



EVALUATION OF BIOCHEMICAL CONTENTS OF MULBERRY SILKMOTH LARVAE DUE TO MUSCARDINE AND FLACHERIE DISEASES

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ABSTRACT

It has been observed during the process of mulberry silkmoth rearing that it suffer great loss of crop due to diseases like Virosis, Muscardine, Flacherie and Pebrine as a result the productivity and quality of mulberry silk evidently get affected. Some brilliant biochemical investigation in relation to free amino acids, protein, crude fibre, carbohydrate, lipids and sterols have been carried out by many workers and they have found that the biochemicals are necessary for the normal growth and development of insect. More over these biochemicals greatly influence growth and development of insects. Infected lot of fifth stage larvae of *Bombyx mori* have been evaluated for their biochemical contents namely free amino acids, carbohydrate, protein, lipids, moisture and ash. The results obtained have been compared with the control and finally presented in the table 1 and 2. The result obtained become very clear when we consider the fact that the pathogens causing the diseases play important role in disturbing the biochemical makeup of the larvae in process of metabolic manifestations. It is also evident that the energy releasing biochemical contents get affected due to the activities of the pathogen causing the disease. The supremacy of commercial crop season over the seed crop season by and large is due to the variations in the climatic and dietary conditions. The greater loss of biochemical content due to Flacherie than the Muscardine is supposed to be caused by different nature of pathogens causing the diseases.

KEY WORDS: Silkmoth Larvae, Muscardine, Flacherie, Biochemical parameters.

INTRODUCTION

Silk is one of the best Natural fibres produced by a phytophagous insect of order Lepidoptera of class insecta. It is also known as queen of fibres and has been symbol of status for men wearing silk made clothes from time immemorial. The increasing demand of silken clothes in India and abroad has created a new sector for its large scale production called “sericulture” to meet the demand of the various textile industries. This way it helps in riching the economy of nation as well as solving the problems of unemployment.

India is the only country of the world which has the blessings of producing all different varieties of silk of which ‘Mulberry’ is the superone and is produced by a silkworm *Bombyx mori* domesticated indoors on chopped mulberry leaves under natural and controlled conditions. But the process of rearing suffers from various diseases caused by different pathogens like bacteria, viruses and fungi and causes a great loss in the productivity and quality of the fibre of great commercial value (Sharma *et al.*, 2008). The earlier pathological investigations carried out by different workers are indicative of the fact that the diseases caused by difference pathogens are of different nature and have different potential to cause damage to silk crops (Allen and Bunson, 1974; Griyaghey, 1974; Jolly, 1974; Kar and Sinha, 2012; Kumari and Sharma, 1994). The present study is based on the said facts and deals with the relative effect of some diseases Flacherie and Muscardine caused by bacteria and fungi on the biochemical content of Larvae of the silkworm *Bombyx mori* during seed crop season and commercial crop season.

MATERIALS AND METHODS

Larvae of *Bombyx mori* infected with Muscardine and Flacherie diseases were collected and carefully identified as per the specific method with the help of the symptoms, as worked out (Jolly and Sen, 1972) and brought to laboratory condition for their biochemical analysis. The biochemical analysis in respect of free amino acids, protein, carbohydrate, lipid, moisture and ash contents were carried out during seed crop and commercial crop seasons as per the standard methods suggested. A control was also maintained. Further data were collected, compared and analysed. The analysed data were finally presented in the table 1 and 2. The entire work during both the seasons in respect of biochemical contents of the diseases of silkworms were carried out in the P.G. Department of Zoology, Magadh University, Bodh-Gaya, Bihar, India.

RESULTS

Observation in relation to the impact of biochemical contents of the larvae of mulberry silkworm of *Bombyx mori* L. in respect of free amino acids, protein, carbohydrate, lipids, moisture and ash contents during the seed crop and commercial crop seasons have been evaluated against the control. Results obtained have been recorded in the table 1 and 2.

