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HOST PREFERENCE AND POPULATION DYNAMICS OF *HOLOTRICHIA NAGPURENSIS* KHAN AND GHAI

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ABSTRACT

Holotrichia nagpurensis **Khan and Ghai is a major white grub species of subfamily Melolonthinae. Its wide host range has been reported from different parts of India. An experiment was carried out to find host preference and population dynamics at three locations of Pantnagar in Terai region of Udham Singh Nagar District during 2018-19. Beetles were recorded from six host plants among which neem** ***Azadirachta indica*****, was the major one. The p-value of two-way ANOVA between populations of three locations (0.0006<0.001) and from six hosts (0.0002<0.001) showed that there exists significant difference in distribution and feeding preference of** ***H. nagpurensis*** **on host plants. Among the hosts,** ***A. indica*** **was found to be the most preferred with maximum adult density (419 adults) and average 46.55 beetles/ tree; and the multiple comparisons revealed a significant host preference. Correlation coefficients revealed that minimum relative humidity exhibits a negative relationship with beetle emergence.**

Key words: Scarabaeidae, *Holotrichia nagpurensis*, adults, host preference, *Azadirachta indica*, population dynamics, weather parameters, relative humidity, correlation coefficients

White grub, also known as May-June beetles, belonging to family Scarabaeidae is a major insect pest. Its adults are nocturnal, and feed on the leaves and soft shoot and fruits of various trees, shrubs and grasses (Ritcher, 1958; Vallejo et al., 1998). Their polyphagous nature make them major pests in India (Metcalf and Luckman, 1975). Of the 2000 species known from the Indian subcontinent 40 species cause serious damage to various crops (Veeresh et al., 1991). Among these, *Holotrichia* spp. (subfamily Melolonthinae) are mostly leaf feeders in adult stage (Arrow, 1917); this genus has >100 species with wide distribution (Mathur et al., 2010). There are species like *H. consanguinea*, *H. longipennis, H. serrata*, *H. insularis* etc observed from 27 host plants in north India (Srivastava and Khan, 1963; Bhadauria and Nigam, 1982; Haq, 1962). Many abiotic factors influence their distribution and diversity. High diversity of phytophagous insects is also the result of factors that affecting their diet breadth (Gaete-Eastman et al., 2004). There is no information about the host range and feeding preference of *H. nagpurensis* on host plants from Terai area of Pantnagar of Udham Singh Nagar district of Kumaon. This study evaluates the host range, feeding preference and population dynamics of its adults.

MATERIALS AND METHODS

The present study was conducted at three locations i.e. Crop Research Centre (CRC), Horticulture research center (HRC) and Livestock Research Center (LRC) of Udham Singh Nagar in Kumaon region Uttarakhand during 2018-19. Weekly surveys were made to record the *H. nagpurensis* incidence on various host plants like neem, guava, jackfruit, litchi, mango, bakane, amaltash, teak, pride of India and ashok in addition to some cultivated field crops like maize, soybean, sugarcane, rice and calotropis. Weekly observations were hade starting from appearance of beetle i.e. from 10th standard meteorological weeks (SMW) to 25th MSW (from March to June), with counting the of the adults feeding on leaves using powerful torch during night. The beetles were also collected from each host plants available on experimental site by shaking the branches to dislodge the beetles. Collected beetles were brought to the laboratory where, they were killed and sorted out before storing. Number of beetles that flew away from tree were also included. Because of largeness in size these were easily identified during flight (Litsinger et al*.,* 2002). The data on the cumulative number of beetles for each tree species was calculated to evaluate the host preference. Data on weather parameters viz., weekly maximum and minimum temperature (^{0}C), relative humidity (RH) (%) at 7:12 am and 2:12 pm, rainfall (mm), wind velocity (km/ hr.) and sunshine (hr) were obtained. The data were subjected to statistical analysis by ANOVA and LSD test (Litsinger et al., 2002) using R and SPSS software packages, respectively. Correlation coefficients of the incidence of beetle with weather factors were computed with R software.

