EFFECT OF FUNGAL AND BACTERIAL DISEASES IN DIFFERENT INSTAR MUGA SILKWORM, *ANTHERAEA ASSAMENSIS* HELFER (LAPIDOPTERA: SATURNIIDAE) IN DIFFERENT CROP SEASONS

Ranjana Das* and K. Das

* Central Muga Eri Research and Training Institute, Central Silk Board, Lahdoigarh ,-785700, Jorhat Assam, INDIA.

[Das, R. & Das, K. 2017. Effect of fungal and bacterial diseases in different instar Muga Silkworm, *Antheraea assamensis* Helfer (Lepidoptera: Saturniidae) in different crop seasons. Munis Entomology & Zoology, 12 (2): 578-582**]**

ABSTRACT: The golden silk producer muga silkworm, *Antheraea assamensis* Helfer, is a multivoltine and polyphagous lepidopteron insect, endemic to North Easter part of India, especially in Assam. Due to out door nature of rearing,the young larvae expose to various rigours changing of environment during different rearing periods which often leads to the out break of diseases affecting in the crop production. Now a day's flacherie and muscardine are the important diseases in muga silk industry which are economically loss the crop production.Broad spectrum insect pathogens have been used extensively as bio-pesticides for controlling of different insects and pathogens for biological management of the pests and diseases in different plantation crops. These biological agents have least injury to non-target organisms, although they are not at all safe to other beneficial economic insects of the ecosystems. Such biocontrol organisms *i.e. Beauveria bassiana* and *Bacillus thuringiensis* are used in tea gardens, rice field and other cereals and vegetable crops throughout the world. It was observed that these live materials severely affected on the golden silk producer mugasilkworm. A detail investigation on the pathological problems of the economic insect was carried out in different crop seasons to ascertain the mortality percentage due to affect of *B. bassiana* and *B. thuringiensis* in different muga rearing areas Assam. The results showed that maximum 70-80% infection recorded due to infection of *B. bassiana* in winter crop (December-January) as a results shortfall of dfls obtained for next commercial season. On the other hand, maximum 43% infection of *B. thuringiensis* was recorded in summer seed crop seasons.

KEY WORDS: *Antheraea assamensis, Beauveria bassiana,* biopesticides, disease incidence, muscardine

The golden silk producer muga silkworm, *Antheraea assamensis* Helfer, is a multivoltine and polyphagous lepidopteron insect, endemic to North Easter part of India, especially in Assam (Choudhury, 1970; Thsngavalu et al., 1988). This is a semi-domesticated insect having five to six generation in a year. Muga culture is a part of the rich tradition of the people of Assm, India and is economically viable crop to the rural people (Benchamin 2000). Generally the farmers of this region conducted rearing on different crop seasons *viz,* Jarua (November-December), Chatua (Februaray-March), Jethua (April-May), Aherua (June-July), Bhodia (August-September) and Katia (October-November) in a year. Due to out door nature of rearing young larvae expose to various rigours changing of environment during different rearing periods throughout the year which often leads to the out break of diseases affecting in the crop production (Das et al., 2008). The most common diseases of muga silkworms are pebrine, flacherie and muscardine. Chaudhury (1981) reported that muscardine disease was not observed in earlier days in mua silk industry. During last a couple of year, muscardine have been gradually increasing year after year and leading to the crop loss to a tune of 70-90% in Jarua crop (November-December). Das et al. (2007) reported that

muscardine disease is now a days one of the burning problem in muga silk industry and is caused by *Beauveria brassiana*, for which the farmers unable to produced their required dfls. On the other hand, flacherie is also one of the important diseases of muga silkworm and it occurred throughout the year. The disease is caused by bacterial pathogen such as, *Bacillus thuringiensis* and highest infection was recorded 41-47% during Aherua (Jun-July) and Bhodia (August-September) crops (Ann, 2007). Das & Das (2007) reported that though the different fungal pathogens were recorded in different time in muga culture but maximum disease intensity 70-90% caused by *Beauveria brassiana* in November-December and January-February crops. In mulberry silkworm also muscardine and flacherie diseases were caused by *Beauveria bassiana* and Bacillus *thuringiensis* in different crop seasons but disease intensity was comparatively very less (Das et al., 2007; Rahmani & Singh, 2000; Balavenkatasubbaiah et al., 1994; Samson et al., 1990). Low temperature and high humidity with foggy weather are the main pre-disposal factors for multiplication of these pathogens. *B. bassiana* (trade name Baba) is commonly used as bio-control agent (BCAs) and similarly high temperature and high humidity also the pre-disposal factors for multiplication of pathogens of *B. thuringiensis* (trade name Bath) in tea gardens, rice fields and other crops as biological insecticides. Broad spectrum insect pathogens have been used extensivelyin now days as bio-pesticides for controlling of different insects and pathogens for biological management of the pests and diseases in different plantation crops. These biological agents have least injury to non-target organisms, although they are not at all safe to other beneficial economic insects of the eco-systems (Das et al., 2009). Such biocontrol organisms *i.e. Beauveria bassiana* and *Bacillus thuringiensis* are used in tea gardens, rice field and other cereals and vegetable crops throughout the world. It was observed that these live materials severely affected on the indegenous golden silk producer mugasilkworm (Das et al., 2005).

