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Morphometric variations in *Hieroglyphus oryzivorus* (Hemiacridinae: Acrididae: Orthoptera)

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Abstract

The present investigation is carried out to know the difference in two forms of *H. oryzivorus* which is the most dangerous pest of the paddy in Sindh. The study is carried during the month of the June 2016 to November 2017. Total of 1709 specimens were collected from Buxapur and Badani a major rice growing areas of Kashmore district. We have collected surprising amount of material both macropterous and brachypterous forms of *H. oryzivorus* from two importance varieties of rice i-e IRRI and Hybrid which are more preferable by this pest. The total body length was in the case of the Macropterous was calculated 32.66 ± 4.5 mm in the male while in the female it was 48.43 ± 3.59 mm, in the Brachypterous form it was 26.7 ± 0.25 mm in the male while in female it was 39.8 ± 4.90 mm. The major difference in the case of the tegmina in the both forms were also noted it was 22.1 ± 5.21 mm in the male while it was 25.33 ± 2.94 mm in the Macropterous form, the measurement in Brachypterous was 8.83 ± 0.28 mm in male while 16.95 ± 4.21 mm in the female respectively. The Multiple cultivation of Dhaga provides the ideal breeding place for enhancement of this pest population. Fair numbers of this species have been collected from this locality.

Keywords: buxapur, badani, macropterous, brachypterous, *Hieroglyphus oryzivorus*, rice, pest

1. Introduction

The Kashmore district is populated by 6, 62,462 peoples. It is bordered by Ghotki, Shikarpur and Jacobabad of Sindh province, while it is connected to Punjab by Rajanpur and Rahemyar Khan. The boundary of the Baluchistan is started with Sui and Derabugti. Due to its unique geography it is very big trade center of rice in Pakistan and Kandhkot rice mandi is largest rice mandi across the country. The rice yield in this area attacked by numbers of pest species but *H. oryzivorus* attack is more sever and common on this crop. However, it is also injurious to maize, millet, sorghum and sugarcane all over the country through severe defoliation rice it is most preferred among all [1]. Outbreak of this grasshopper has been recorded in Gujarat Rajasthan and Himachal Pradesh [2]. Recently, taxonomy and ecology of this group has been studied from Uttar Pradesh, Jharkhand and Bihar respectively [3, 4]. In Pakistan it is abundant in Khairpur Nathan Shah, District Dadu and Jacobabad Sindh and Baluchistan (Plains) and also previously been recorded from East Pakistan [5, 6]. Although, it is primarily pest of paddy but also attack on maize, jowar, sugarcane, bajra and banana in many countries [1]. The young hopper first feed on grass on buds of paddy fields. When the attack is very severing the leaves may be entirely eaten up or reduced midribs of stalks and when fields completely dry up and former bear million rupees losses [6]. As they are deadly damaging insect and causes the reasonable loss to the various crops so after knowing the exact occurring timing of this species in field we will be able to make plane control measures on appropriate timing in future.

2. Materials and methods

Sampling

Sampling was made from the June 2016 to October 2016. At random basis from various localities of Kashmore, particular Badani and Buxapur and the river Indus bank are more concentrated due to its diversified habitat. Mostly sampling was made from rice, wheat, grasses, vegetables, bushes and grasslands. Beside this, frequent survey was made at all possible habitat. The collected material was brought to laboratory for further analysis.

Killing and preservation

The collected specimens was killed by means of potassium cyanide in standard entomological bottles or by chloroform after pinning the specimen they stretched on the stretching

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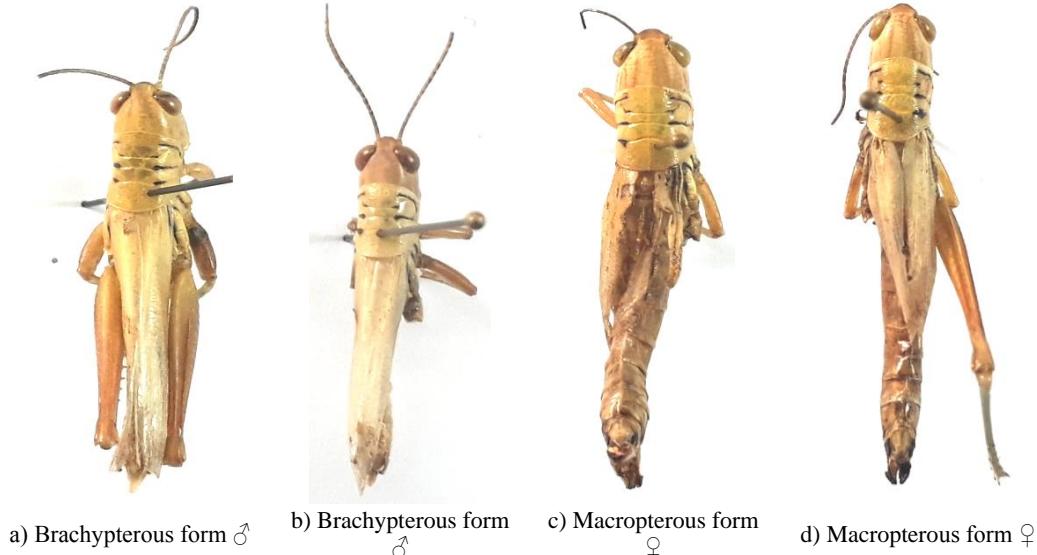
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board and the attention is paid to the position of antenna wings and legs in order to display important taxonomic characters. The fully dry specimen was removed from stretching boards and was stored in the insect boxes with the labels showing locality, date and collector's name.

