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Investigation on the rate of spread of Grasserie disease in Silkworm, *Bombyx mori* L population

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Abstract

Grasserie is most dreaded disease among all infectious diseases of the silkworm, *B. mori* which cause heavy crop loss at field level if not managed properly. In present study rate of disease spread in silkworm population through different modes (inoculation, spray and also through introduction of carriers in a healthy population of silkworms) were investigated that revealed the disease

spread in the silkworm population through all the three modes and ascertained that once pathogen comes in contact with the host not only spread infection in the but also deteriorate the economic characters significantly. It is therefore, concluded that utmost care must be given to exclude the pathogen from the rearing environment in order to save the cocoon crop.

Keywords: *Bombyx mori*, Carriers, Infection, Nuclear Polyhedrosis virus and Spread

1. Introduction

Due to the continuous domestication the silkworm *Bombyx mori* L has become susceptible to various infectious diseases caused by different pathogenic microbes. Diseases contribute considerably to the cocoon crop and directly affect the farming community due to reduced returns and affecting the earning foreign exchange (Govindan and Devaiah, 1995) ^[4]. Different infectious diseases in silkworms cause 40 percent crop losses (Sheebarajakumari *et al.*, 2007) ^[10] and the loss due to grasserie has been reported to the extent of 25-32 percent (Chisti and Sahaf, 1990) ^[3]. The disease is of economic importance in sericulture as it is most common and known to inflict significant losses to cocoon crop throughout the year especially during summer season (Selvakumar *et al.*, 2002) ^[9]. The disease is called by numerous local names such as 'Halu-Halu' in Karnataka, 'Rosa' in West Bengal, 'Pal Puruga' in Andhra Pradesh, 'Pal Poochi' in Tamil Nadu and 'Aabah Baimair' in Kashmir. It has been observed that, after through disinfection in the rearing environment there is always sporadic grasserie incidence which leads to crop losses. It was felt to investigate the causes of spread of grasserie diseases in the silkworm population.

2. Materials and methods

The silkworms were reared enmass upto 3rd instar and just after 3rd moult worms were classified into four batches / treatment. The various treatment is as (T₁ - inoculated batch, T₂ - sprayed batch, T₃ introduction of carriers in a healthy population at the ratio of 8:92 and T₄ - Control). The *Bombyx mori* nuclear polyhedrosis virus (*BmNPV*) inoculum of 1x10⁶ was collected from silkworm pathology laboratory of the institute and used in the experiment. Each treatment had five replications of 100 larvae reared upto spinning. The data with regard to larval duration, disease incidence, cocoon yield and pupation rate were recorded and analyzed statistically.

3. Results and discussion

Perusal of results revealed that significant difference was recorded both in 5th as well as total larval duration being shorter 180.01 and 660.01 likewise significant difference was also recorded with respect to larval as well as pupa mortality (Table-1). Highest larval and pupal mortality (59.00 and 23.00) were recorded in T₁. Cocoon yield by number was decreased significantly and the lowest was recorded in T₁ (4100.00) as compared to T₄ (9766.66), similarly lower cocoon yield by weight was recorded in T₁ (5.93kg) as compared to 17.79Kgs in T₄. Significant difference was also observed in pupation rate being lowest in T₁(43.90%) and highest was recorded in T₄ (98.98%).

Grasserie is caused by *Bombyx mori* Nuclear polyhedrosis virus (*BmNPV*) is the most dreaded disease one which causes great crop loss even sometimes results in total crop failure when infection is severe (Illahi and Nataraju, 2007) ^[6]. Apart from

causing larval mortality, grasserie is also responsible for the post cocoon mortality if the infection takes place during late age rearing especially during 5th stadium (Chandrashakera *et al.*, 2004) [1]. It has been observed that after taking prophylactic measures the sporadic disease outbreak of grasserie takes place at farmer's level. A study was undertaken to investigate the cause and rate of spread of grasserie disease in the silkworm population and its impact on the host. Results of the study revealed that all the three treatments tested spread disease in the silkworm population and had also significant impact on economic characters. The 5th as well as total larval duration prolonged in infected batches as compared to that of control which could be due to cessation of feeding by diseased worms. The results of present study are in agreement with the findings of Gururaj *et al.*, (1999) [5] and Mikhailov *et al.*, (1992) [7] who reported that silkworm infected with viral disease loose feeding ability due to the decreased digestive enzymes activity and variation in hormones titers. Vijayakumari *et al.*, (2001) [11] have also reported prolongation of 5th instar in *BmNPV* infected silkworms and attributed it to the increased production of juvenile hormone with decrease in ecdysone titer. Disease incidence both larval as well as pupal mortality was recorded in all treated batches but higher mortality was recorded in T₁ (inoculated batch) as compared to other two treatments. This may be due to the ingestion of

higher dose of viruses and its quick dissolution in the midgut and liberation of virions that invaded the neighboring susceptible cells of the host and lead to the mortality in one cycle. The present finding corroborates the study of Chandrasekharan *et al.*, (2006) [2] who reported that higher dose of grasserie virus can cause mortality to the larvae within one cycle of its multiplication, but low dose may require more such multiplication cycles to cause mortality. It is also established from the present investigation that the *BmNPV* spreads infection secondarily by introduction of carriers in the silkworm population however the degree of infection was low as compared to T₁ and T₂. varies. This is in agreement with the investigation carried out Nataraju (1998) [8] who reported the introduction of *BmNPV* carriers into the healthy population of silkworms resulted in the infection but the infection range in the population was in proportionate with the number of carriers introduced in the host population. Results of the present study elucidated that infection have influenced cocoon crop yield (by number and by weight) and pupation rate significantly. It is therefore, confirmed from the study that once the virus comes in contact with the host, start multiplication and spread disease in the population that not only cause mortality but also effect the yield. It is concluded that utmost care must be taken to exclude the pathogen from the rearing environment in order to harvest the good cocoon crop.

Table 1: Disease spread and its impact of grasserie through different modes on silkworm, *Bombyx mori* L.

Treatment	Larval duration (hrs)		Mortality due to Grasserie at		Cocoon yield / 10,000 larvae		Pupation rate (%)
	5 th	Total	Larval	Pupal	by number	by weight	
T ₁	212.86 ^d	692.86 ^d	59.00 ^d (50.16)	23.00 ^d (28.64)	4100.00 ^d	5.93 ^d	43.90 ^d (41.47)
T ₂	200.53 ^b	680.53 ^b	33.00 ^b (35.03)	16.00 ^b (23.56)	6700.00 ^b	10.72 ^c	76.11 ^b (60.71)
T ₃	209.86 ^c	685.86 ^c	41.00 ^c (39.79)	19.00 ^c (25.82)	5900.00 ^c	9.65 ^b	67.79 ^c (55.40)
T ₄	180.01 ^a	660.01 ^a	1.33 ^a (6.53)	1.00 ^a (5.73)	9766.66 ^a	17.79 ^a	98.98 ^a (83.35)
C.D (P≤0.05)	5.73	4.00	2.17	1.21	240.59	1.33	1.70
SE(m)	1.73	1.21	0.88	0.36	72.64	0.56	0.51

- Means with different super script are significantly different from each other.
- Values in parenthesis are Arc sine transformed values

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