

CERAMBYCID BORER INFESTATION AMONG DIFFERENT AGE GROUPS OF MULBERRY, *MORUS* SPP. IN JAMMU AND KASHMIR

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ABSTRACT

Mulberry longicorn beetle, *Apriona germari* Hope (Coleoptera: Cerambycidae) and red spotted longicorn beetle, *Batocera rufomaculata* De Geer continues to pester mulberry plants irrespective of their genotype and age group, however, infestation rate varied significantly ($P < 0.05$) among screened cultivars and different age groups of *Morus* spp. (Urticales : Moraceae). The screened genotypes, Viz. Goshorami, Chinese White, KNG, Tr-10, S-146, Mandalay, and V-1 were all susceptible to the attack of both the longicorn beetles; however, Chakmajra and KNG varieties offered slight resistance to their attack. Infestation rate of *A. germari* in the age group of 1-5 years was significantly low than the age groups of 6-10 and above 10-year-old mulberry plants. *B. rufomaculata* pestered least number of mulberry plants in the age group of 1-5 years where as highest infestation rate was recorded in the age group of above 10-year-old plants.

Key words: Cerambycid borers, mulberry plants, Jammu and Kashmir

INTRODUCTION

Cerambycidae, the largest insect family,

form an important group of wood boring insects attacking healthy, weak, stressed and dead host trees; till date more than 4 000 genera with 35 000 species were recorded of the family and many more species are probably yet to be discovered (Hanks, 1999). Feeding by grubs in the cambium and xylem causes wide spread mortality among deciduous broad leaf trees (Yang, *et al.*, 1995). Due to their concealing nature, the infestation of cerambycid borers goes unnoticed till the death of the hosts.

Mulberry, *Morus* spp., the sole food plant of silkworm, *Bombyx mori* (Lepidoptera: Bombycidae), is subject to the attack of large number of insect pests including cerambycid borers. Long horned beetles predominantly infest mulberry plants in Jammu and Kashmir and form an important group of pests of deciduous trees in the region (Hussain, *et al.*, 2009).

The infestation of long horned beetles continuously pose great threat to mulberry plants in the state of Jammu and Kashmir (India), reducing their economic product (leaf) both qualitatively and quantitatively, thus, affecting the sericulture industry very badly. The smooth and successful rearing of silkworm, *B. mori*, demands mulberry plants to be raised on scientific lines in the region.

With this motive, present study was carried out as a preliminary investigation to secure quality leaf for silkworm rearing.

MATERIAL AND METHODS

The present study was carried out in 2005-2007 in mulberry farms of Jammu and Kashmir state and a total of 8 sites, (4 each in Kashmir and Jammu divisions) viz. Uri, Mansbal, Pampore and Achabal (Kashmir division) and Banihal, Barnoti, Miransahib, and Ramban (Jammu division) were selected to investigate the incidence of Cerambycid borers among different age groups of mulberry plants. A total of 7-genotypes of *Morus* spp., viz. Goshorami, Chinese White, KNG, Tr-10, S-146, Mandalay, and V-1 were screened against the attack of cerambycid borers. Monthly survey was conducted by fixed plot method. Frass indexing method was adopted to assess the borer infestation and rate of incidence of borers was calculated by the following formula:

$$\% \text{ infestation} = \frac{\text{Total number of trees infested}}{\text{Total number of trees observed}} \times 100$$

Infestation of different species of Cerambycid borers in mulberry farms were observed on the basis of species specific symptoms. Shape and size of bore/tunnel, tunneling pattern, frass type in tunnels, shape of the grubs, nature and distance between sub tunnels- bores/tunnels arising from the main feeding tunnel which open through which feces and chewed frass expelled out and presence or absence of frass in main feeding tunnel.

These features are species specific and served to characterize the infested plants.

Infestation rates were recorded separately for different mulberry genotypes and age groups. The observations made during the current study were tabulated. Statistical tests, Chi square (χ^2) test and Student's t-test were utilized to analyze the data and the values were considered significant at $P < 0.05$.

