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FIRST REPORT ON THE CO-EXISTENCE OF A MICROSPORIDIAN WITH LAMERIN BREED OF THE SILKWORM, *BOMBYX MORI* L.

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In the present study, the co-existence of a microsporidian with Lamerin breed of the silkworm, *Bombyx mori* L. has been investigated. This investigation has produced information on the influence of microsporidian on morphometric parameters of the breed. The microsporidian parasite transmits transovarially, causes disease, is not found to be an important factor that adversely influences the development of the host. Microsporidian parasite and Lamerin breed have a close relation with each other. Larvae developed from the eggs laid by female infected with microsporidian parasite were as normal as larvae developed from the eggs laid by healthy female. The infection showed no significant effect on development and health status during their life cycle.

Key words: *Bombyx mori*, co-existence, Lamerin breed, microsporidian,

INTRODUCTION

Microsporodiosis in the silkworm, *Bombyx mori* L. is a dreaded disease caused by *Nosema bombycis*. The disease has almost wiped out sericulture in several European countries in the past with its efficient parasitisation, unique transovarial transmission and secondary infection in silkworm (Tasuk, 1971). The disease is becoming increasingly more and more complex, because several strains of the microsporodia are being encountered in the silkworm crop (Fujiwara, 1993). No silkworm breed is reported to be completely immune to the microsporidiosis. However a hibernated mulberry silkworm breed - Lamerin survives inspite of infection by a microsporidian parasite for generations without causing much harm (Vijayalakshmi, 2000). The disease is transmitted to the progeny through the infected mother and the infected larvae survive and spin cocoons. There was no systematic study on the relationship and influence of the associated microsporidian on the host. The present study was carried out to investigate the effect of microsporidian on the larval, pupal and adult morphometric development.

MATERIALS AND METHODS

Collection of Eggs of Lamerin breed of the silkworm

The eggs of silkworm breed Lamerin infected with the microsporidian and disease free were received from Regional Tasar Research Station, Imphal, India during 2003 (Fig. 1). Manipur is one of the important sericulture potential states in India, with its traditional pockets of sericulture village like Leimaram, Leimapokpam, Tera Khongshangbi and Awangjiri. The use of silk is associated since the period of Khamba Thoibi year. Manipur is endowed with very rich flora and fauna. The high hilly terrain, forests, hills, deep forestation, high rainfall, high humidity, moderate climate in plains, valleys and cold at high altitudes are the main ecological components. The state admits a temperature range of 0-38.5^{0}C and average rainfall varying from 933 -2593 mm and relative humidity from

Table I : Measurement of each instar length and width (mm) during 0-day and on 7th day in 5th instar.

Treat-ment	Measurement of different instar larvae during zero-day										Mature 5th Instar larva	
	I		II		III		IV		V			
	Length	Width	Length	Width	Length	Width	Length	Width	Length	Width	Length	Width
T1	2.50 ± 0.53	0.25 ± 0.05	4.10 ± 0.57	0.91 ± 0.09	12.60 ± 0.97	1.49 ± 0.10	20.10 ± 2.08	2.23 ± 0.43	32.40 ± 0.63	3.35 ± 0.63	48.20 ± 1.62	4.89 ± 0.10
T2	2.50 ± 0.53	0.28 ± 0.04	4.10 ± 0.57	0.92 ± 0.08	12.50 ± 0.85	1.51 ± 0.06	20.00 ± 2.16	2.17 ± 0.44	32.40 ± 3.24	3.50 ± 0.58	47.60 ± 2.32	4.82 ± 0.30
t-test	0NS	1.41NS	0NS	0.27NS	-0.25NS	0.55NS	-0.11NS	-0.31NS	0NS	0.56NS	-0.67NS	-0.71NS

Values are mean ± SD; NS : Not significant.

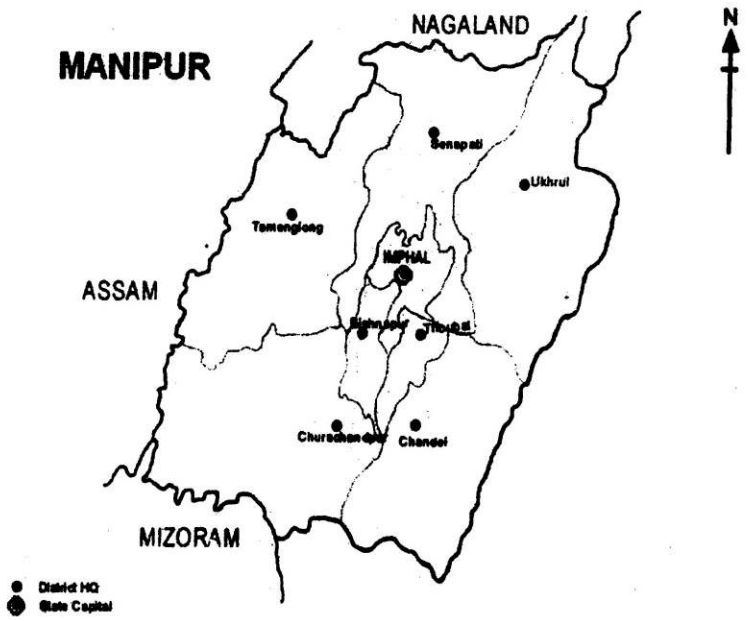

Fig. 1 : Collection of egg of Lamerin breed infected with microsporidian and disease free from Regional Tasar Research Station, Imphal (Manipur).

