CONSTRAINS IN MANAGEMENT FOR CONSERVATION OF MUGA SILKWORM (*ANTHEREA ASSAMENSIS* HELFER)

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ABSTRACT: Non mulberry silk Muga – Golden silk produced only in Brahmaputra valley of Assam province in NE Region. The ranges of biological resources including their genetic resources are renewable in nature or in similar *ex- situ* conservation with their proper management can fulfill human needs in larger extent. Developing and strengthening of *in situ* mechanism for seri-biodiversity conservation in the protected areas is the need of the hour. Diseases and pests are the main constrains in management for conservation of muga silkworm.. Flacherie, muscardine, uzi and yellow fly are the most common diseases and pests on muga silkworm which cause significant yield loss in the vanya silk industry. The aerial and ground spraying of bio-control insecticides like *Beauveria bassiana* and *Bacillus thuringiensis* to eradicate various kinds of moth caterpillars is an increasingly widespread practice throughout the world. These bio-control agents severely affect the vanya silkworms *ie*. the non target insects through different mode of transmission. Aspergilosis in muga silk moth during "Bhodia" (August) seed crop causes 35-40% loss in seed production. Therefore to understand the main constrains in management for conservation of vanya silk are discussed in the study.

KEY WORDS: Constrain, disease, pest, vanya silkworm.

North East India is considered as hot spot of seri-biodiversity particularly in case of non-mulberry (*vanya*) silk sector which play a significant role in sustainable rural livelihood and poverty alleviation in the country. The vanya silk cultivation is an eco friendly and women friendly occupation that provides high employment, vibrancy to village economies and ideal programme for weaker section of the society. Muga, golden silk produced only in Brahmaputra valley of Assam province in NE Region. The ranges of biological resources including their genetic resources are renewable in nature or in similar *ex- situ* conservation with their proper management can fulfill human needs in larger extent. Anthropogenic climate change is an important issue which needs to be taken seriously in the context of Lepidoptera conservation and pest research (Porter, 1995; Woiwod, 1997; Watt & Woiwod, 1997). The term conservation refers to the preservation, restoration, or protection of the planet's natural resources and ecosystems. Muga silkworm is an insect which needs proper conservation. There are many constrains in conservation of muga silkworm. The abiotic and biotic factors of the environment during different seasons greatly influence the growth and development of muga silkworm in the form of cocoon weight, pupa weight, shell percentage, potential fecundity, reelability and denier of the silk (Chiang, 1985; Yadav, 2000)The aerial and ground spraying of bio-control insecticides like *Beauveria bassiana* and *Bacillus thuringiensis* to eradicate various kinds of moth caterpillars is an increasingly widespread practice throughout the world. These bio-control agents severely affect the muga silkworms i.e. the non target insects through different mode of transmission. Therefore to understand the main constrains in management for conservation of vanya silk are discussed in the study.

MATERIAL AND METHODS

Geography of the study area:

The study was conducted 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 of Goalpara, Kamrup, Jorhat, Golaghat, Sivsagar, Lakhimpur and Dibrugarh during the rearing period and the infected larvae were collected for isolation of the pathogen.

Collection of data:

The diseased larvae showing typical symptoms of muscardine and flacherie disease were collected from muga growing areas for isolation of the pathogens from all the districts. The typical diseased larvae were collected from the rearing sites in sterile polythene bags and brought to the laboratory immediately for isolation of the pathogens. The diseased samples were collected in the different crop seasons viz. Chatua Seed crop (March-Apri) Jethua commercial crop(May-June), Aherua Pre-seed crop (June-July), Bhodia Seed crop (August-September), Katia commercial(October-November) and Jarua Preseed crop (December-February. The diseased cadavers were treated with 70-90% ethyl alcohol for 2 minutes, then 5.25% Sodium Hypochloride for 3-5 minutes, 19% Sadium thiosulphate for 3-5 minutes and later three successive washing with sterile water. The surface sterilized muga silkworms were homogenized aseptically. A loop- full homogenate were streaked on potato dextrose agar and nutrient agar plates and the plates were incubated for 48 hours at 25° ± 2° C and 30° ± 2°C separately. The growths of microbial colonies were observed and mycelium and conidia were studied. Pure culture was maintained for the isolates on potato dextrose agar and nutrient agar slant. At the same time the pests were also collected to know the constrains for conservation of muga silkworm.

RESULTS AND DISCUSSION

Fungal diseases

Three different species of entomogenous fungi viz., *Beauveria bassiana, Aspergillus niger* and *Fusarium moniliforme* are found to cause White muscardine, Aspergillosis and Fusarosis diseases of muga silkworm.

White muscardine

White fluffy and frosty mycelial growth emerging out through inter-segments, lateral as well as ventral sides of whole body, ultimately covering the whole body and appendages. Initially the larvae loose appetite, become inactive and on death, gradually, they become harder and finally mummified (Das, *et al*., 2007). The infected worms become harder, paler and completely inactive followed by bending of the body dorsally. It dies in about 72-96 hours of infection. Dead worms are compressed, reduced body fluid and spongy with fragile skin. A white encrustation appears round the body becomes laterally compressed, dry, hard, and brittle and, mummified.. Continuous cloudy and foggy weather for 3-4 days, medium temperature (22 ± 1 0C) with high humidity (>80%) are congenial for white muscardine disease.

Aspergillosis

This disease is found in almost all the growing season. White fluffy and frosty mycelial growth emerging out through inter-segments, lateral as well as ventral sides of whole body, ultimately covering the whole body and appendages.

