Uttar Pradesh J. Zool. 16 (2) : 104-108 , 1996 *ISSN 0256-971X*

EFFECT OF DIFFERENT MULBERRY VARIETIES DURING LATE - AGE SILKWORM *BOMBYX MORI* ON INCIDENCE OF GRASSERIE AND THE COCOON CHARACTERS

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The effect of feeding different mulberry varieties during 4th and 5th instars of bivoltines (NB 18 and NB4D2) and a cross - breed (PM x NB 18) was studied. On the whole, S54 and mixed feeding encouraged the incidence of diseases and lowered the economically important larval and cocoon characters.

INTRODUCTION

Nutrition plays a vital role in determining the health, and productivity of the silkworm *Bombyx mori* (L). Growth and development of silkworm larval and the economic characters of cocoon are greatly influenced by the nutritional status of leaves, which even varies from different varieties of the same species (Misra *et al.*, 1995). Moreover, the health, the state of being free from diseases, in turn depends upon the nutritional status (Aruga, 1994). However, the farmers of northern Karnataka are facing shortage of leaf in the penultimate stage (ex : 5th instar) and they are feeding different variety of borrowed leaves at the time of scarecity of fodder (Basavarajappa, 1995). Further, the studies on influence of nutrition on incidence of diseases in general and grasserie in particular are very scanty, and therefore, the present investigation has been undertaken to evaluate the different mulberry varieties during the 4th and 5th instars of NB18, NB4D2 and PM x NB18, results of which has been discussed in this paper.

MATERIALS AND METHODS

The experiment was conducted under sterilized laboratory conditions of northern Karnataka. The incidence of grasserie and the economic characters were tested by feeding leaves from different (*viz.* M5, S54, Mysore local and mixed : all the three varieties in equal proportion) mulberry variety.

The fresh mulberry leaves of specific variety was procured from a 3 years old mulberry garden which was located in Karnataka University Campus (represented the northern Karnataka conditions) under irrigated condition. The disease free layings of three popular silkworm breeds namely NB18, NB4D2 and a cross - breed PM x NB 18 were procured from the KSSR & DI, Bangalore. The layings were brushed, larvae were reared upto the 3rd moult by feeding normal quality of M5 leaves as per Krishnaswami (1978). The experiment was performed by treating the freshly emerged 4th instar larvae, the treated group contained 30 larvae replicated thrice. A separate group fed on M5 leaves at normal rate, was maintained as control.

Observations on incidence of the grasserie were recorded every day. The disease was confirmed microscopically and per cent mortality was calculated as per Samson *et al.* (1990). The larval and cocoon characters were evaluated by following standard methods. The results were statistically compared by following ANOVA.

RESULTS AND DISCUSSION

Incidence of grasserie

The grasserie incidence was high when the silkworms were fed with S54 and mixed mulberry varieties. NB4D2 was relatively more sensitive to S54, and mixed feeding, as compared to NB18 and PM x NB18. The breed yielded higher grasserie (10 and 12.2% respectively) when fed with S54 and mixed varieties. PM x NB18 appears to be comparatively more resistant to S54 and mixed feedings. However, the incidence of grasserie was moderate when M5 and Mysore local leaves were fed.

Table I : Effect of mulberry varieties on incidence of grasserie, and larval and cocoon characters of *B. mori*.

