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SPECIES ABUNDANCE OF WHITE GRUBS ASSOCIATED WITH SUGARCANE IN UTTAR PRADESH

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ABSTRACT

Species diversity and abundance of phytophagous Scarabaeidae (Coleoptera) associated with sugarcane was monitored at fortnightly intervals in Amroha district of Uttar Pradesh, during May - July 2013. The collections were made with light traps using black and mercury vapour lamps as light source. Studies revealed that Melolonthinae and Rutelinae were represented with 6 and 7 species under 4 and 2 genera, respectively and Dynastinae was poorly represented with one species. In total, 14 species under 7 genera were attracted to the light traps and seasonal variations in the species diversity and abundance were observed. Whittaker rank abundance curve depicted the presence of Holotrichia nagpurensis Khan and Ghai, *Lepidiota mansueta* Burmeister followed by *Anomala dimidiata* (Hope) and *Maladera insanabilis* (Brenske) as common species..

Key words: Melolonthinae, Rutelinae, Dynastinae, Uttar Pradesh, relative abundance, species diversity

White grubs (Coleoptera: Scarabeidae) are the serious pests of several agricultural and horticultural crops with a wide geographical distribution. Scarabaeidae includes about 27,800 species where 2000 species occur in India (Jameson and Ratcliffe, 2001). The scarabaeids show diverse feeding habits with those under the three subfamilies, Melolonthinae, Rutelinae and Dynastinae being mostly phytophagous. The subfamily Melolonthinae is the largest of all with 750 – 800 genera and 11,000 - 12000 species worldwide (Houston and Weir, 1992; Evans, 2003). The immature stages, popularly called as white and root grubs, feed on the roots of the several plants including economically important crops while adults feed on the leaves of weeds and avenue trees like neem, ber, *Acacia*, *Prosopis, Polygonum* etc. The losses incurred due to white grubs are huge in case of commercial crops like sugarcane, groundnut, potato, maize and upland rice (Ranga Rao *et al.,* 2006). Knowledge on the abundance of species in a locality can provide an insight into how a community functions. Species abundance curves are used to deal with several complexities among communities (Verberk, 2012). Relative species abundance gives an idea of how common or rare a species is. Hence, a study was undertaken to assess the species diversity and relative abundance of phytophagous white grubs associated with sugarcane in the western Uttar Pradesh.

MATERIALS AND METHODS

The study was carried out at Jallopur village, Amroha district (28°54'N; 78°31'E), Uttar Pradesh, during May to July 2013. Monitoring was done at fortnightly intervals during peak emergence of scarabaeids and the adults were collected using light traps having black and mercury vapour lamps as light sources. The collected adults were sorted, cleaned, dried, mounted, labeled and identification was carried out with keys (Brenske, 1899; Arrow, 1910, 1917; Khan, 1975).The voucher specimens are deposited with the National Pusa Collection, Division of Entomology, Indian Agricultural Research Institute, New Delhi. The seasonal abundance was worked out through percentage and relative species abundance using Whittaker plot (Whittaker, 1965).

RESULTS AND DISCUSSION

Emergence of phytophagous beetles belonging to the subfamilies Melolonthinae, Rutelinae and Dynatinae of Scarabaeidae from the soil started immediately after dusk and continued till night. Melolonthines were the first to get attracted sharply from 7.25 to 7.30 pm followed by rutelines from 7.45pm to 8.00pm. A total of 2937 scarabeids was collected during five fortnightly intervals from May to July. The light trap catches consisted of fourteen species of seven genera (Table 1). Melolonthines and rutelines were represented by 6

Table 1. Species diversity of Scarabaeidae associated with sugarcane (Amroha Dt., Uttar Pradesh)

