



Studies On the Varietal Preference and Diurnal Activity of *Oxya Hyla Hyla* (Serville) (Orthoptera: Acrididae) On Rice Agro-Ecosystem

KEYWORDS

Varietal preference, Diurnal activity, *Oxya hyla hyla*, Rice, Agro-ecosystem.

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ABSTRACT

Varietal preference and Diurnal activity of *Oxya hyla hyla* was studied in Dargakona of Cachar District in Assam. Investigations were made on twelve varieties of rice in three seasons (Aus, Sali and Boro) during 2010-2011. Among them Luit (58.96%), Aizong (63.79%) and Guchiboroa (68.87%) were observed to be the most Susceptible varieties during all the three seasons. The diurnal activity study indicated that the maximum activity by the grasshopper species was observed at 10- 11 hrs. during Aus season in 1st year and 11- 12 hrs. in 2nd year. In Sali season peak activity was noticed at 15- 16 hrs. in 1st year and in 2nd year it was recorded at 9- 10 hrs whereas in Boro season during 1st year the maximum activity was observed from 10- 11 hrs and 16- 17 hrs. during 2nd year. The overall maximum activity was recorded at 9- 12 hrs. during all the seasons in both the years. 't' test indicated negatively significant difference during Aus vs Sali ($t' = -3.5, p < 0.05$) at 15-16 hrs. in 2010 and Aus vs Boro ($t' = -2.99, p < 0.05$) at 16-17 hrs. during 2011.

Introduction

Oryza sativa Linn. is an important crop grown in large hectares (426 lakh hectares) in India. Many herbivore insects have been reported to feed on this plant, including several species of grasshoppers (Suresh Chand & Muraliranjana, 1999). Grasshoppers are one of the largest and most diverse groups of insects (Paulraj, Anbalagan & Ignacimuthu, 2009). These are polyphagous in nature and have a wide distribution, feeds on a wide variety of grasses and forb species. They are classified as grass- feeders (graminivorous), forb- feeders (forbivorous), or a mix of the two (ambivorous) (Isley, 1944). Although often viewed as polyphagous herbivores, most grasshoppers are selective to some degree, exhibiting definite plant preferences (Mulkern, 1967). Host plant shifting may occur in grasshoppers when their main host is absent and may indicate the removal of a particular plant species due to environmental degradation or urbanization (Paulraj et al., 2009). Grasshoppers damage to crops, characterized by irregular defoliation adjacent to roadsides, may begin during the seedling stage (mid- day) and continue until harvest. Yield losses from grasshoppers depend on many factors including grasshopper density, growth stage, their size, weather conditions and plant vigor (Begna & Fielding, 2003). It is very difficult to study their preferences for different food plants by observing their feeding behaviour. Among grasshoppers, the small rice grasshoppers (*Oxya hyla hyla*) (Serville) are one of the most important paddy pest (Das & Ray, 2012). It is distributed throughout the north- east region of India (Marngar & Kharbuli, 2001). As it is the serious insect pest of rice, the present investigation was undertaken to assess the rice varieties preferred by this insect as well as the diurnal activity performed by the species in Cachar District under Barak Valley of Assam, north- east India.

Materials and Methods

Various rice cultivars were grown in earthen pots (7 cm. diameter) enclosed in mosquito proof fine mesh (0.2mm) wire net cage (1.5 m X 1.5 m) with three replications each. Study was conducted during three seasons, viz- Aus, Sali and Boro. Adult grasshoppers were collected from field and starved for 8 hrs for conditioning. Twelve rice varieties were assessed during each season. Ten (10) adults were released in each replica. Five leaves of each variety were provided for feeding. Area of each leaf was calculated before and after feeding for 24 hrs. Percent damage of leaves were calculated and transformed to 0-9 Scale of standard evaluation system for rice (Anonymous, 1980).

Diurnal activity was conducted in cultivars' field in Dargakona of Cachar District, Assam during three crops seasons for two years (2010- 2011) on Krishna, Eri and Narayan varieties, respectively. The period of the study was confined to 6-18 hrs. during Aus and Boro seasons and at 6-17 hrs. in Sali season at an interval of one hour. Three replications were followed in 0.5 ha. area of crop land during the three crop seasons. Quadrat method (1m x 1m) (Ghosh, 1985) was used to observe the insect sample. Five quadrats were considered for each replication.