Table 1 reveals the relative effect of Muscardine and Flacherie diseases on the free amino acid contents during the seed crop season. It is evident from the table that the no. of free amino acids in the experimental lot for Muscardine is 15 where as the total no. of free amino acids in control is 19. The arginine, cystic acid, methoxyinesulphoxide & threonine are altogether missing

in the experimental lot. Further the cystic acid, cystin glutamic acid, glycine, lysine has been found in traces under the experimental lot (Sinha *et al.*, 1976; Sinha and Pandey, 1990). The asparagines, asparatic acid, beta alanine, leucin and valine are abundant in the heamolymph of the Muscardine infected lot (Jolly *et al.*, 1969). Likewise the impact of Muscardine disease in respect of free amino acids during the commercial crop season against the control has been presented in table 2. The table reveals the presence of altogether 17 free amino acids under the infected lot in comparison to 19 free amino acids under the control lot. The methyoxinesulphoxide, threonine is altogether absent in the experimental lot. Further the cystic acid, cystine, glycine & lysine are in traces in comparison to control. It is further clear that the asparagines, glutamic acids and lucine are abundant in control (Jolly *et al.*, 1969). Whereas these acids show their presence in traces in respect of Muscardine.

The impact of Muscardine disease on the carbohydrate contents at larval level during the seed crop and

commercial crop season has been evaluated and the results have been presented in the table 1 and 2. Table 1 account for 6.13% carbohydrate contents in the Muscardine lot against 7.37% carbohydrate contents in the control which is highly significant. Likewise 6.57% against 7.93% under the control as per table 2 which appears significant (Kar and Sinha, 2012).

The impact of Muscardine disease on the protein contents at larval stages during the seed crop and commercial crop seasons. Table 1 indicates that the percentage of protein under the experimental lot is 42.70% under the control, which is significant. Table 2 also accounts the presence of 41.65% protein contents in the experimental lot against 43.11% under the control lot during the commercial crop season which appears to be significant (Agrel, 1949; Ahsan, 1982; Jolly and Sen, 1972; Sharma and Sinha, 1991; Sinha, 1982).

TABLE 1: Showing effects of Muscardine and Flacherie diseases on the biochemical contents of Larvae of Mulberry silkworm during seed crop season

Replication	Biochemical Parameters	Experimental % (A.V.)		Control %	C.D. at 0.5% Level for Characters
		Muscardine	Flacherie		
1	No. of Free Amino acids	15	13	19	**
2	Carbohydrate (%)	6.13	5.19	7.37	***
3	Protein (%)	40.40	38.54	42.70	**
4	Lipid (%)	15.40	13.28	15.97	**
5	Moisture (%)	50.64	48.39	51.32	N.S.
6	Ash (%)	5.46	4.34	5.47	N.S.

Key symbols: ***: Highly significant, **: Significant, N.S.: Non significant

Table 1 indicates that the lipid contents in the Muscardine infected larvae are 15.40% against 15.97% under the control lot during the seed crop season. Further the lipid contents are 15.71% in the infected lot against 16.13% under the control during the commercial crop season, as per table 2 which is significant (Agrawal *et al.*, 1975; Sinha 1970). The relative impact of Muscardine disease on the moisture contents at the larval stage during the seed crop and commercial crop seasons have been presented in the table 1 and 2. Table 1 indicates the presence of 50.64% moisture in the experimental lot against 51.32% under the

control during the seed crop seasons. Likewise the moisture contents has been found to be 51.34% in the Muscardine lot against 51.38% in the control lot during the commercial crop season as per table 2, which does not appear to be significant (Pandey, 1989). The relative effect of Muscardine disease on the ash contents is 5.46% in the experimental lot against 5.47% of the control during the seed crop season. The presence of 5.54% ash contents in the Muscardine lot against 5.66% of the control during the commercial crop season, which is not significant.