RESULTS

In the present study two species of long horned beetles viz. *Apriona germari* Hope (Coleoptera: Cerambycidae) and *Batocera rufomaculata* De Geer (Coleoptera: Cerambycidae) were registered to pester the mulberry plants irrespective of their genotype and age.

Infestation of *Apriona germari*

The infestation rate of *A. germari*, commonly called mulberry longicorn beetle, on different mulberry varieties viz. Goshorami, Chinese white, Chakmajra, Mandalay, KNG, Tr-10 and V-1 ranged between 15.05-22.67%. Highest infestation rate was recorded in Goshorami variety of which 22.67 ± 1.60 (mean \pm SE) percent plants were infested by the beetle, whereas least infestation rate was recorded in Chakmajra variety (Table 1). Though the infestation rate varied between different genotypes, but it is statistically insignificant ($P > 0.05$) among most of the genotypes. However, rate of infestation is significantly lower in Chakmajra variety than rest of the varieties except KNG ($P < 0.05$).

Table 1. Mean infestation rate of *A. germari* in different age groups of 7-mulberry genotypes in Jammu and Kashmir

Genotype	Infestation rate (mean \pm SE) in different age groups (%)			
	1-5 years	5-10 years	Above 10 years	Mean*
Goshocrami	20.00 \pm 1.00	22.50 \pm 1.50	25.50 \pm 6.50	22.67 ^a
Chinese white	17.63 \pm 1.18	19.12 \pm 0.74	21.87 \pm 1.81	19.54 ^{ab}
Chakmajra	13.83 \pm 0.70	16.50 \pm 1.28	14.83 \pm 0.60	15.05
Mandalay	14.50 \pm 1.77	23.00 \pm 1.32	20.17 \pm 1.45	19.22 ^{ab}
KNG	14.00 \pm 1.00	18.50 \pm 1.50	20.00 \pm 2.00	17.50 ^b
Tr-10	16.25 \pm 0.59	19.88 \pm 1.28	23.25 \pm 1.75	19.79 ^{ab}
V-1	18.67 \pm 1.05	24.00 \pm 1.75	22.50 \pm 1.43	21.72 ^{ab}

*Means followed by the same superscripts are insignificantly different ($P > 0.05$)

Infestation rate among different age groups of mulberry trees were statistically significant ($P < 0.05$); 16.41 \pm 0.92 (mean \pm SE) percent mulberry plants in the age group of 1-5 years were attacked by *A. germari*, where as 20.50 \pm 1.00 (mean \pm SE) and 21.16 \pm 1.30 (mean \pm SE) percent plants in the age groups of 6-10 years and more than 10 years were infested by it respectively. Statistical analysis revealed that infestation rate was significantly lower among plants in the age group of 1-5 years than plants in the age group of more than 10 years ($t=3.02$, $P < 0.05$, $df=4$), however, difference in infestation rate in 6-10 years and more than 10 years is insignificant ($P > 0.05$).

Infestation of *Batocera rufomaculata*

The infestation was recorded in all the mulberry genotypes screened against the attack of red spotted longicorn beetle, *B. rufomaculata* (Table 2). Infestation rate varied significantly among different age groups of mulberry plants ($P < 0.05$). Red spotted longicorn beetle pestered least number, 6.564 \pm 0.37% (mean \pm SE), of

mulberry plants in the age group of 1-5 years, where as 12.69 \pm 0.66% (mean \pm SE), and 17.56 \pm 0.82% (mean \pm SE) trees in the age groups of 6-10 years and above 10 years were attacked respectively. The infestation rate among plants in the age group I (1-5 year old plants) is significantly different from that of 6-10 years ($t=8.15$; $P < 0.05$, $df=12$); which in turn is again different from the above 10 year old mulberry plants ($t=4.68$; $P < 0.05$; $df=12$). The difference in infestation rate between 1-5 year and above 10 year old plants is highly significant ($t=12.31$; $P < 0.05$; $df=12$).