Subfamily / Species	No. of beetles trapped					Total trap catch
	20-5-2013	4-6-2013	19-6-2013	3-7-2013	20-7-2013	
Melolonthinae						
Holotrichia nagpurensis Khan and Ghai	45	19	–	–	–	64
H. consanguinea Blanchard	2	29	–	–	–	31
Lepidiota mansueta Burmeister	–	34	986	2	–	1022
Maladera insanabilis (Brenske)	26	16	29	254	348	673
Schizonycha ruficollis (F.)	–	1	2	–	–	3
Maladera sp. indet	–	31	6	–	–	37
Subtotal	73	130	1023	256	348	1830
Rutelinae						
Anomala bengalensis Blanchard	18	14	–	–	–	32
Anomala dimidiata (Hope)	3	23	289	574	21	910
Anomala dorsalis F.	–	2	1	7	2	12
Anomala varicolor Gyllenhal	–	–	–	4	–	4
Anomala sp.	–	17	–	–	–	17
Adoretus flavus Arrow	–	–	–	–	55	55
A. versutus	–	–	–	–	3	3
Subtotal	21	56	290	585	81	1033
Dynastinae						
Heteronychus sublaevis Fairmaire	–	19	5	13	2	39
Sub-total	–	19	5	13	2	39
Total	94	205	1318	854	431	2902

and 7 species under 4 and 2 genera, respectively and Dynastinae was poorly represented with only one species. Melolonthines were the most dominant constituting to 63% followed by the subfamily Rutelinae (36%), with the least representation (1%) from Dynastinae.

The adult emergence started after receipt of showers in third week of May and peak catches were obtained during II fortnight of June (1318 adults) followed by I fortnight of July (854). The peak emergence recorded during second fortnight of June is in conformity with Shah and Shah (1990), who documented *Holotrichia longipennis* Blanchard peak emergence in western Himalayas during II fortnight of June in 1990. A clear shift in the abundant species was observed, and during second fortnight of May, *H. nagpurensis* was abundant followed by *A. bengalensis* while it was *L. mansueta* followed by *H. consanguinea* during first fortnight of June. The abundance of *L. mansueta* continued till second fortnight of June followed by *A. dimidiata* which took over as abundant species during first fortnight of July. *Maladera insanabilis* was abundant during second fortnight of July, and the species diversity decreased thereafter (Fig.1).

Fourteen species under seven genera belonging to Melolonthinae, Rutelinae and Dynastinae were collected of these Melolonthinae and Rutelinae were equally represented while Dynastinae was poorly represented.The number of species varied from 4 to 10. Species richness was highest during first fortnight of June (10 species) while species abundance (1222 adults) was observed during subsequent fortnight of June (Table 1). *Holotrichia nagpurensis* and *H. consanguinea* were moderate (64 and 30, respectively) and observed up to first fortnight of June beyond which

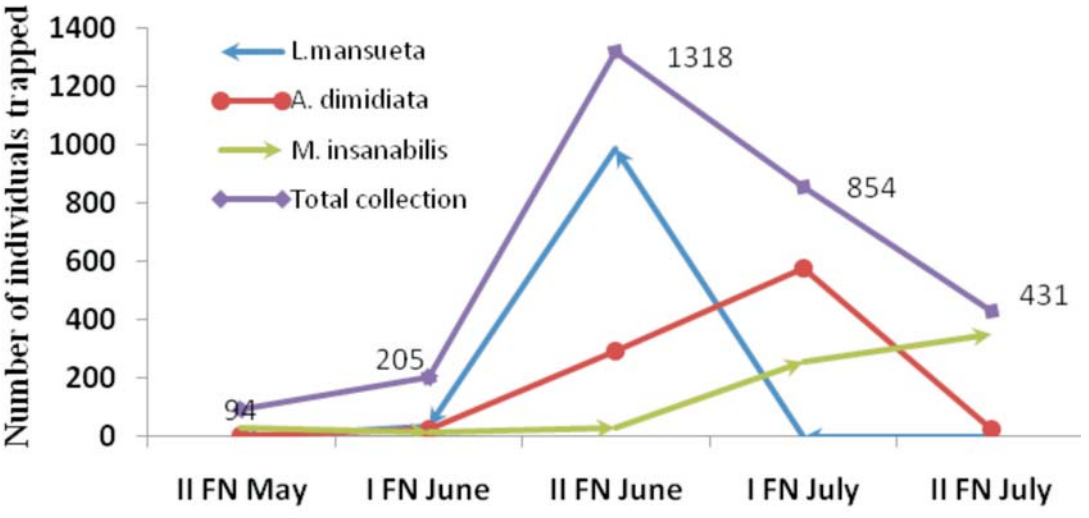

Fig. 1. Temporal distribution of dominant scarabaeids associated with sugarcane (Amroha Dt., Uttar Pradesh)

the species diversity was skewed towards *L. mansueta, A. dimidiata* and *M. insanabilis. Lepidiota mansueta* was found in high numbers during June alone and no trap catch was observed beyond. This can be attributed to the short adult living stage, which is also a characteristic non feeding stage. This is the only species in genus *Lepidiota* which do not feed in the adult stage.