TABLE 2: Showing effects of Muscardine and Flacherie diseases on the biochemical contents of Larvae of Mulberry silkworm during commercial crop season

Replication	Biochemical Parameters	Experimental % (A.V.)		Control %	C.D. at 0.5% Level for Characters
		Muscardine	Flacherie		
1	No. of Free Amino acids	17	15	19	**
2	Carbohydrate(%)	6.57	5.53	7.93	***
3	Protein(%)	41.65	39.41	43.11	**
4	Lipid(%)	15.71	14.86	16.13	**
5	Moisture(%)	51.34	48.41	51.38	N.S.
6	Ash(%)	5.54	4.44	5.66	N.S.

Key symbols: ***: Highly significant, **: Significant, N.S.: Non significant

The overall observation in respect of the Muscardine disease on the biochemical contents at larval stage during the seed crop and the commercial crop seasons are finally indicative of the following facts. The effect of Muscardine disease on the free amino acids, proteins, carbohydrates & lipids are evident as it affects the biochemical concentration of the larvae of mulberry silkworm.

Likewise the impact of Flacherie disease of mulberry silkworm caused by bacterial infection has also been evaluated and its relative analysis with Muscardine disease in respect of biochemical contents at larval stage of *Bombyx mori* L. has been carried out as per table 1 and 2 (Muscardine and Flacherie) during the seed crop and commercial crop season. *Bombyx mori* larvae infected

with Flacherie disease have total number of free amino acid 13 and 15 during the seed crop and commercial crop season. The percentage of carbohydrate is 5.19% and 5.43% , protein 38.54% and 39.41%, lipid 13.28% and 14.86%, moisture percentage 48.39% and 48.41% and ash percentage 4.34% and 4.44% as per the table 1 and 2.

DISCUSSION

Infected lot of fifth stage Larvae of *Bombyx mori* has been evaluated for their biochemical contents namely free amino acids, carbohydrate, protein lipids, moisture and ash during the seed crop and commercial crop seasons finally reveal the under given facts.

1. The effect of Muscardine and Flacherie diseases on the free amino acids, protein, carbohydrates & lipids are evident as it affects the biochemical concentration of the larvae of mulberry silkworm (Agrawal, 1974; Jolly and Sen, 1990; Pandey, 1989; Sharma and Sinha, 1991; Sinha, 1970).
2. No significant difference between control and experimental lot (infected) in respect of ash and moisture contents have been noticed (pandey, 1989).
3. Seasonal variations in respect of biochemical contents have been found to be highly significant (Choudhary, 2008; Kumari, 2003; Sharma and Sinha, 1991). Commercial crop season has registered its supremacy over the seed crop season both under the experimental and control lots.
4. Deficiency of biochemical contents in the infected lot has been found to impair of larval growth of mulberry silkworm (Kumar, 2001; Pandey, 2003).
5. The losses of biochemical contents are relatively greater due to Flacherie infection than the Muscardine infection.

The results obtained become very clear when we consider the fact that the Pathogen causing the disease play important role in disturbing the biochemical makeup of the larvae in process of metabolic manifestations (Agrawal, 1974; Jolly and Sen, 1990; Pandey, 1989). It is also evident that the energy releasing biochemical contents get affected due to the activities of the pathogen causing the disease. The supremacy of commercial crop season over the seed crop season by and large is due to the variations in the climatic and dietary conditions (Choudhary, 2008; Kumari, 2003; Sinha *et al.*, 1976). The greater loss of biochemical content due to Flacherie than the Muscardine is supposed to be caused by different nature of pathogens causing the diseases (Vago, 1963).

CONCLUSION

The finding of the above experiment as shown in the table 1 and 2 clearly shows that irrespective of the season Flacherie disease is more harmful for the moths of different stages in causing damage to the biochemical contents of varied categories than that of the Muscardine and is more damaging to the economy of silk industries than Muscardine thus affects the economy of Nation.

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