Therefore, a detailed study on muscardine and flacherie diseases were done in this institute to find the occurrence of these two diseases in different instars silkworms in the different muga farmers field which may help to the farmers, scientists, sericulturists and the industry to take up necessary action for controlling of diseases.

MATERIAL AND METHODS

The study was carriedout in different muga growing districts of Assam, India. The state experiences a very hot–humid weather during summer with an average temperature of 30◦C (max. 38.5◦C. min. 7◦C). The annual rainfall ranges between 1,500 and 2,600 mm with moderate humidity (75%). The disease survey was conducted in the farmers filed viz. Goalpara, Kamrup, Jorhat, Golaghat, Sivsagar, Lakhimpur and Dibrugarh districts, during *Jarua* (November-December), *Chatua* (Februaray-March), *Jethua (*April-May), *Aherua* (June-July), *Bhodia* (August-September) and *Katia* (October-November). During the survey period dead cadavers 50 numbers each were collected scientifically in 3rd, 4th and 5th stage in different crop seasons for isolation of the pathogens. The collected samples were surface sterilized in the place of collection with 0.1% HgCl2 and rinsed with steril distilled water twice. A total 900 samples were collected from the different seasons and localities were tried for isolation of the pathogens on Potato Dextose Agar (PDA) medium aseptically. Colony growth was observed at an interval of 24h up to 4 days at 25^0 $\pm$ 2^0 C and incubated at in BOD incubator.The isolated fungal

and bacterial pathogens during 3rd 4th and 5th instars dead worms were presented in the table 1, 2, 3 and 4.

RESULTS AND DISCUSSION

The different fungal and bacterial pathogens were isolated from the dead silkworm larvae collected from the different localaties in the three different stages were presented in the table 1,2,3,and4. The results showed that though disease infection was recorded from 3rd instar onwards the maximum infection was obtained in 5th instar silkworms (Table 2). Highest fungal pathogens 60% were isolated in 5th instar dead silkworms during Jarua winter crop where the temperature and relative humidity fall down to 5-18°C, 56-68%, followed by Chatua crop with 46% and Jethua with 8% pathogens. No fungal pathogens were isolated in Aheuua, Bhodia (rainy summer) and Katia (autumn) crops.

The results showed that there were six different fungi were isolated and grouped in to six genuses (Table 3). These were *Beauveria brassiana, Aspergillus fumigatus, Fusarium moniliformae, Penicillium degetatum, P. chrysogenum* and *Nigrospora oryza*. On quantification analysis of different muscardine pathogens of muga silkworm in different seasons reveled that maximum fungal pathogens including all the mentioned genera were recorded in Jarua (60%) and Chatua (46%) crops. On the other hand highest number of pathogen isolated from the 5th instar dead silkworm, least number isolated from the 3rd istar silkworm, 4th instar was in between the population recorded 5th and 3rd instar (Table 3). Among the different fungal pathogens *Beauveria brassiana* is most severe one and 32 &58% population was recorded in Chatua and Jerua crop seasons. Similar result was suported by Das et al. (2007).

In case of Bacterial pathogens, these were isolated throughout the year in all instars silkworms. Maximum bacterial pathogens were obtaineded during rainy summer seasons *ie,* Aherua and Bhodia crops with 46 and 48% where maximum temperature and relative humidity recorded 26-37 °C and 75-91%. Least number of pathogen were isolated during Jethua and Katia crop seasons with prevailling temperature and relative humidity were in between optimum range *ie.* 21-31°C and 70-81%. However, the pathogens were isolated from 3rd to 5th instar dead silkworms but percentage of occurrence was always high in 5th instar silkworm.

There were three bacterial pathogens isolated, these were *Bacillus thuringiensis, Aeromonus salmonicida* and *Streptococcus bombycis* (Table 4). The first two were occurred through out the year and last one not recorded during Aherua and Bhodia crop seasons.The result on quantification analysis of different bacterial pathogens in different seasons showed that highest bacterial pathogen *B. thuringiensis* was isolated in Aherua and Bhodia crops with 54% and followed by *Aeromonus salmonicida* with 44 & 46% respectively. In case of *Streptococcus bombycis*, it was not isolated during Aherua and Bhodia crops however the quantity of occurrence in other crops were also negligible.

The results of the present study has indicated that *B. brassiana* and *B. thuringiensis* were found always highest in the dead cadavers of muga silkworms which economically loss the crop production up to. K. Das et al. (2009) reported that the bio-pesticides such as *B. bassiana* (trade name Baba) and *B. thuringiensis* (trade name Bath) are commonly used as bio-control agent (BCAs) tea gardens, rice fields and other crops near to the different som gardens. This might be the incidence for occurrence of highest populations of *B. brassiana* and *B. thuringiensis* in the dead muga silkworms.

LITERATURE CITED

Ann, 2007. Annual report Central Muga Eri Research &Training Institute, Lahdoigarh, Jorhat, Asssam.

