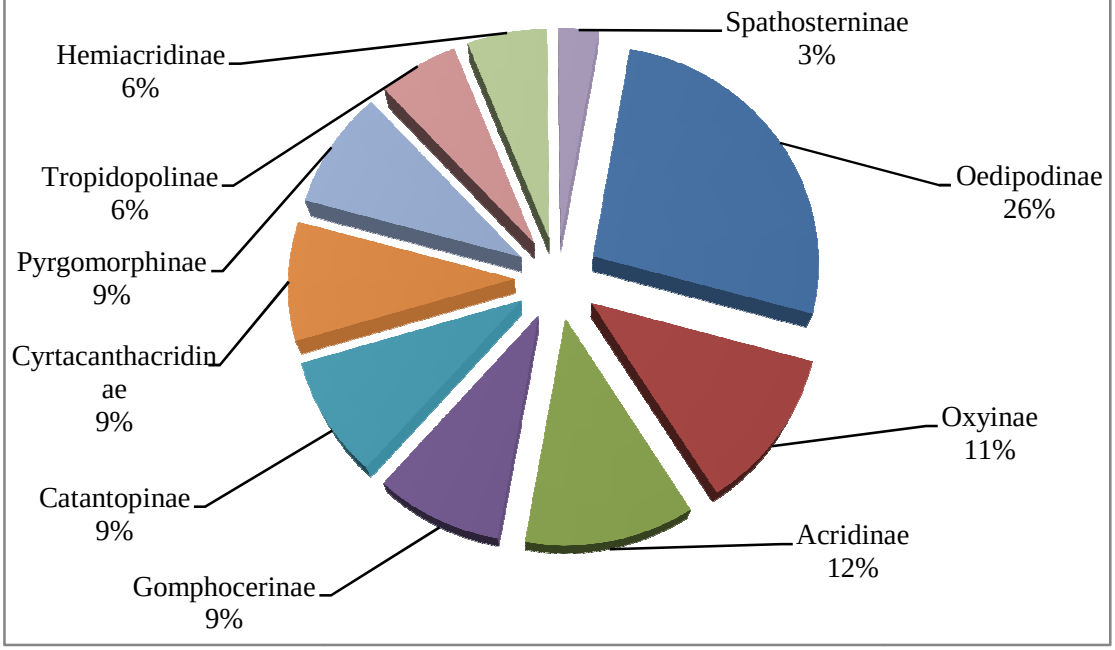


Figure 2. Grasshoppers richness with reference to tribe in paddy and pulses of Bihar and Jharkhand

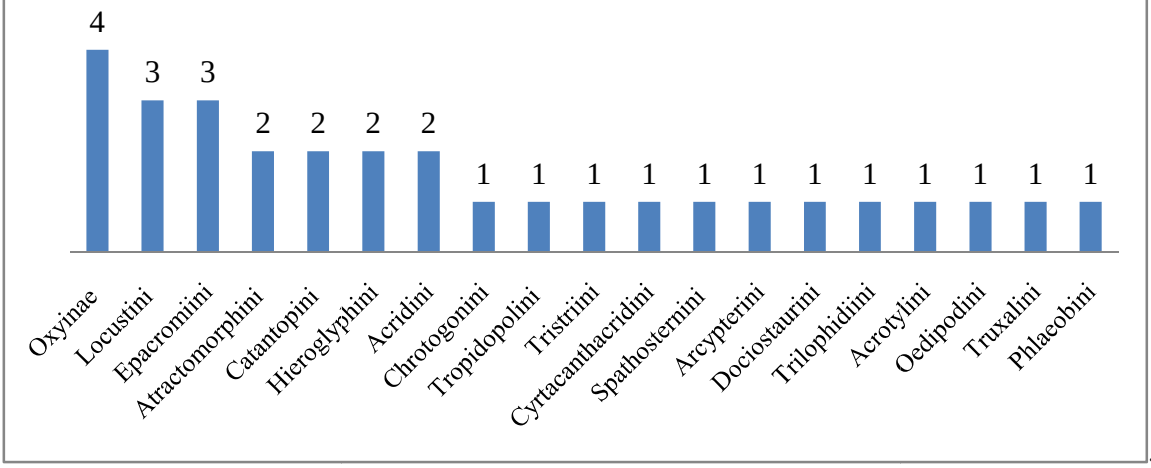


Figure 3. Grasshoppers species recorded from pulses and paddy fields of Bihar and jharkhand

