



ORIGINAL RESEARCH PAPER

Zoology

RELATIVE EFFECTS OF MUSCARDINE AND FLACHERIE DISEASES ON THE BIOCHEMICAL CONTENTS OF MALE MOTHS OF MULBERRY SILKWORM

KEY WORDS: *Bombyx mori* L., Control, Experimental conditions, Parameters, Pathogens, Seasons.

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ABSTRACT

As a matter of fact the silk producing insects suffer great loss of crop (20-30%) due to various diseases like Virosis, Sporozoosis, Flacherie and Muscardine. The Muscardine and Flacherie diseases caused by fungal and bacterial infection are very prominent among the mulberry silkworm. It retards the growth, development and metabolic activities of a silkworm as a result the length and width of the worm get affected. Due to species diversities of pathogens causing in the extent of harms made by the pathogens are also reported by earlier investigator . Observation in relation to the relative impacts of two diseases on the biochemical contents on the Male moths of *Bombyx mori* have been evaluated and presented in the table 1 and 2. Results are indicative of the fact that the number and concentration of free amino acids get affected in relation to the impact of said diseases. A part from this the percentage carbohydrates, lipids and proteins also get affected under the experimental conditions as compared to control. However the percentage of moisture in the Male moths has shown increase in compared to control. No significant variations have been observed in the ash contents in relation to the impact of disease. The impacts of Flacherie disease as compared to Muscardine disease in respect of biochemical contents in Male moths are more significant in relation to deficiency of biomolecules.

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. Today over four million people earn their livelihood through sericulture (Hadimani *et al.* 1986). India is second largest producer in the world of the most valuable silk variety mulberry silk (Sampath, 1992). 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 nations as well as solving the problems of unemployment.

India is the only country of the world which have the blessings of producing all different varieties of silk of which 'mulberry' is the super one 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 (Agrawal and Jolly 1974; Jolly and Sen 1990; Pandey 1989; Sharma, (2008). The earlier pathological investigations carried out by different workers are indicative of the fact that the diseases caused by different pathogens are of different nature and have different potential to cause damage to silk crops (Agrawal 1994; Ali 2007; Allen and Bunson 1974; Griyaghey 1974; Jolly 1974; kar and Sinha 2012; Kumari and Sharma 1994;Wyatt,(1961).

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 Male moths of the silkworm *Bombyx mori* during seed crop season and commercial crop season.

MATERIALS AND METHODS

Male moths of *Bombyx mori* L. infected with Muscardine and Flacherie diseases were collected from rearing sight and carefully identified with the help of the symptoms, as worked out (Jolly nad Sen, 1972) for the biochemical investigation in respect of free amino acids, proteins, carbohydrates, lipids, moisture and ash contents and analysis 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.

RESULTS

Results obtained in relation to the impact of Muscardine and

Flacherie diseses on the biochemical contents of Male month of *Bombyx mori* have been recorded in the table 1 and 2 during the seed crop and commercial crop season.

Table 1 indicates that there are only 16 free amino acids in the experimental lot as compared to 19 free amino acids of the control lot. In the experimental lot the free amino acids like arginine, cystine, methoxine sulphoxide and valine are altogether found to be absent. Apart from this concentration of alpha alanines, asparagines, glutamic acid, glycine, lysine, serine and threonine have been found to be in traces in comparision to control (Sen *et al.* 1969). Similarly table 2 accounts for the impact of Muscardine disease on the free amino acids are 17 and control 19 in the Male moths during the commercial crop season. It indicates that the concentration of free amino acids like arginine, asparagines, cystine, glycine, methoxine sulphoxide and valine are in traces. However no free amino acids are missing. Seasonal changes and diets greatly influence the number of amino acids in *Bombyx mori* (Sinha *et al.* 1990).

Table 1 indicates that the concentration of carbohydrate is 6.57% in the experimental lot as compared to 7.58% of the control, which is not significant. Likewise as per table 2 the concentration of carbohydrate is 6.63% against 7.82% of the control which is not significant (Kar and Sinha, 2012).

Table 1 indicates that the percentage of protein in the experimental lot which is 46.13% as compared to 46.83% of the control. Further table 2 reveals that the percentage of protein in the experimental lot which is 46.94% as compared to the control, which is 47.11% and it is show significant (Agrel 1949; Ahsan 1982; Jolly and Sen, 1972).

