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An alternative host preference study by Oxya hyla hyla (Orthoptera: Acrididae)- a non insecticidal method of pest management

KEYWORDS: Alternative host, Oxya hyla hyla, Pest, Feeding preference, Non insecticidal

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ABSTRACT *Sixteen alternative host of O. hyla hyla were recorded from three study sites of Cachar District. Among them the most preferred food plants (8 nos.) were assessed against the pest species along with one rice cultivar (main host) to determine the per cent of feeding preference. It was found that Cynodon dactylon with 84.84% preference proved to be the highest feeding preferred host by the grasshopper species followed by rice cultivar (Narayan) (89.67%). Whereas A. compressus (72.55%) attained the second preferred host status. Most of the food plants showed preference values ranging from 51- 100 according to 0- 9 scale score of standard evaluation system. ANOVA indicated significant difference ($p<0.05$) in feeding preference by O. hyla hyla among all the food plants. Study proved that there alternative hosts has the high potentiality to manage the grasshopper species. Imperata cylindrica was proved to be the least preferred hosts (24.04%).*

Introduction
Insects are the major components of animal diversity in terms of number of species in most of the habitats and ecosystems. The species of the subfamily Acrididae, Oxyinae and Truxalinae were restricted to feed on grasses. Among grasshoppers the acridids are the most important group (Ananthaselvi et al., 2009). Acridids cause extensive damage to both agro- ecosystem (COPR 1982) and rangeland ecosystem (Hewitt & Onsager, 1983). Grasshoppers are one of the largest and most diverse groups of insects (Paulraj et al., 2009). They also cause significant damage to tree seedlings (Joshi et al., 1999) and agricultural crops.

They are also important components of the food for many birds and mammals (Capinera et al., 1997; Mayya et al., 2005). Most grasshoppers are oligophagous and exhibit definite host preferences (Mulkern, 1967), according to which they are classified as grass- feeders (graminivorous), forb- feeders (forbivorous) or a mix of two (ambivorous or mixed feeders) (Isely, 1944). Host plant shifting may occure 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). Among them small rice grasshopper Oxya hyla hyla is one of the important insect pest of rice in Barak valley of Assam (Das & Ray, 2012). This is distributed through out north- eastern India and considered as a major pest of rice (Oryza sativa) (Marngar & Kharbuli, 2001). As it is a serious destructive pest of paddy in this region, the present investigation was undertaken to ascertain some alternative host of the pest, which has the high potentiality to divert the pest species from destruction of main rice cultivar. Therefore, alternative host species may be used as non- insecticidal tools to manage O. hyla hyla species.

Materials and Methods
For the study of alternative host plants of O. hyla hyla, field survey was carried out during 2010- 2012. Three sites viz- Dargakona, Dudhpatil and Kalain were selected for the study. Observations were made on eye watch. Survey was done in all the field crops and nearby vegetation after harvesting of the crops and during the crop seasons. The plants where O. hyla hyla were found were observed and collected. Altogether sixteen (16) plant species were found. Out of sixteen hosts the most preferred leaves of eight were allowed to feed by the O. hyla hyla on cage (20 x 20 x 20 cm size) along with one rice cultivar (Narayan). Area of leaves was calculated before and after feeding by graph paper method. Three replications were followed for each host plant preference. Percent damage was also calculated and transformed to 0-9 scale of standard evaluation system for rice (Anonymous, 1980). Plants which are found to be damage by the species were then identified with the help of plant taxonomist.

Results and Discussion
Sixteen (16) alternative hosts has been reported from all the three study sites, belong to Poaceae, Cyperaceae, Convolvulaceae and Polygonaceae family (Table 1). Out of these eight alternative hosts viz- Cynodon dactylon (L.), Axonopus compressus (Sw.) Beauv., Echinochloa colonum (L.) Link., Vetiveria zizanioides (Linn.) Nash, Kyllinga monocephala Rottb. and Digitaria sanguinalis (L.) Scop. were screened to study the feeding preference. Among the eight alternative hosts studied, C. dactylon was found to be the most preferred (84.84%) followed by A. compressus (72.55%), E. colonum (67.74%), V. zizanioides (55.56%), K. monocephala (54.30%) and D. sanguinalis (52.55%), which indicated score 9 according to score scale. Least preferred hosts were I. cylindrica (24.04%) and E. indica (41.75%) which belong to score 7 and indicated moderately susceptible host species. Preference of a rice cultivar (Narayan) was also studied along with the host plant species to compare the preference study which indicated 89.67% damage and belong to score 9 (Table 2).