Mulberry variety	Silkworm breed	Disease incidence			Larval and cocoon characters								
		Grasserie incidence	Per cent cocoon melting	Total	Larval duration (hrs)	Ten mature worms wt. (g)	Per cent cocoon formation	Cocoon wt. (g)	Shell wt. (g)	Shell ratio (%)	ERR for 10,000 worms		Estimated cocoon yield (kg)
											By No.	Wt. (kg)	
M5	NB_{18}	3.3	1.2	4.5	612.6	24.560	89.9	1.293	0.230	17.9	8999.9	11.558	46.136
	NB_4D_2	2.2	1.4	3.6	612.0	26.171	88.8	1.359	0.247	18.2	8888.9	12.048	48.271
	PM X NB_{18}	4.4	1.1	5.5	543.0	17.610	95.5	1.349	0.233	17.3	9555.6	12.876	51.531
S54	NB_{18}	9.9	2.7	12.6	612.3	24.884	83.3	1.222	0.216	17.7	8333.3	10.190	40.717
	NB_4D_2	10.0	3.9	13.9	613.3	28.327	85.5	1.642	0.252	15.3	8555.6	14.020	56.156
	PM X NB_{18}	7.8	2.4	10.2	542.6	22.030	92.2	1.366	0.251	18.4	9222.2	12.599	50.378
Mysore local	NB_{18}	4.9	3.5	8.4	611.3	21.427	94.4	1.611	0.193	11.9	9444.4	10.985	60.831
	NB_4D_2	3.3	3.4	6.7	610.0	21.943	95.5	1.385	0.218	15.7	9555.6	13.230	52.907
	PM X NB_{18}	4.4	1.2	5.6	551.0	15.734	93.3	1.375	0.225	16.4	9333.3	12.536	51.315
Mixed leaves	NB_{18}	11.1	4.0	15.1	611.6	25.310	82.2	1.299	0.212	16.3	8222.2	10.695	42.711
(M_5+S_{54}+ Mysore local)	NB_4D_2	12.2	5.6	17.8	614.3	25.000	81.1	1.264	0.220	17.4	8111.1	10.267	41.004
	PM X NB_{18}	8.9	8.9	17.8	540.3	16.097	87.7	1.255	0.214	17.1	8777.7	11.028	44.025

Each value is a mean of 3 replications.

Moreover, the melting parentage was low in the cross - breed (except for when fed with mixed varieties) as compared to the bivoltines. Among the bivoltines, the NB4D2 recorded higher melting parentage than the NB18. Cocoon melting was minimum when M5 leaves were fed (Table I). The highest cocoon melting was recorded in PM x NB18 when mixed leaves were fed.

Larval duration : It was evident from the results that feeding on different varieties or on the mixed varieties had any significant ill effect on larval duration. However, PM x NB 18 indicated shortest larval period (Table I).

Mature worm weight : As usual the bivoltines demonstrated highest body weight among the bivoltines, NB4D2 recorded higher body weight as compared with that of the NB18 (except for feeding on mixed leaves). Feeding on S54 mulberry leaves appeared to enhance the body weight significantly (Table II).

Table II : F values for larval and cocoon characters screened against mulberry varieties.

Characters	Analysis of variance between		
	Silkworm breed	Mulberry variety	Interaction
Grasserie incidence (%)	0.50	24.74*	0.80
Per cent melting	0.50	10.46*	2.83**
Larval duration (hrs)	170.05*	0.06	0.32
Ten mature worms wt. (g)	17.78	4.07**	0.55
Per cent cocoon formation	4.92**	3.13**	1.57
Cocoon weight (g)	4.22*	1.48	1.65
Shell weight (g)	3.97**	4.66**	0.70
Shell ratio (%)	0.61	3.84**	1.96
ERR for 10,000 worms brushed : By number	1.47	4.38**	1.05
By weight	4.72**	9.00*	0.78
Estimated cocoon Yield (kg)	3.39**	1.28	1.61

* = Values significant at 1% level.

** = Values significant at 5% level.

Per cent cocoon formation : Interestingly, all the silkworm breeds indicated highest per cent cocoon formation when maintained on Mysore local. The worms fed on M5 leaves were next better to show the per cent cocoon formation. Among the silkworm breeds mostly the PM x NB18 indicated highest per cent cocoon formation (Table I).

Cocoon and shell weight : The NB18 recorded lower cocoon weight than the NB4D2 and PM x NB18 when fed on M5, S54 leaves. Contrarily the breed registered higher cocoon weight when fed on Mysore local and mixed leaves. Among the tested breeds, the NB4D2 recorded higher shell weight, followed by the cross-breed PM x NB18 (Table I).

