Biological Forum – An International Journal **7**(1): 1-6(2015)

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Indigenous Technical Knowledge Associated in Muga culture

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(Received 01 October, 2014, Accepted 13 December, 2014)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Indigenous Technical Knowledge (ITK) is the actual knowledge of a given population that reflects the experiences based on tradition and includes more recent experiences with modern technologies. Muga culture is an age old traditional practices sustaining amidst the rural folk since time immemorial in Assam and few states of North East India. Since long past, muga culture was recognized as one of the most promising venture for development of socio-economic condition of the rural populace in Assam. From the study, it is revealed that the culture involves various indigenous practices and beliefs, varies from one location to another and also believed to be effective in production system. Current study was conducted at Golaghat district of Assam for obtaining traditional practices of ITK in muga culture and presented in this manuscript.

Keywords: Traditional practices, muga culture, khorika, jail, *Ocimum sanctum*

INTRODUCTION

Indigenous Technical Knowledge (ITK) is the actual knowledge of a given population that reflects the experiences based on tradition and includes more recent experiences with modern technologies. Indigenous practices are an unwritten body of knowledge. So far, here is no systematic record to of describe what they are, what they do and how they do, how they can be changed, their operations, their boundaries and their applications. It is held in different brains, languages and skills in as many groups, cultures and environments as are available today (Atte, 1989). The ITKs are also part of the lives of the rural poor and these are increasingly being seen as a reservoir of ideas and solutions for many serious problems in various field. Traditional practices of agricultural and other allied crop that farmers have learnt from their long association with the land, its flora and fauna were based on eco-friendly and its sustainability. Muga culture is an age old traditional practices sustaining amidst the rural folk since time immemorial in Assam and few states of North East India. It involves lot of traditional practices and beliefs over the time and many of time these traditional practices have proved to be successful and sustainable. These traditional practices can be exploited for increasing production of muga raw silk. However, due to changing of traditions and way of living in many of the communities, it is no longer possible to pass on many of these ITKs to the young generation. Therefore, it is need of the hour to recognize ITK, value it and appreciate its association with local communities. Improvement of the socio-economic condition of the muga farming community would be almost impossible, if this rich tradition of ITK is kept to a few people. With the changing environment, its farming system and improvement brought in the methods, it is often realized that modern techniques adopted for commercialization of muga culture may not be sustainable for long run. In most of the field particularly in agriculture, researchers are started to re-learning the indigenous techniques associated in its production. Therefore, it is felt necessary to recognize, collect and document the ITKs associated in muga culture. Incorporating ITKs into R & D can add value to the development of sustainable technologies of muga culture which in turn, help the farmers for improving their socio-economic condition. Keeping view of this, attempt was made to collect the indigenous practices involves in production system of muga culture.

METHODOLOGY

Considering existence of large number of traditional muga farmers, Golaghat district of Assam was selected purposively for the present investigation. Survey was conducted at 150 farmers in 15 villages who are having long association in muga culture. The farmers were interviewed personally to know the indigenous practices adopted specially in silkworm seed production, rearing of silkworm and management of pest and diseases of silkworm using an interview schedule prepared for the purpose. All the practices described by the farmers were recorded carefully. Besides, field activities available at the time of survey was also observed and evidenced personally.

RESULT

The most common indigenous practices adopted by the farmers in silkworm seed production, rearing of silkworm and management of pest and diseases of silkworm were recorded and evidenced as further.

A. Silkworm Seed production

Normally farmers prepared their own seed at their home. Sometimes, 2-3 farmers make a group to accomplish the various activities of seed production smoothly. To prepare quality silkworm seed following practices are strictly followed by the farmers in different steps.

Selection of healthy silkworm brood. The farmers generally preferred the seed cocoons from Garo Hills of Meghalaya but, due to far of place, many of times, they used collect the seed cocoons locally. To select a healthy brood of silkworm, the farmers used to observe various behaviors of silkworm during its rearing. Prompt movements' of silkworm larvae in upward and downward direction at the food plants at regular intervals, deep green body color with copper color mandible, free from incidence of diseases like Flacharie (farmer commonly termed as 'Mukhlaga') and Pebrine (farmer termed as 'Phutuka'), feeding behavior of larvae, i.e., feeding of entire leave of a plant, uniform size of larvae, etc, are considered as good symptoms for a healthy silkworm brood. One of the most common observation made by the farmers during selection of healthy nature of silkworm is showing instantaneous response of larvae while touch by somebody during its movements. Presence of more than two pieces of solid form excreta in the hind gut or in rectum portion of the larvae is also considered as an indication of healthy worm.