The relative impact of Muscardine disease on lipid contents in Male moths during both the season have been evaluated and presented in the table 1 and 2. Table 1 shows that the percentage of lipid is 12.16% in the experimental lot against 12.64% of the control during the seed crop season. Likewise the percentage of lipid contents is 12.44% in the experimental lot against 12.96% of the control during the commercial crop season, which is significant (Agrawal *et al.* 1975; Tripathi 2005). Table 1 reveals that the percentage of moisture in the experimental lot is 50.12% against 48.14% of the control, which is evidently significant (Jolly 1966; Pandey 1989). Similarly the percentage of moisture in the experimental lot is 50.22% against 48.91% of the control during the commercial crop season. It appears that the experimental lot carry greater percentage of moisture as compared to control. The relative impact of Muscardine

disease on the ash contents of Male moths during both the seasons are presented in the table 1 and 2. Table 1 indicates that the percentage of ash in the experimental lot is 7.12% against 7.22% of the control during the seed crop season. Likewise the percentage of ash is 7.14% in the experimental lot against 7.31% of the control as per the table 2, which does not appear to be significant.

Further the impact of Flacherie disease of mulberry silkworm (*Bombyx mori*) on the biochemical contents at adult moths stages have been also evaluated with Muscardine disease for understanding the relative effects of diseases in mulberry silkworm and the results obtained have been recorded in the table 1 and 2 along with muscardine.

Tables reveals that the number of free amino acids (15 and 16), percentage of carbohydrate (6.11% and 6.24%), protein (43.28% and 44.39%), lipid (10.59% and 11.27%) due to Flacherie infection of *Bombyx mori* get significantly less like Muscardine infection during the seed crop and commercial crop season as compared to control which is in the tune of (No. of free amino acids 19%, percentage of carbohydrate 7.58% and 7.82%, protein 46.83% and 47.11% and lipid 12.64% and 12.96%) during seed crop and commercial crop season. The percentage of moisture content in Flacherie infected adult Male moths like Muscardine infection are greater than the control (48.14% and 48.91%). However no significant differences in respect of ash content at adult stages of *Bombyx mori* between Flacherie infected moths and normal moths have been obtained.

DISCUSSION

Observation in relation to the relative impact of two diseases on the biochemical contents on the Male moths of *Bombyx mori* have been evaluated and presented in the table 1 and 2. Results are indicative of the fact that the number and concentration of free amino acids get affected in relation to the impact of said diseases (Agrawal *et al.* 1974; Jolly and Sen, 1990). Apart from this the percentage of carbohydrate, lipid and protein also get affected under the experimental condition as compared to control (Agrawal, 1994). However the percentage of moisture in the Male moths has shown increase as compared to control (Jolly 1973; Pandey, 1989). No significant variations have been observed in the ash contents in relation to the impact of disease. The impact of Flacherie disease as compared to Muscardine disease in respect of biochemical contents in Male moths are more significant in relation to deficiency of biomolecules.

The overall relative analysis between diseased and non diseased conditions of adult moths of Mulberry silkworm reveal the following facts.

1. Both the Muscardine (fungal infection) and Flacherie (bacterial infection) of *Bombyx mori* significantly affect the biochemical contents of adult moths (Agrawal and Jolly 1974; Jolly and Sen 1990; Pandey 1989; Sinha *et al.* ,1976).
2. The relative deficiencies of Flacherie infection in respect of biochemical contents at adult stages of Mulberry moths are relatively more than Muscardine infection.
3. Seasonal differences among both types of infection are significant (Choudhary 2008; Kumari 2003; Sinha *et al.* , 1990).

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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Table 1. Showing effects of Muscardine and Flacherie diseases on the biochemical contents of Male moths of Mulberry silkworm during seed crop season.

	Replication Biochemical parameters	Experimental % (Av.)		Control (%)	C.D.at 0.5% level for characters
		Muscardine	Flacherie		
1	No. of free amino acids	16	15	19	**
2	Carbohydrate (%)	6.57	6.11	7.58	NS
3	Protein (%)	46.13	43.28	46.83	**
4	Lipid (%)	12.16	10.59	12.64	**
5	Moisture (%)	50.12	48.21	48.14	**
6	Ash (%)	7.12	6.90	7.22	NS

Key symbols :- NS =Non significant , ** = Significant

Table 2. Showing effects of Muscardine and Flacherie diseases on the biochemical contents of Male moths of Mulberry silkworm during commercial crop season.

	Replication Biochemical parameters	Experimental % (Av.)		Control (%)	C.D.at 0.5% level for characters
		Muscardine	Flacherie		
1	No. of free amino acids	17	16	19	**
2	Carbohydrate (%)	6.63	6.24	7.82	NS
3	Protein (%)	46.94	44.39	47.11	**
4	Lipid (%)	12.44	11.27	12.96	**
5	Moisture (%)	50.22	48.91	48.91	**
6	Ash (%)	7.14	6.94	7.31	NS

Key symbols :- NS =Non significant , ** = Significant

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