Identification

The taxonomic material was properly mounted, labeled and important taxonomic characters were noted and photograph of the macropterous and brachypterous forms were taken out.



During present study the different major rice producing areas were visited especially Buxapur and Badani. It was noticed that the both macropterous and brachypterous forms of the *H. oryzivorus* were present. Both species look like the different species at the first sight but when the collected material was brought into the laboratory it was revealed that they were the two different forms of the same species. It was also noted that the antennae length was greater in the macropterous form compare to the brachypterous form i.e 6.66 ± 0.57 mm and 10.39 ± 0.76 mm respectively in male. Morphometric differences are presented in the Table 1 and 2. Earlier,^[7] reported the similar findings from the Khairpur Nathan Shah District Dadu. The major difference was found in the wing pads the one was identified as the macropterous form which contain the functional wings while the reduced winged were identified as the brachypterous form. In the present investigation it was noticed that the macropterous form of this pest is reported. Our study based on the large number of specimens having both macropterous and brachypterous confirmed the findings of^[6, 7] and^[8]. But collection of

Identification of the samples was done by the following scheme^[8, 9] with slight modification was followed.

3. Result and Discussion

Key to differentiation of *H. oryzivorus* forms

1.	Total body length in ♂ 26.7 ± 2.5 mm, tegmina 8.83 ± 0.28 mm	Brachypterous form
-	Total body length in ♂ 32.66 ± 4.5 mm, tegmina 22.1 ± 5.21 mm	Macropterous form

macropterous forms in such large numbers could be warning on production of future swarm in future. It was noted that they pose constant threat to pastures of crops in both irrigated and rain-fed areas. The *H. oryzivorus* Carl (1916) is polyphagous insect feed on all type of plants specially rice are more favorable and deadly damaging by this. Due to that economy of district is suffering and farmers are getting financial loss. In order to save the economy it is necessary to conduct a research on the seasonal distribution of an important rice pest *H. oryzivorus* form rice ecosystem surrounding by maize, wheat and other vegetation. Climatic condition of this region made it trouble-free for breeding of different insects groups there are few references on this species yet no work is done in comparison of both forms on molecular level it should be investigated in future. The species occur in both forms but the reduced wing do not have ability to produce the swarm but the functional wings are indication of the flight and has tendency to produce the swarm that why this investigation is designed to known the morphological differences of the species, it might be help out to plan control in future.

Table 1: Measurement of different body parts of *H. oryzivorus* (Brachypterous form)

Parameter (mm)	Male (n=30)(mm)		Female (n=30)(mm)	
	(Mean±S.D)	(Range)	(Mean±S.D)	(Range)
Antennal segment	27.66 ± 0.37	27.0-28.0	28.0 ± 0.00	28.00
Antennal length	6.66 ± 0.57	6.0-7.0	10.09 ± 0.8	7.3-10.8
Length of head	2.1 ± 0.11	2.1-2.3	5.18 ± 0.61	4.2-6.3
Dis: between two eyes	1.0 ± 0.005	1.04-1.05	1.89 ± 0.28	1.4-2.1
Length of pronotum	3.5 ± 0.60	2.81-3.86	6.84 ± 1.2	4.9-8.4
Length of tegmina	8.83 ± 0.28	8.5-9.0	16.95 ± 4.21	12.0-23.0
Length of femur	14.9 ± 0.40	14.5-15.3	20.7 ± 2.2	17.0-24.0
Total body length	26.7 ± 0.25	26.5-27	39.8 ± 4.90	30.0-49.0

Table 2: Measurement of different body parts *H. oryzivorus* (Macropterous form)

Parameter (mm)	Male (n=30)(mm)		Female (n=30)(mm)	
	(Mean±S.D)	(Range)	(Mean±S.D)	(Range)
Antennal segment	27.53±0.48	27.0-28.0	28.56±0.48	28.0-29.0
Antennal length	10.39±0.76	8.0-11.2	10.84±0.57	9.8-11.5
Length of head	3.52±0.24	3.15-3.85	6.02±0.28	5.6-6.65
Dis: between two eyes	1.34±0.22	1.05-1.75	2.48±0.3	2.1-2.8
Length of pronotum	5.33±0.6	3.85-6.3	7.40±0.8	5.9-8.4
Length of tegmina	22.1±5.21	14.0-28.0	25.33±2.94	20.0-29.0
Length of femur	15.73±1.12	14.0-17.0	23.13±1.85	20.0-25.0
Total body length	32.66±4.5	23.0-39.0	48.43±3.59	42.0-56.0

4. Conclusion

Very surprising amount of material both forms of *H. oryzivorus* i.e macropterous and brachypterous) of *H. oryzivorus* was collected from two importance varieties of rice i-e IRRI and Hybrid which are more preferable by this pest. The female is larger than the male due to the dimorphic nature it could be easily reconigized in field but detail study is needed to know the other differences.

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