20-100%. The state is located between 23.83 and 25.58^{0}N latitude and 93.05 and 94.78^{0}E longitude with 22.365 km in area.

Confirmation of the health status of Lamerin breed of the silkworm

In order to free Lamerin breed colony from contamination by associated microsporidian isolate, the following procedure was followed :

- Gravid female moths were isolated in sterilized containers.
- After oviposition, the females were examined for infection.
- Egg batches from uninfected mother moths were maintained separately.
- Surface sterilization of eggs was done by immersing in 2% formaldehyde for 5 minutes at room temperature prior to hibernation.

Rearing of healthy and infected population of Lamerin breed

The healthy and infected laying (observed as T_1 and T_2) were incubated at 25 ± 1^{0}C and 80 ± 5% R.H., brushed in seperate disinfected rearing trays and rearing rooms at silkworm pathology laboratory in Central Sericultural Research and Training Institute, Mysore (India) following the standard procedure (Datta, 1992). The size of larva (anaesthetized with chloroform ($CHCl_3$) - Sisco Research Laboratories Pvt. Ltd. Bombay, India at zero days of each instar and on 7th day of 5th instar were measured with scale. The size of male and female pupa and adult were measured.

RESULTS AND DISCUSSION

The results of influence of microsporidian on the morphometrics of the Lamerin breed are presented in Table I, II and III. The size of larva, pupa and adult were identical in both the batches (T_1 and T_2) except width of the female adult in T_2 was significantly decreased. The growth of the larvae in terms of larval body length and width was significantly increased with the larval development in both the batches (Table I). There was no significant influence of the microsporidian on the larval development. The larval length from 1st instar (hatched larvae) to mature 5th instar larvae ranged from 2.50 to 48.20mm and width 0.25 to 4.89mm in T_1, however in case of T_2 the larval length ranged from 2.50 to 47.60 mm and width 0.25 to 4.82 mm. The 5th instar larva increased 13 times in larval length from the just hatched larva in both the treatments. According to the measurements, average body length of pupa was 20.90 mm, 19.60 mm and width were 6.20 mm, 5.20 mm in T_1 batch of female and male, respectively. However, in case of T_2 average body length were 20.60 mm, 19.30 mm and width was 5.80 mm, 5.30 mm in case of female and male, respectively (Table II). The average body length was 19.80 mm and 17.40 mm and width was 8.70 mm and 5.10 mm in female and male adults in T_1 respectively. However, in case of T_2 the average body length of female and male adults were 19.10 mm and 18.40 mm and width were 7.10 mm and 4.60 mm, respectively The body size of female adults was larger than that of the male counter parts in both treatments (Table III).

Table II : Measurement of pupal length and width (mm) sex wise.

Treatment	Size of female pupa		Size of male pupa	
	Length	Width	Length	Width
T1	20.90 ± 1.37	6.20 ± 0.63	19.60 ± 1.07	5.20 ± 0.42
T2	20.60 ± 1.51	5.80 ± 0.79	19.30 ± 0.82	5.30 ± 0.48
t-test	0.47NS	1.2NS	0.70NS	-0.49NS

Value are mean ± SD; NS : Not significant.

Table III : Measurement of adult length and width (mm) sex wise.

Treatment	Size of female moth		Size of male moth	
	Length	Width	Length	Width
T1	19.80 ± 0.92	8.70 ± 1.25	17.40 ± 1.51	5.10 ± 0.88
T2	19.10 ± 0.99	7.10 ± 1.37	18.40 ± 0.84	4.60 ± 0.52
t-test	1.63NS	2.73*	-1.83NS	1.5NS

Value are mean ±SD; NS : Not significant; * : Significant at 5% level.

It is observed from the results that the associated microsporidian parasite with Lamerin breed of the silkworm *Bombyx mori* does not affect the most morphometric parameters of its host significantly except significant decrease was observed in width of female adults in T_2. This is contrary to the observations made in the silkworm with microsporidian infection such as *Nosema bombycis* where 100% mortality is observed by 3rd instar when transmitted transovarially (Han & Watanabe, 1988). The growth of the larvae becomes tiny when infected with *N. bombycis* in the early 1st and 2nd instar and dies by 4th or 5th instar after discharging spores (Baig, 1994). But in the present study there was no effect of infection on the morphometric of the host and the infected batch was as good as

healthy ones. Reports are available on the host parasite interaction that growth of the host is markedly inhibited by parasitic infection (Nath *et al.*, 1990; Rath *et al.*, 2000; Dorert Goertz *et al.*, 2004). In present investigation, it is clearly indicated that the microsporidian is associated with breed for generations without causing any appreciable harm to the host. From the study, it is inferred that the infection of Lamerin breed by microsporidian parasite does not significantly influence larval, pupal or adult growth and demonstrates the co-existence of a microsporidian and Lamerin-breed of the silkworm.

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