Benchamin, K. V. 2000. Economics of muga &Eri sericulture in North east India. Proceeding of the seminar on Sericulture R&D in muga and Eri. CMER&TI, lahdoigarh, Jorhat, Assam, Pp. 236-242.

Choudhury, S. N. 1970. Eri, Muga Pat. Assam Science Society. Gauhati, Assam.Published by Govt of Assam.

Chaudhury, S. N. 1981. Muga Silk Industry, Directorate of Sericulture, Govt. of Assam, Gauhati, Assam.

Das, K., Barah, A., Das, R. & Chakarvorty, R. 2005. Seasonal incidence of diseases in muga silkworm, *Antheraea assamensis* Helfer, in different muga growing belts. The 20th congres of International sericultural Commission. Pp. 259-263.

Das, K., Das, R., Dutta, P. & Chakarvorty, R. 2007. First Report on some important endo-mycoflora of *Antheraea assamensis* Helfer, from North east India. Sericologia, 47 (2): 225-228.

Das, K., Das, R., Dutta, P. & Chakarvorty, R. 2007. Seasonal Diversity of certain endophytic fungi in *Antheraea assamensis* Helfer from North East India. Insect Environment, 13 (3): 116-118.

Das, K., Das, R. & Chakarvorty, R. 2008. Diseases in muga silkworm *Antheraea assamensis* Helferin different muga growing belts of Assam. National Seminar on Harnesing Natural resources towards the SocioEconomic Development of North East India. Titabar, Jorhat, Assam.

Das, K., Chutia, M., Das, R. & Chakarvorty, R. 2009. Impect of Bio-Pesticides on Indegenous Muga silkworm, *Antheraea assamensis* Helfer in different crop seasons. Journal of Science, Technology and Management, 2: 3-8.

Thsngavalu, K., Chakravorty, A. K., Bhagawati, A. K. & Isha, Md. 1988. Hand book of muga culture. Central Silk Board.

Table 1. Record of diseaed dead cadaers collected during different crop seasons.

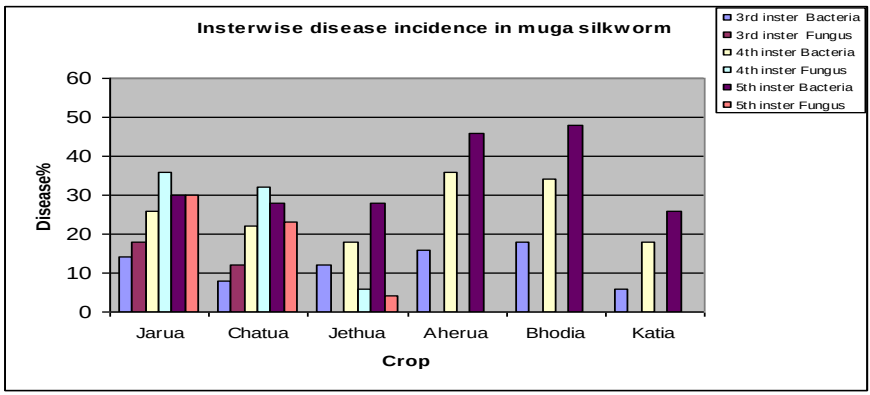

Table 2. Isolation of bacterial & fungal pathogens in different instar dead cadavers in quantitative manner.

Sl No	Season	3rd instar		4th instar		5th instar		Temp.° C	R.H%
1	*Jarua* (November-January)	Bac	Fun	Bac	Fun	Bac	Fun	Min.Max	Min.Max
		07 (14%)	09 (18%)	13 (26%)	18 (36%)	15 (30%)	30 (60%)	5-18	56-68
2	*Chatua* (February-March)	04 (08%)	08 (16%)	11 (22%)	16 (32%)	14 (28%)	23 (46%)	9-20	56-70
3	*Jethua* (April-May)	06 (12%)	00	09 (18%)	03 (6%)	14 (28%)	04 (8%)	22-30	70-81
4	*Aherua* (June-July)	08 (16%)	00	18 (36%)	00	23 (46%)	00	26-34	75-89
5	*Bhodia* (August-September)	09 (18%)	00	17 (34%)	00	24 (48%)	00	29-37	78-91
6	*Katia* (October-November)	03 (6%)	00	09 (18%)	00	13 (26%)	00	21-31	70-78

Table 3. Seasonal occurrence of Fungal pathogens from dead cadavers (%).

Pathogens	Jarua	Chatua	Jethua	Aherua	Bhodia	Katia
Beauveria brassiana	58	32	-	-	-	-
Aspergillus fumigatus	11	08	03	-	-	-
Fusarium moniliformae	10	13	-	-	-	-
Penicillium digetatum	18	21	04	-	-	-
P. chrysogenum	13	14	-	-	-	-
Nigrospora oryzae	04	06	-	-	-	-

Table 4. Seasonal occurrence of Bacteril pathogens from dead cadavers (%).

Pathogens	Jarua	Chatua	Jethua	Aherua	Bhodia	Katia
Bacillus thuringiensis	37	23	21	54	54	19
Aeromonus salmonicida	20	16	19	44	46	18
Streptococcus bombycis	13	07	08	-	-	13