Results and Discussion

The Varietal preference study revealed that during Aus season, among twelve rice varieties screened, Luit was proved to be the most preferred variety which is a local variety. Here the damage was found to be 58.96% followed by Agnisali (55.98%). The least preferred variety was Ranjit where it registered only 32.01% damage. As regards the damage score, Luit, Agnisali and Murali were recorded as susceptible varieties as per the damage score (Anonymous, 1980). The second group of varieties was Mohanbhog, Kalabansful, Shailboroa, Sonamukhi, Terawali, IR- 36 and China whose score was 7 and considered as moderately susceptible varieties. The least preferred variety Ranjit proved as less susceptible variety belongs to damage score 5. No rice varieties were found immune, resistant and moderately resistant to the pest as per standard evaluation system for rice (Anonymous, 1980) (Table 1).

Whereas during Sali season the most preferred variety was observed as Aizong, where it showed 63.79% damage. The least preferred variety was Bahadur, where it has observed only 21.53%. As regards the damage score, Chatoki, Kalabiren, Aizong and Mashuri were belongs to score 9 which indicated susceptible varieties as per damage score (Anonymous, 1980). But Joria, Nagrasali, Dumsail, Ranjit, Kalijira and Punjab were proved to be moderately susceptible as these varieties of rice showed score 7. As Bahadur and Konkusbiren varieties fallen on damage score 5 therefore, they belongs to less susceptible group which is least preferred. No varieties were found to be immune, resistant and moderately resistant to the pest (Table 1).

Guchiboroa witnessed to be the maximum preferred (68.87%) variety during Boro season. The least preferred was found as Jaya variety where preference was 38.08%. However, Guchiboroa, Bansful, Khoiboroa, Balam, Aaswati and BR -19

Table 1: Screening of some Aus rice cultivars against *O. hyla hyla* in three crop seasons

Score ⁺	Rank	Damage %	Rice cultivars*		
			Aus	Sali	Boro
0	Immune	No damage	Nil	Nil	Nil
			Nil	Nil	Nil
	Resistant		Nil	Nil	Nil
			Nil	Nil	Nil
1	Moderately resistant	1 - 10			
		11 - 20	Ranjit (32.01%)	Bahadur (21.53%), Konkusbiren (25.63%)	Narayan (45.56%), Gopalbheri (47.02%), Leskiboroo (42.67%), Jaya (38.08%), Chocklate (40.79%), Chotochina (46.96%)
3	Less susceptible	21 - 35			
		36 - 50	Mohanbhog (42.68%), Kalabansful (37.26%), Shaiboroo (44.46%), Sonamukhi (42.68%), Terawali (49.76%), IR-36 (43.31%), China (38.25%)	Joria (46.43%), Nagrasali (46.78%), Dumsail (40.40%), Ranjit (42.09%), Kalijira (35.36%), Punjab (49.11%)	
5	Moderately susceptible	51 - 100			
			Murali (50.57%), Krishna (50.97%), Agnisali (55.98%), Luit (58.96%)	Mashuri (50.95%), Chatoki (51.36%), Kalabiren (53.37%), Aizong (63.79%)	Guchiboroo (68.87%), Bansful (64.66%), Khoiboroo (66.59%), Balam (54.07%), Aaswati (63.55%), BR-19 (50.75%)

+ = According to 0-9 scale score of standard evaluation system for rice (Anonymous, 1980), * = Average of three replications

considered as susceptible varieties as these belongs to damage score 9. On the other hand, as Narayan, Gopalbheri, Leskiboroo, Jaya, Chocklate and Chotochina varieties belongs to damage score 7 were proved as moderately susceptible. No varieties were found to be immune, resistant, moderately resistant and less susceptible group (Table 1).

Diurnal activity was studied during two year period (2010-2011) in three (Aus, Sali, Boro) crop seasons (Fig 1 & 2). During 1st year in Aus season activity of grasshopper was studied from morning 6 to evening 18 hrs. where highest (3.0 ± 0.7) activity was recorded at 10-11 hrs. (Fig 1). But Sali season

study was undertaken at hourly interval from 6-17 hrs. where day -length prevailed a little shorter than the Aus season. During this season, maximum (3.8 ± 0.66) activities by the pest species showed at 15-16 hrs. (Fig 1 & 2). In Boro season the activity was observed during 6-18 hrs. where peak (2.6 ± 1.16) activity was recorded at 10-11 hrs. and minimum (1.0 ± 0.54) activity was recorded at 17-18 hrs. (Fig 1).