Selection and preservation of seed cocoons. Seed cocoons are generally selected from the peak day of spinning called 'Bharpak' and preserved in perforated bamboo cage called 'Chakari Pera'. Transportation of seed cocoons are generally done at dusk in perforated bamboo baskets keeping a layer of paddy straw inside the basket to protect the cocoons from any jerk. In order to make the grainage house (the house where silkworm eggs are produced) free from dust, diseases and various pest, the farmers used to splash the ground and walls of grainage house with cow dung mixed mud prior to enter the seed cocoons. Some farmers also hang the Twigs of Tulsi (*Ocimum sanctum*) plants at the grainage house to make the room hygienic.

Moth emergence and egg laying. While emerging the moths from the seed cocoons in the evening, the male and female moths are allowed to pair naturally in the night. Once natural parings are completed, the hind wings of female moths of each pair are tied in "*khorika*" (bunch of dry thatch grass) with the help of cotton thread. In the same *khorika*, sometimes more than one pair of moths is tied to minimize the quantity of *khorikas*, required space, etc. The *khorikas* are hanged in rope fitted in two posts or in walls in a dark room. Sometimes, the *khorikas* are hanged in some special device made for the purpose and kept in a dark room. During the time of coupling, utmost care is taking for avoiding any kinds of disturbance to the coupled moths. Mechanical coupling are not preferred by the farmers. However, sometimes the farmers make pairing of moths forcibly. At the time of mechanical coupling, male and female moths are picking together in both left and right hand separately. Abdomens of male and female moths are kept together to touch with each other. A mild blow of air is passing to the female moth through mouth to facilitate the quick coupling. Pairing of moths is allowed for 10-12 hours. After 10-12 hours of pairing, decoupling of moths are done through release of smoke generate by burning of paddy straw for a few minutes generally at the evening time. The farmers also believed that exposing the moth in to smoke, quantity of egg laying are increased. At the time of shortage of male moths, the female moths are tied in *khorikas* and hang at branches of plants or bamboo in outside to allow coupling with wild male moths at night. No lights and sounds are allowed at the places of keeping moths for pairing with the wild moths. Moths are allowed to lay eggs for maximum three days. After three days of egg laying, female moths are removed from the *khorika*. The *khorikas* with the eggs are kept aside and observed carefully till hatching of worms. In the extreme hot days, sometimes the *khorikas* with the eggs are deep in cool water for a few minutes to keep the embryo safe from high temperature effect. Branches of thorny plants commonly known as *Jatuly paka*, Bogori, etc. are also used to hang at the door or windows to protect the moths from nocturnal birds, enemies, etc.

During grainage, the farmers also observe morphological character of moths, coupling behaviors, urination of female moths, egg laying pattern, colour of eggs, etc. According to the farmers, peak emergence of moths at the evening, dark brown colour of moths, natural coupling before midnight, high frequency and heavy flipping of wings of moths, white urination of female moths at the time of decoupling, scattered egg laying, lay of 140-170 eggs by a moth, brown colour of eggs, no depression of eggs, alive of moths for 5-6 days after egg laying, etc are the good symptoms for succeeding crop. Emergence cripple moths, less flipping of wings, not showing tendency for coupling, grimy urination of female moths, laying of eggs at a bunch, more number of white eggs, etc are considered as bad sign for the succeeding crop.

B. Rearing of silkworms and cocoon production

Rearing of silkworms (Figs. 1-6). Newly hatch tiny silkworms are brushed at the early morning directly by hanging the *khorikas* in the twigs of plants of tender leaves. Farmers believe that if the newly hatch silkworms feed on its egg crust attached on the *khorika*, and then the silkworm will be healthy. That is why, the farmers do not detached the eggs from the *khorika* and allow the silkworms to hatch in the *khorika*. Generally, hatching allows for 2 days. Worms are brushed in shady places during summer and sunny places during winter. To protect the tiny worms from various birds, predators, etc., the farmers keep on regular watching in the field.

To protect the tiny worms from ants nested in soil the farmers used to put ashes surrounding the base of trees. Generally, the muga farmer wraps the tree trunk above 2/3 feet from the ground by bark or leaf of banana to check the worms toward ground. When the leaves of plants are eaten over, the worms are crawl down to the tree trunk for searching another plant. At that time the farmers picked the worms from the tree trunk and collect in a triangular shaped bamboo tray called '*Challoni'*. The *Challoni* with the worms are hanged in to a selected leafy plant. Generally, the worms are transferred in 3rd or 4th stage from one plant to another plant. At the time of transferring the worms, if weak worms are observed, the worms are collected and to be kept into tender leaves of selected plants for growing up quickly.

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Fig. 1-6. 1-4. Farmers shifting the worms from one plant to another plant on *Chaloni*, 5. Shifting mature worm to *Jali*, 6. After collection of worms hanged on Chaloni to another plant.