RESULTS AND DISCUSSION

The results of the study brought out the host range/ preference and population dynamics of *H. nagpurensis*. These included the major host plants like *A. indica*, *P. guajava*, *A. heterophyllus*, *L. scinensis, M. indica*, *M. azadirach*, *C. fistula*, *T. grandis*, *L. speciosa* and *Polyalthia* sp. in addition to some cultivated field crops like *Z. mays*, *G. max, S. officinarum*, *O. sativa* and *Calotropis* sp. These revealed the wide host range with significant variations and choice of host plant for feeding; significantly maximum (713 beetles) was observed at the location HRC followed by LRC (698) and CRC (503) on the preferred hosts. Among the 15 host plants selected, which are common to all the sites, six trees i.e. *A. indica*, *M. indica*, *A. heterophyllus, P. guajava*, *Z. mays* and *M. azadirach* inhabited maximum adults (Table 1); of these *A. indica* was the most preferred inhabiting >one fifth, and the least (11.91%) on *M. azadirach* followed by *Z. mays* (11.54%) only. On an average, *A. indica* recorded 46.55 adults/ tree. Two-way ANOVA revealed significant differences among the locations studied, and among the six host trees. The multiple comparison values also indicate that *A. indica* was significantly most preferred (Table 2). The emergence of *H. nagpurensis* started from 7 pm of 10th and up to 25th MSW with a peak during 16th MSW (Fig. 1); correlation coefficients revealed a non-significant but positive correlation with maximum temperature (r=0.167), and a negative one with minimum temperature (r=-0.130); negative relationship with both maximum and minimum RH and

Table 1. Incidence of *H. nagpurensis* on hosts in three locations (2018-19)

S. No.	Host name	CRC	HRC	LRC	Total	% of total
1	*Azadirachta indica* L.	115	147	157	419	21.89
2	*Zea mays* L.	55	98	68	221	11.54
3	*Psidium guajava* L.	85	139	138	362	18.91
4	*Atrocarpus heterophyllus* Lam.	89	142	128	359	18.75
5	*Melia azedarach* L.	64	77	87	228	11.91
6	*Mangifera indica* L.	95	110	120	325	16.98
	Total	503	713	698	1914	

Table 2. Multiple comparisons of hosts for feeding preference (2018)

S. No.	I-Sample	J- Sample	Mean Diff.	Sig.
1.	*A. indica* L.	*Z. mays* L.	66.00	.003*
		P. guajava L.	19.00	.316ns
		A. heterophyllus	20.00	.292ns
		Lam.	63.67	.004*
		M. azadirach L.	31.33	.110ns
		M. indica L.		
2.	*Z. mays* L.	*A. indica* L	-66.00	.003*
		P. guajava L.	-47.00	.024*
		A. heterophyllus	-46.00	.026*
		Lam.	-2.33	.900ns
		M. azedarach L.	-34.67	.080ns
		M. indica L.		
3.	*P. guajava* L.	*A. indica* L	-19.00	.316ns
		Z. mays L.	47.00	.024*
		A. heterophyllus	1.00	.957ns
		Lam.	44.67	.030*
		M. azadirach L.	12.33	.510ns
		M. indica L.		
4.	*A. heterophyllus* Lam.	*A. indica* L	-20.00	.292ns
		Z. mays L.	46.00	.026*
		P. guajava L.	-1.00	.957ns
		M. azadirach L.	43.67	.033*
		M. indica L.	11.33	.544ns
5.	*M. azadirach* L.	*A. indica* L	-63.67	.004*
		Z. mays L.	2.33	.900ns
		P. guajava L.	-44.67	.030*
		A. heterophyllus	-43.67	.033*
		Lam.	-32.33	.100ns
		M. indica L.		
6.	*M. indica* L.	*A. indica* L	-31.33	.110ns
		Z. mays L.	34.67	.080ns
		P. guajava L.	-12.33	.510ns
		A. heterophyllus	-11.33	.544ns
		Lam.	32.33	.100ns
		M. azadirach L.		

ns=non- significant; significant at p=0.05

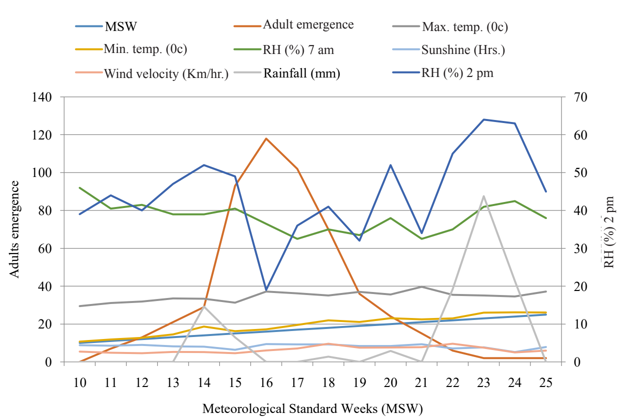

Fig. 1. Seasonal emergence of *H. nagpurensis* vs. weather factors

rainfall were also observed of which only the one with minimum RH (r=-550*) was significant. These results corroborate with those of Pal (1977) and Gupta (1973); and weather factors and availability of desirable host are importan (Veeresh 1988; Ratnadass et al., 2012**)**. Present results are in partial agreement with those of Mishra and Singh (1999) on the favourable weather. Prathibha et al. (2013) also reported that rainfall is an important factor realting to emergence and aggregation of this beetle, and significant correlation with maximum temperature corroborates with that of Seram and Saikia (2015).

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