During 2nd year the maximum (3.2 ± 0.80) activity by the species was observed at 11-12 hrs. in Aus season whereas Sali season showed peak (3.0 ± 1.09) activities at 9-10 hrs. In Boro season, the maximum (3.6 ± 0.24) activity was recorded at 16-17 hrs. (Fig 2). 't' test was employed to compare the activities of grasshopper among the peak hour periods between the seasons, viz- Aus vs Sali, Aus vs Boro, Sali vs Boro in both the years. The study indicated that there was no significant difference of activities among the peak hrs. between all the seasons in both the years except during 2010 ('t' = -3.5, p < 0.05) at 15-16 hrs. and Aus vs Boro ('t' = -2.99, p < 0.05) at 16-17 hrs.

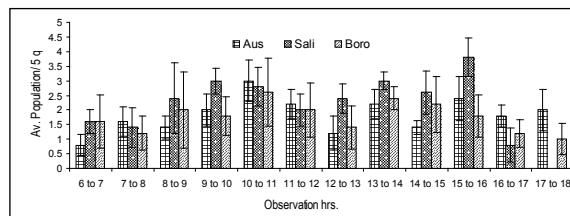


Fig 1: Diurnal activity by *Oxya hyla hyla* (Serville) on three rice seasons during 2010

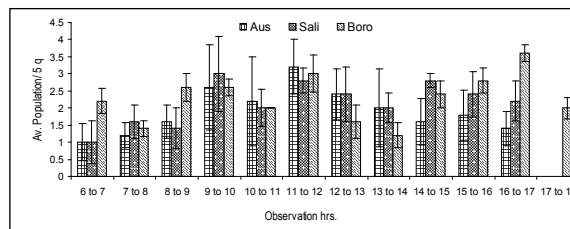


Fig 2: Diurnal activity by *Oxya hyla hyla* (Serville) on three rice seasons during 2011 during 2011.

Screening of rice varieties in all the three seasons showed that *O. hyla hyla* which is a serious paddy pest in this valley of Assam, preferred almost all the varieties of rice at tender to middle age of the crop. Host preference studies helps in management of this serious pest as a non- insecticidal method. Suresh Chand & Muraliranjana (1999) reported that food consumption by *Oxya nitidula* (Walker) was highest during 61- 75 days after sowing in IR20, CO43 and CO45 varieties which corroborates more or less our study. Diurnal activity in three seasons reveals that insect activities was higher in Sali season at evening during 1st year and in Boro season during 2nd year. It may be due to varietal preferences and seasonal variations. Ray & Bhattacharjee (2006) found that diurnal activity by *D. armigera* increases at 13- 18 hrs. which also in agreement with our investigation where highest insect activity was recorded during 13-18 hrs.

REFERENCE

Anonymous. (1980). Standard evaluation system for rice. IRRI (International Rice Research Institute) Los Banos, Philippines. pp. 44 | Begna, S. H. & Fielding, D. J. (2003). Damage potential of grasshoppers (Orthoptera: Acrididae) on early growth stages of small- grains and Canola under Subarctic conditions. J. Econ. Entomol., 96 (4), 1193- 1200. | Das, M. & Ray, D. C. (2012). Bio- efficacy of some conventional pesticides against *Oxya hyla hyla* (Serville) (Orthoptera: Acrididae) on rice in Cachar district of Assam, North- East India. Environment and Ecology, 30 (1), 85- 87. | Ghosh, A. K. (1985). Sampling techniques in rice research. ICAR Publication. New Delhi, pp. 623. | Isley, F. B. (1944). Correlation between mandibular morphology and food specificity in grasshoppers. Ann. Entomol. Soc. Am., 37, 47- 67. | Marrang, D. & Kharbuli, B. (2001). The influence of some plant extracts on the feeding activity of small rice grasshopper, *Oxya hyla hyla*. Uttar Pradesh J. Zool., 21 (3), 241- 247. | Mulken, G. B. (1967). Food selection by grasshoppers. Annu. Rev. Entomol., 12, 59- 78. | Paulraj, M. G., Anbalagan, V. & Ignacimuthu, S. (2009). Distribution of grasshoppers (Insecta: Orthoptera) among different hosts plants and habitats in two districts of Tamil Nadu, India. Journal of Threatened Taxa, 1 (4), 230- 233. | Ray, D. C. & Bhattacharjee, P. P. (2006). Diversity and composition of insecta in rice agroecosystem in Barak valley of Assam (India). Indian J. Environ. & Ecoplan., 12 (1), 231-236. | Suresh Chand, D. & Muraliranjana, M. C. (1999). Evaluation of food consumption by *Oxya nitidula* (Walker) in relation to plant age of some rice cultivars, *Oryza sativa* L. J. Orthoptera Res., 8, 99- 101. |