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Morphological variability among *Holotrichia consanguinea* (Coleoptera: Scarabaeidae) Populations of India

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Abstract

The white grub species *Holotrichia consanguinea* Blanchard, is cosmopolitan in distribution and a major pest of several economic crops. Present study has been carried out to find the morphological variability among three populations of *H. consanguinea*, which were collected from different states viz. Andhra Pradesh, Rajasthan and Uttar Pradesh. A dendrogram was constructed based on the similarity index of 17 characters of three populations of *H. consanguinea* using UPGMA. The dendrogram revealed that all three populations are morphologically similar for all the selected characters.

Keywords: *Holotrichia consanguinea*, root mean square deviation coefficient, dendrogram

1. Introduction

White grubs are the serious insect pests of several economic crops that belong to subfamilies Melolonthinae and Rutelinae of Scarabaeidae (Coleoptera). Melolonthinae is the largest subfamily that includes several tribes ^[1], of which five viz., Melolonthini, Sericini, Hopliini, Diplotaxini and Macroductylini known to occur in India. Melolonthini is the largest tribe comprising of several genera, of which *Holotrichia* (Hope) is the largest genus.

It is believed that more than 100 species occur under *Holotrichia* and *H. consanguinea* is one of the major species present across the country. *Holotrichia consanguinea* was reported as predominant species in Rajasthan, Uttar Pradesh ^[2], and Gujarat ^[3] associated with groundnut and sugarcane crops. Studies on intraspecific variation aids in population ecology studies to find out source of variability in the group of populations ^[4]. The extent of intraspecific variability is considered as distinctiveness of the individuals or population and differences among or within populations, which depend on several factors such as geographical, ecological and biological characteristics of the species are commonly viewed as systematic uniqueness⁵. Hence, the present study has been carried out to find the morphological variability among three populations of *H. consanguinea* collected from three different regions of India.

2. Material and methods

Surveys were conducted in different parts of Andhra Pradesh, Rajasthan and Uttar Pradesh for the collection of adult *H. consanguinea* beetles during May - August, 2015. Adult beetles were collected through light traps and manual scouting on host trees. The beetles attracted towards the light source were trapped in the collection bucket, placed beneath the light source that contained cotton swab sprinkled with ethyl acetate. The beetles trapped in the collection bucket were sorted out and transferred to small insect boxes for further processing. The specimens were cleaned, relaxed, pinned and labelled for further studies. Around 30 good specimens of both sexes of each population were taken and sorted out to two subgroups each containing 15 specimens for further morphological studies to ascertain the intraspecific variations.

Cluster Analysis

About 17 characters were selected (Table 1) from two sub groups of three populations based on their morphological variations. The scores were given based on their presence or absence/variation using binary numeral system, which uses only two symbols: typically zero (0) and one (1). Later a dendrogram was constructed using unweighted pair-group method arithmetic average (UPGMA) cluster analysis based on the dissimilarity index and analyzed by root mean square deviation coefficient values.

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Table 1: Characters selected for preparing character matrix

	Character	Character matrix	
		0	1
1	Colour	Slightly brown	Dark brown
2	Clypeal emargination	Slightly emarginated	Deeply emarginated
3	Clypeal carina	Absent	Present
4	Clypeal sides	Oblique	Parallel
5	Length of antennal club to remaining segments	Less	Equal
6	Pronotal serrations	Absent	Present
7	Pronotum anterior angles	Obtuse	Acute
8	Pronotum posterior angles	Obtuse	Acute
9	Pronotum punctations (middle)	Sparse	Dense
10	Pronotum punctations (lateral)	Sparse	Dense
11	Scutellum at anterior side	Narrow	Broad
12	Elytra costa	Absent	Present
13	Hind tibial spur	Straight	Slightly curved
14	Hind tibial transverse carina	Absent	Present
15	Parameres	Asymmetrical	Symmetrical
16	Chitinised knobs of parameres	Absent	Present
17	Spiculum	Not in exact Y shape	Y shape