Spinning and harvesting of cocoons (Figs. 7-10). The ripening worms crawl down from the branches or top of the trees in the evening time are to be collected in a bamboo basket and release them into mountage (farmers termed as '*jail'*). The *jails* are made of leave and twigs of certain plants locally named as *Azar*, *Singari*, *Nahar* and also *Som* itself. At the time of maturation, some of the worms stop feeding and take rest on the tree trunk or branches of plants during day time. At that time, the farmers collect the worms in '*Challoni'* and keep in the temporary shed (Mounting hall) to make easier to put them in to *jail* (mountage) after ripening. The farmers use torch light or keroseneted lamp specially made with the help of bamboo for lighting and collect the worms during night. *Jalis* are generally kept in open and well aerated shed prepared temporarily in the rearing field itself and keep on watching for protection from ants, birds, lizards, bats, owl, snakes, monkeys, etc.

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Fig. 7-13, 7-8. Mature worms kept on Jali for formation of cocoons, 9. Harvested cocoons, 10. Cocoons' mountage, 11. Dead bird hanged on tree trunk for avoiding other birds, 12. Banana leaf for avoiding down movement of worms, 13. Some medicinal plant branch (unidentified).

Generally after 6-7 days in summer and 8-12 days in winter after spinning, the cocoons are harvested. During harvesting the cocoons, the flimsy and melted cocoons are to be sorted out. The cocoons used as seed cocoons are kept in shady places with utmost care and the other cocoons are to be kept as reeling cocoons. For stifling, the reeling cocoons are exposed into bright sunlight or hot smoke generate by burning of fire wood. After dying of pupae, farmer also used to expose the cocoons in sunlight for 2-3 days to reduce the moisture contents of the cocoons as well as pupae.

C. Management of pest and disease of silkworms (Figs. 11-13)

Before brushing of worms, the farmers use to clean all dry leaves and twigs of host plants used for rearing of silkworm. All the dry leaves, twigs and debris are collected and burn in different locations of the rearing field itself to repel different pest of silkworms like wasp, flies, bugs, etc nested in the host plants by the smoking. Before brushing, the farmers also used to remove the nest of ants, spiders, trail of termites, etc. Different sucking pest like bugs, mantis, grasshoppers, etc. are collected and killed mechanically from the plants prior to brushing of silkworms. They also used to keep rotten fish or frog at the tree trunk to create a center of attention of the ants nested in the host plants. When the ants are coming towards the fish or frog, then the farmer burnt them. To control the red ants, keep banana just beneath the soil surface of rearing field. To prevent mortality of silkworms, the farmers use to pin corm plants (*Colocasia)* in the tree trunk during rearing. Some farmers hang tulsi twigs in between *khorikas* during graingae and believe that this practice prevents the outbreak of pebrine disease of silkworm. During rearing, the farmers generally restrict the entry of people to the rearing field as they believe that the evil sight of outsiders may cause the Flacherie diseases of silkworms. To protect the worms from the infestation of uzi fly (a serious pest of muga silkworm) clean water kept in a transparent polythene bag and hang in the plants used for rearing. Some of the farmers also reported that, to protect the worms from the infestation of uzi fly, they also used to burn the dry leaves and twigs at certain intervals in the rearing field. To protect the worms from birds, bats, etc. the farmer also used to hang a metallic empty container at the top of the plants in the rearing field with the help of a tall bamboo. The containers is connected with the help of rope and pull it at regular intervals in both day and night to frighten away birds, bats, owls, etc. To keep away nocturnal birds, the farmers sometimes used to hang lightening lamp at the top of the plants in the rearing field with the help of a tall bamboo. While any symptoms of silkworm diseases are observed, the worms are to be screened and reared them separately in a safe distance. To protect the worms from the fungal disease, the farmer used to burn the paddy straw or dry twigs of plants around the field in the evening and morning regularly. Some farmers also restricted the entry of women into rearing field. However, restriction of the entry of women is not followed by all the farmers.