Shell ratio : M5 appeared to influence the better shell ratio than the other varieties of mulberry (Table I). However, the highest shell ratio was recorded in PM x NB18 when fed on S54 leaves. The shell ratio was remarkably less when Mysore local variety was fed.

Effective rate of Rearing (ERR)

Mysore local variety followed by M5 appeared to influence the ERR by number, in a favourable way uniformly in all the breeds. Whereas, the maximum ERR by weight was recorded in NB4D2 when maintained on S54 and Mysore local varieties. Among the silkworm breeds PM x NB18 indicated uniformly better ERR by weight irrespective of the mulberry variety (Table I).

Estimated Cocoon Yield (ECY) : The estimated cocoon yield was higher in NB4D2 as compared to that of NB18 and its hybrid PM x NB18 when fed on M5 and S54 leaves. Whereas NB18 recorded the maximum cocoon yield when fed on Mysore local variety. Interestingly, the PM x NB18

registered better cocoon yield, as compared to the bivoltines, when maintained on M5 and mixed varieties (Table I).

Analysis of variance of the data indicated that between the silkworm breeds there was a significant variation with respect to the larval duration, per cent cocoon formation, cocoon weight, shell weight, effective rate of rearing by weight, and the estimated cocoon yield. However, regarding the mulberry varieties, there was a positive indication of a significant variation with respect to the incidence of the grasserie, per cent melting, larval weight, per cent cocoon formation, shell weight, shell ratio, and the ERR by numbers and weight (Table II).

DISCUSSION

Analysis of variance of the data demonstrated a significant difference between varieties and the incidence of grasserie and cocoon melting (Table II). Perhaps, different varieties of mulberry have different proportion of nutrient contents (Haque *et al.,* 1990). Therefore, might have influenced the particular silkworm race differentially to develop susceptibility to a specific disease. As a result, possibly NB4D2 showed more susceptibility to grasserie and cocoon melting than NB18 and its hybrid PM x NB18. When a silkworm breed is brought up on a particular mulberry variety, it develops compatability with its food. This might continue for generations. But, when all of a sudden, the variety is changed the palatability might have lost and silkworm experience physiological stress to enchance susceptibility to diseases. Perhaps, therefore, feeding on such leaves, enhanced the incidence of grasserie and cocoon melting.

The varietal composition of nutrients in the leaves of different mulberry varieties differentially influence the growth and development of the silkworm *B. mori* (Das & Sikdar, 1970; Krishnaswami *et al.*, 1971; Misra *et al.*, 1995). Perhaps, therefore, although there was hardly any difference with respect to larval duration on feeding a particular mulberry variety. The body weight did indicate a significant variation. As compared to that from M5, while S54 favoured the increase in body weight, the Mysore local decreased the same. However, feeding on mixed leaves favoured only the growth of NB18.

The differences in cocoon characters were reported by Gabriel & Rapusas (1976). Opender *et al.* (1979) and Pillai *et al.* (1981) following the feeding on different mulberry varieties. The feeding of S54 and mixed mulberry leaves lowered the economically important larval and cocoon characters. Mysore local, although performed better in other respects, it lowered the larval weight and shell ratio. Nevertheless, NB18 fed Mysore local provided maximum cocoon yield. And, the cross - breed PM x NB18 fed S54, and Mysore local yielded maximum per cent cocoon formation, cocoon weight shell weight, shell ratio, ERR by number and weight, and the cocoon yield were relatively lesser than those from feeding M5. The NB18 fed Mysore local manifested the high per cent cocoon formation high ERR by number and the maximum cocoon yield. But the cocoon weight, shell weight and shell ratio are remarkably less. However, NB18 fed M5 showed least disease incidence, better larval and cocoon characters. On the whole, mulberry variety M5 appeared to have majority of the positive indications and the NB18 performed better in all respects. Hence, the combinations deserve encouragement.

ACKNOWLEDGEMENTS

The authors are grateful to the Central Silk Board, Ministry of Textiles, Government of India for the financial assistance during the tenure of this work.

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