Species abundance distribution showed a hollow curve or hyperbolic shape on a histogram depicting few common species and many rare species (McGill *et al.,* 2007) in the surveyed region (Fig. 2). The longer the communities existed and larger the genera, larger will be the space occupied according to age and area and size and space principles (Yule, 1925). The potential causes of hollow curve distribution in the present study in the surveyed locality needs to be explored with more extensive, surveys..

Whittaker's rank abundance curve also revealed that there are few common species *viz., L. mansueta, A. dimidiata* and *M. insanabilis,* which were at the top of the curve and many rare species *viz., S. ruficollis, A. dorsalis, A. varicolor* and *A. versutus,* which were

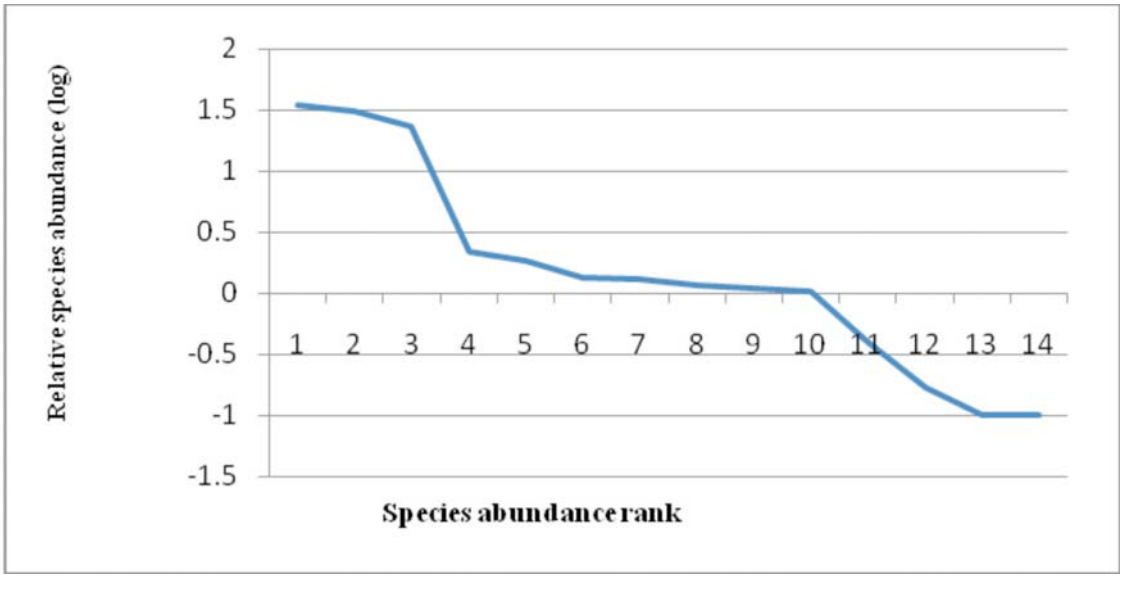

Fig. 2. Whittaker rank abundance plot of white grubs associated with sugarcane (Amroha Dt., Uttar Pradesh)

at the bottom of the curve. The curve was slight 'S' shaped and slope of the curve indicated that species evenness was low. The present study revealed that the species in community is highly skewed towards three species *viz., L. mansueta, A. dimidiata* and *M. insanabilis* and are the dominant species (1022, 910 and 673, respectively occupying 39, 35 and 26%). Their populations were observed at different times thus avoiding competition.

A wide diversity of scarabeids was documented in Amroha district Uttar Pradesh. Fourteen species under seven genera of three subfamilies *viz*., Melolonthinae, Rutelinae and Dynastinae were recorded. The maximum trap catch was obtained during second fortnight of June while high species richness was observed during first fortnight of June. Temporal partitioning of species emergence was observed with *H. nagpurensis* emerging early followed by *L. mansueta, A. dimidiata* and *M. insanabilis*. Relative species abundance showed skewed pattern indicating few common species. *Lepidiota mansueta* was the dominant species followed by *A. dimidiata* and *M. insanabilis*.

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