Initially the larvae loose appetite, become inactive and on death, gradually, they become harder and finally mummified (Das, *et al*., 2007). The infected worms become harder, paler and completely inactive followed by bending of the body dorsally. It dies in about 72-96 hours of infection. Dead worms are compressed, reduced body fluid and spongy with fragile skin. A white encrustation appears round the body becomes laterally compressed, dry, hard, and brittle and, mummified.. Aspergillosis generally infect early instar silkworm. The early instar silkworm becomes inactive and dies without clear morphological symptoms. Late instar silkworm develops black spot at the site of infection and dies due to Aflatoxin produced by the fungus.

Fusarosis

Fusarosis is found to occur severely in the month of Feb-March.. Fusarosis mostly infect 3rd, 4th and early 5th stage silkworm. The infected worms become lethargic and die suddenly. After 24 hrs of dyeing dirty white mycelial growth appear on the cadavars later the infected and died worms turns to black colour.

Though Aspergillosis and Fusarosis may occur in all type of weather but high temperature (30 ± 2 0C) with high humidity (>85%) are congenial for the disease development of infection. These funguses can over winter on soil and plant debris or as epiphytes by producing chlamydospore and on reaching favourable they germinate, multiply, spread and cause infection to considerable ranges. The continuous use of bio-pesticides e.g. Baba also responsible for fungal diseases in muga silkworm.

Flacherie or bacterial disease

Flacherie is a generic name for the syndrome represented by flaccidity of silk worm. This disease infects the alimentary tract of the worms but blood cells, hypodermis and fat bodies also infected. Severe infection can cause yield loss up to 80-90% in summer and rainy seasons. It is a flaccid condition symptomatically showing softness, dullness and lethargicity in the larvae. Occurrence of the disease was in peak during last stage of the worms, *i.e*., mid 4th to 5th instar and the worms died before spinning. Maximum mortality was reported in February-March, November-December followed by June-July and July-August (CMER&TI & AAU Project progress report, 2007).

Three bacteria associated with flacherie disease are identified as *Bacillus thuringensis, Aeromonas salmonicida* and *Streptococcus bombycis*. Bacterial septicemia (*Bacillus thuringensis*) and Bacterial toxicosis (*Aeromonas salmonicida*) are the two most devastating bacteria. *Streptococcus bombycis is non pathogenic.* (CMER&TI & AAU Project progress report, 2007).

Factors affecting disease development

Sudden fluctuation of weather, *viz.,* temperature, relative humidity and rainfall is the main cause of flacherie disease. High temperature (36 OC and above), high humidity (above 75%) is suitable for disease development. Bio-pesticides e.g using of Bt in the adjacent area accelerate the bacterial diseases of muga silkworm.

Uzifly:

Exorista sorbillans and *Blepharipa zebina* are major pests of muga silkworm. These pests complete their life cycle in muga silkworm and occurred in winter and post winter during pre-seed and seed crop of Jethua commercial brood. It caused the considerable lost of muga sill worm crop loss 20-90 % in pre-seed (Jarua, Dec-Jan) and seed (Chatua, Feb-Mar) crop.

Yellow fly:

The muga cocoons are infested by yellow fly. The fly completely fed on head region of the pupae and emerged from the same by making a hole which is about 1cm diameter.

During the time of conservation of muga silkworm the adjacent area should be free from alternate host of the diseases causing agents and pests. People of the adjacent area should be aware about the knowledge of muga culture along with its enemies. From this study, it is understood that the white muscardine disease pathogen *B. bassiana* might have disseminated from the other crop fields as now a days these bio pesticides are commonly used in tea gardens, rice fields vegetable fields etc. The native strains of *B. bassiana* are not so infective and infection percentage was lower than the commercial strains. It is reported that muscardine diseases in muga silkworm were not found in earlier days (Choudhury, 1981). The bio-pesticides were not available in those days although the native strains of *B. bassiana* were present in soils. Climate change may have also some effect on the infection capability of microbes as pathogens. Climate change is recognized as a major threat to the survival of species and integrity of ecosystems worldwide. The commercial bio-pesticides agents prepared by *B. bassiana*, *B. thuriengiensis* etc. are infective and can easily disseminate by air, water or by other medium. Again, these are applied in the other crop filed very frequently which increase the chance of more dissemination in a wide area. In muga silkworm, effect of pests and diseases also are more intense, being reared outdoor and it affects the economy directly. Hence long term sustainability measures needs to be taken. Conservation measures both in-situ and ex-situ accounts a vital role in maintaining the muga silkworm sustenance.

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Table 1. Various diseases of Muga silk worm and their field occurrence.

Diseases	Field occurrence (%)					
	Season 1 (Dec-Jan)	Season 2 (Feb-Mar)	Season 3 (May-Jun)	Season 4 (Jun-Jul)	Season 5 (Jul-Aug)	Season 6 (Oct-Nov)
White muscardine	38.98	24.00	0.00	0.00	0.00	13.13
Aspergillosis	28.47	0.00	0.00	2.56	11.11	17.19
Fusarosis	23.73	17.65	0.00	0.00	12.44	20.11
Bacillus thuringensi	84.74	81.17	68.18	0.00	72.22	0.00
Aeromonas salmonicida	22.03	11.76	10.60	43.75	16.66	57.81
Uzi fly *E. sorbillans B. zebina*	13.7	23.8	1.2	0.4	0.3	0.2
Yellow fly	0	0	5.0	4.0	0	0