3. Result and discussion

The various characters studied for the variations among three populations of *H. consanguinea* through root-mean-square deviation coefficient revealed that the value of root-mean-square deviation coefficient is nil (0) among all six groups viz. two groups of Andhra Pradesh and two groups of Rajasthan and two groups of Uttar Pradesh emphasizing that there is no significant variation among these populations (Table 2). Cluster diagram plotted by using UPGMA (Unweighted Pair Group Method with Arithmetic Mean) with six groups of three populations viz., two groups of Andhra Pradesh (HCAP1, HCAP2), two groups of Rajasthan (HCRA1, HCRA2) and two groups of Uttar Pradesh (HCUP1, HCUP2) were positioned on main cluster, which did not separate into branches (Fig. 1). This clearly states that the three populations are morphologically similar for all the

selected characters. In a melolonthine species, *Phyllophaga hirticula*, phenotypic variation of sexual character (male and female genitalia) was found to be equivalently higher than the variation of non-sexual characters [6]. But in present studies, no distinct variation was found between sexual and non-sexual characters of *H. consanguinea*, where male genitalia characters such as symmetry, chitinized lobes of parameres and spiculum of three populations did not show much variation. However, variations occurred in morphometric analyses of three populations, where territorial map showed three separate populations [7]. The conclusions drawn from morphometric analysis may be considered as indicative and further investigations/analysis need to be carried out taking into account both morphological and morphometric analyses of three populations to draw definite conclusions.

Table 2: Distance matrix based on root-mean-square deviation coefficient

	HCAP1	HCAP2	HCRA1	HCRA2	HCUP1	HCUP2
HCAP1	0	0.000	0.000	0.000	0.000	0.000
HCAP2		0	0.000	0.000	0.000	0.000
HCRA1			0	0.000	0.000	0.000
HCRA2				0	0.000	0.000
HCUP1					0	0.000
HCUP2						0

Note: HCAP, HCRA, HCUP are Andhra Pradesh, Rajasthan and Uttar Pradesh populations of *H. consanguinea*, respectively

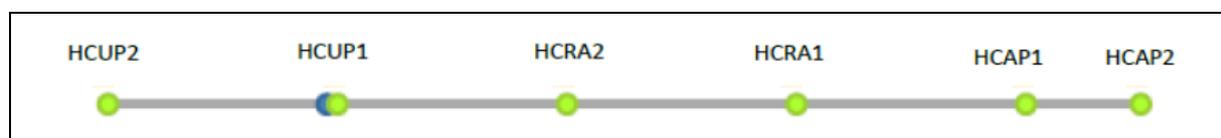


Fig 1: Cluster diagram of three population *H. Consanguinea*; HCUP, HCRA, HCAP ARE Uttar Pradesh, Rajasthan and Andhra Pradesh Population Respectively

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References

1. Smith ABT, Evans AV. A supplement to the checklist of

the New World chafers (Coleoptera: Scarabaeidae: Melolonthinae) with notes on their tribal classification. Zootaxa. 2005; 1032:29-60.
 2. Sreedevi K, Tyagi S, Sharma V. Species diversity of white grubs (Coleoptera: Scarabaeidae) in the sub-Himalayan and northern plains of India. Current science. 2017; 113(2):322-329.
 3. Kapadia MN, Butani PG, Beria NN. White grub species attacking groundnut in the Saurashtra Region in Gujarat,

- India. International Arachis Newsletter. 2006; 26:28-29.
4. Violle C, Enquist BJ, McGill, Jiang L, Albert CH, Hulshofl C. The return of the variance: intraspecific variability in community ecology. Trends in ecology and Evolution. 2012; 27(4):244-252.
 5. Willig MR, Owen RD, Colbert RL. Assessment of morphometric variation in natural populations: the inadequacy of the univariate approach. Systematic Zoology. 1986; 35:195-203.
 6. Polihronakis M. Morphometric analysis of intraspecific shape variation in male and female genitalia of *Phyllophaga hirticula* (Coleoptera: Scarabaeidae: Melolonthinae). Annals of the Entomological Society of America. 2006; 99(1):144-150.
 7. Kumar PV, Sreedevi K, Varghese E. Morphometric variation among the populations of white grub, *Holotrichia consanguinea* (Blanchard) (Coleoptera: Scarabaeidae) in India. Journal of Entomology and Zoology Studies. 2018; 6(3):1156-1161.