The abundance of host plants near the paddy fields supports in the survivality of O. hyla hyla in absence of the main hosts. The observations suggest that O. hyla hyla preferred obviously the rice variety but also showed high preference for grasses mostly belongs to poaceae family. C. dactylon belongs to poaceae family found to be most preferred host species among the alternative hosts. ANOVA was employed on feeding preference among all the eight alternative hosts along with one rice variety, which proves significant differences of performance for feeding preference. Majeed & Aziz (1981) studied on the feeding preference of twenty one different food plants on different stages of Gastrimargus transversus who found that Cyperus rotundus and Echinochloa colonum were preferred more with preference value above 100 per cent.

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Table 1: List of some alternative host plants of O.hyla hyla in three study sites.

Scientific name	English name	Common name	Family
Axonopus compressus (Sw.) Beauv.	Broadleaf Carpet grass	Chepta ghash	Poeacae
Cynodon dactylon (L.)	Barmuda grass	Duboribon/Durba	Poeacae
Imperata cylindrica (L.) P. Beauv.	Thatch grass	Ulukher/Ulu/ Shon	Poeacae
Vetiveria zizanioides (Linn.) Nash	Vetiver	Birina/binna	Poeacae
Eleusine indica (L.)	Goose grass	Mal ankura	Poeacae
Colocasia esculanta L.	Taru yam	Kosu	Araceae
Echinochloa colonum (L.) Link.	Jungle rice	Jangle dhan	Poeacae
Cyperus iria L.	Rice flat sedge	Jalmutha	Cyperaceae
Digitaria sanguinalis (L.) Scop.	Crab grass	Makarjuli	Poeacae
Paspalum scrobiculatum Linn.	Koda millet	Kodoa dhan	Poeacae
Saccharum spontaneum L.	Kans grass	Kash	Poeacae
Dactyloctenium aegyptium (L.)	Crow foot grass	Makra	Poeacae
Kyllinga monocephala Rottb.	Greater kyllinga	Bindi mutha	Cyperacae
Ipomoea hispida (vahl) Roem. & Schult	Ipomea	Kolmou	Convolvulaceae
Setaria glauca (L.)	Fox tail grass	Kakni/ Pingi	Poeacae
Polygonum hydropiper Linn.	Water pepper	Pan arich	Polygonaceae

But the present investigation disagrees their study who recorded the preferred value ranging from 51- 100 although the test species was different. Whereas our study corroborates the findings of Majeed & Aziz (1981) whose preferred values of C. dactylon and O. sativa ranging from 51- 100. Study also similar with Iqbal & Aziz (1975) who found that Spathosternum prasiniferum preferred the weeds, E. colonum, C. dactylon, C. rotundus etc. However, all the eight alternative host species proves that they have high potentiality to use them as a non- insecticidal tool against the O. hyla hyla species on rice agro- ecosystem.

Table 2: Screening of some alternative hosts against O. hyla hyla.

Score+	Rank	Damage %	Rice cultivars**
0	Immune	No damage	Nil
1	Resistant	1 – 10	Nil
3	Moderately resistant	11 – 20	Nil
5	Less susceptible	21 – 35	Nil
7	Moderately susceptible	36 – 50	Eleusine indica (L.) (41.57%), Imperata cylindrica (L.) P. Beauv. (24.04%)
9	Susceptible	51 - 100	Cynodon dactylon (L.) (84.84%), Axonopus compressus (Sw) Beauv. (72.55%), Echinochloa colonum (L.) Link. (67.74%), Vetiveria zizanioides (Linn.) Nash (55.56%), Kyllinga monocephala Rottb. (54.30%), Digitaria sanguinalis (L.) Scop. (52.55%)
			Rice variety (Narayan) (89.67%)
CD at 5%= 4.91*			

Note: += According to 0-9 scale score of standard evaluation system for rice (Anonymous, 1980), **= Average of three replications, *= Significant (p<0.05)

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