Among the genotypes Chakmajra variety showed slight resistance to the attack of longicorn beetle under study. Results revealed that infestation rate is significantly lower ($P > 0.05$) in Chakmajra as compared to the other genotypes studied, where as it is highest in Goshocrami. The beetle pestered 4.71 \pm 0.52% (mean \pm SE), 9.71 \pm 0.68% (mean \pm SE) and 13.00 \pm 0.61% (mean \pm SE) plants of Chakmajra variety and 7.5 \pm 0.5 % (mean \pm SE), 15.5 \pm 1.5% (mean \pm SE) and 19.5 \pm 1.5 % (mean \pm SE) plants of Goshocrami in age groups of 1-5

Table 2. Infestation rate of *B. rufomaculata* among different age groups of mulberry plants

Genotype	Infestation rate (mean \pm SE) in different age groups*		
	1-5 years	6-10 years	Above 10 years
Goshoerami	7.50 ^a \pm 0.50	15.50 ^b \pm 1.50	19.50 ^c \pm 1.50
Chinese white	7.12 ^a \pm 0.55	13.50 ^b \pm 0.32	18.87 ^c \pm 0.69
KNG	6.00 ^a \pm 1.00	12.50 ^b \pm 0.50	17.50 ^c \pm 0.50
Tr10	6.65 ^a \pm 0.42	12.37 ^b \pm 0.46	17.87 ^c \pm 0.63
Chakmajra	4.71 ^a \pm 0.52	09.71 ^b \pm 0.68	13.00 ^c \pm 0.61
Mandalay	6.57 ^a \pm 0.57	12.14 ^b \pm 0.59	17.57 ^c \pm 0.84
V-1	7.42 ^a \pm 0.48	13.14 ^b \pm 0.82	18.85 ^c \pm 0.98

*Means followed by the same superscripts are not significantly different ($P > 0.05$)

year, 6-10 year and above 10 years respectively. Infestation rate among other genotypes of different age groups ranged between 6.00-18.87% (Table 2).

DISCUSSION

Although Beeson (1941), Ertian (2003), Zeya *et al.* (2003), Khan *et al.* (2004) and Hussain *et al.* (2009) observed the infestation of *A. germari* in mulberry trees, but they have not reported the infestation rate among different genotypes. In the present study, the rate of infestation among mulberry genotypes viz. Goshoerami, Chinese white, KNG, Tr10, Chakmajra, Mandalay and V-1, in different age groups revealed that all the screened genotypes were prone to the attack of mulberry longicorn beetle and the difference in infestation rate among genotypes except Chakmajra is not significant; Chakmajra variety though susceptible to the attack of the longicorn beetle under study relatively offered slight resistance against it. The

infestation rate among 1-5 year old plants is significantly lower than rest of the age-grouped plants.

B. rufomaculata is a polyphagous pest attacking more than 50 species including mulberry plants (Husain and Khan, 1940; Beeson, 1941; Duffy, 1968; Tara, 1983; Sharma and Tara, 1995; Zeya *et al.*, 2003; Khan *et al.*, 2004). Preliminary work carried out by Tara (1983) and Sharma and Tara (1995) on the infestation rate revealed that Chakmajra variety is relatively resistant to the attack of *B. rufomaculata* and in the present study Chakmajra variety continued to be relatively resistant as compared to the other genotypes (table 2). Among the rest of the screened genotypes, the difference in the rate of infestation was insignificant by Student's t-test. Infestation rate was significantly different among different age groups ($P < 0.05$), least (6.564 \pm 0.368%; mean \pm SE) in 1-5 year age group and highest (17.594 \pm 0.817%; mean \pm SE) in above 10 year old plants.

CONCLUSIONS

The present study revealed that mulberry plants irrespective of their genotype and age group are susceptible to the attack of Cerambycid borers in temperate and subtropical climatic conditions of Jammu and Kashmir state (India). This information will contribute to study the biology and behavior of these pests in relation to the host plant. Future studies will include to investigate the management strategies against the longicorn beetles. The present and proposed future investigations will help to prevent mulberry plants from borer infestation, which otherwise pose great threat to sericulture industry in the region.

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