DISCUSSION

From the present study, it has found that in order to prepare the quality silkworm seed, farmers' select healthy brood of silkworm through observing various good symptoms and behaviours of silkworms during its rearing. If the silkworm larvae are infected in any disease, they are not considering the brood to rear in the next generation. Naturally, these practices have very much relevancy for harvesting a good muga crop. In management of pest and diseases of silkworm, the farmers never used any inorganic pesticides/insecticides in the rearing field. Since, silkworm itself is an insect and it is also a pest for its food plants, the chemical pesticides used for control the other pest of silkworm or its host plants may cause harmful for the silkworm. Hence, they are using different practices for control of pest for both host plants as well as silkworms, which are neither harmful for plants nor silkworms. Various indigenous practices of muga culture adopted by the farmers are also found very much eco-friendly. Study made on the traditional practices of muga culture by some researchers also reported the same practices adopted by the muga farmers in different parts of Assam. Some farmers adopted certain practices for selection of healthy broods of muga. Egg laying pattern, colour of eggs, morphological character of moths, coupling behaviours, detached eggs from the *khorika*, hatching pattern, mobility of worms, feeding behaviour, cuticular pigmentation of worms, presence of excreta in larval rectum, larval growth, pupal character, silk contents, etc are considered for selection of a healthy silk worm brood for seed purpose. It was also reported that the muga farmers practiced lot of traditional practices like burning in rearing field, incomplete weeding, direct mode of brushing, mixed plantation, day wise separate brushing, spreading banana leaves on the ground after brushing, restriction of women entry in to rearing field, screening of worms based on size, non-vegetarian foods during rearing, location preference for obtaining muga seeds, etc. Phukon *et al.* (2006) reported the same practices adopted by the muga farmers in the districts of Upper Assam. At the time of silk worm seed production, the farmers used to transport the seed cocoons generally in night from different seed zones of Assam and other North Eastern states. While collect the seed cocoons, they observed the concentration of excretes presences on the ground of rearing field, presence of least egg shell in the *khorika*, presence of excreta in the rectum of larvae, copper colour of mouth part, peak harvested cocoons, etc. He also reported that the farmers sprayed Tulsi (*Ocimum sanctum* Linn) and Neem *(Azadirachta indica)* mixed water on the floor to maintain temperature, humidity and make the room hygienic. After emergence of moths, the female is tied on *khorika* and male moths are allowed to couple naturally. Prior to brushing the newly hatch worms , the rearers used to tied dead scaly fish, frogs and keep molasses at the base of the host plants to attract ants and finally burn them. Generally, the rearers used to slippery leaves or bark of banana plants, Tora (Zingiberaceae), buffalo dung, ash, etc for stop the movement of worms into ground.

During the night, some rearers placed bamboo leaves on the top of the host plants to drive away the nocturnal birds, predators. Dutta *et al.* (2009) reported that the muga silkworms are reared outdoor and hence, loss during early instars is too high, sometimes to the extents of 60-80 percent, Further the crops are not always assured due to outbreak of various diseases and pests. To minimize the loss caused by these factors, farmers generally used some practices learnt from their forefathers also called as indigenous technology knowledge (ITK). He also reported that the farmers used to hanging dead frogs, crabs, or rotten fish randomly in different places of rearing field to check Gandhi bug which is a sucking pest of early stage muga silkworm. To control the red ants, keep banana (*Musa domestica*) just beneath the soil surface of rearing field. He also reported various practices for control of pest of muga host plants. To prevent mortality of silkworms, the farmers use to pin some plants like (*Colocasia esculenta*) in the tree trunk during rearing.

Sharma *et al.* (2010) reported that to selection of seed cocoons, the rearers usually select the seed cocoons by seeing the larval colour, movement of worms, number of ridges on the silkworm litters (preferred 6 ridges) and by touching the tubercles of the larvae. Further, feeding behaviour is one of criterion for selection of seed cocoons. Feeding of leaves of the plants from top to bottom consider as good sign of healthy larvae. The farmers '*khorika'* made of thatch grass. Some farmers hang Tulsi twigs in between *khorikas* and believe that this practice prevents the outbreak of pebrine disease of silkworm. During rearing, the farmers generally restrict the entry of people to the rearing field as they believe that the evil sight of outsiders may cause the flacherie diseases (bacterial disease of silkworm) of silkworms.

Dry leaves of certain plants are used for spinning of cocoons, which helps in shining and compactness of muga cocoons. In the recent past, although various improved practices of muga culture were recommended, adoptions of improved practices by the farmers are not encouraging. Many of the farmers' reluctance to adopt the recommended practices rather they use traditional practices. The reason may be due to low cost involvement, easily available, effective for producing cocoons.

CONCLUSION

Since long past, muga culture was recognized as one of the most promising venture for development of socio-economic condition of the rural populace in Assam. From the study, it is revealed that the culture involves various indigenous practices and beliefs, varies from one location to another and also believed to be effective in production system. Hence, further study covering all the traditional muga growing pockets in Assam and other North Eastern states of India is an urgent need to recognize and collect all the ITKs associated in muga culture. These ITKs are also need to understand thoroughly, critically validate and document in different form using the modern techniques so as to integrate the best ones into the farming system to reduce dependence on external inputs, cost of production and make the culture eco-friendly. Incorporating ITK into R & D agenda, production of muga raw silk can be increased which in turn help to earn more income by the farmers in the coming days.

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