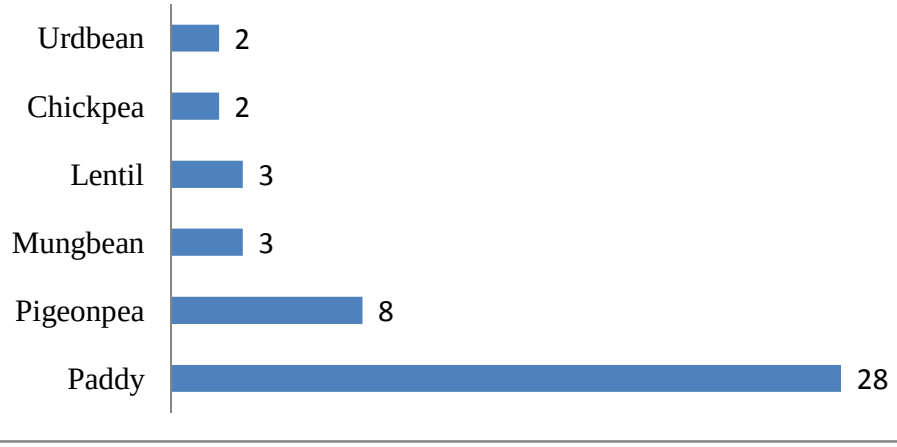
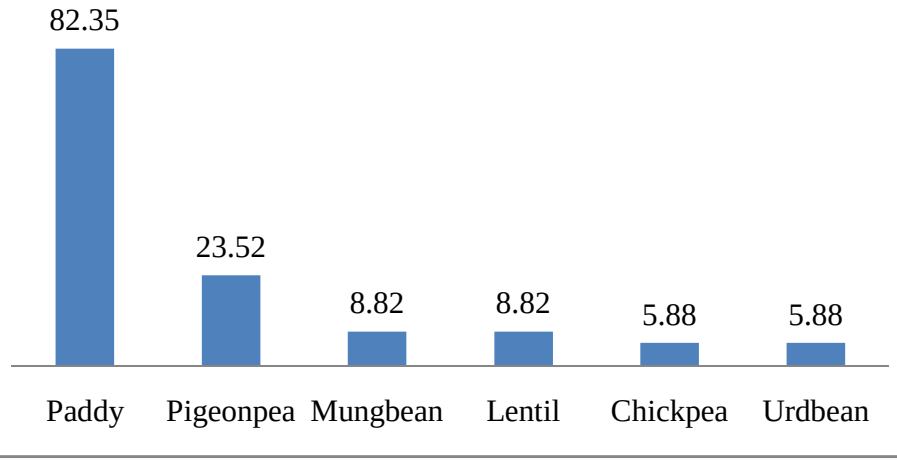


Figure 4. Percentage of species, paddy Vs pulses in Bihar and Jharkhand



CONCLUSION

82.35% species recoded from paddy followed by pigeon pea (23.52%), mung bean and lentil (8.82%), urd bean and chickpea (5.88%) respectively (Figure 4). Due to chewing type of mouthparts grasshoppers that tear away plant tissue commonly thought of as feeds on foliage, flowers, fruits, and stems also. This result clearly shows that the paddy fields are heavily infested by grasshoppers than pulses in Bihar and Jharkhand. Since there is heavy infestation shown in paddy and pulses fields of Bihar and Jharkhand hence may be considered as major pest. So, there arises a need to check these pests through conventional methods in order to increase the productivity of paddy and pulses of both states of India.

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