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**Short Communication**

# GENETIC RESOURCES OF SILK PRODUCING NON-MULBERRY PLANTS

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India grows all known commercial varieties of silk viz. mulberry, tasar, muga and eri. The tasar, muga and eri come under the non-mulberry sector and contribute a lot in the national economy. The three commercial non-mulberry silkworms are polyphagous and feed on the leaves of many plants. Recognising the importance of natural resources and their future utilisation in genetic improvement, various agencies are collecting germplasm. Due to devastating deforestation, the useful genetic resources of non mulberry food plants are being depleted very fast. If the timely efforts are not made, some of the most useful plants will be extinct in near future. In view of above facts, it is necessary to undertake genetic resource survey (exploration/collection), conservation and evaluation of food plants of tasar, eri-and muga silkworms in India for protection as well as utilisation of valuable genes with a view to bring about further improvement in these food plants.

## NON-MULBERRY SILK YIELDING FOOD PLANTS

### Tasar food plants

Tropical tasar insect *Antheraea mylitta* D. primarily feeds on *Terminalia tomentosa*, *T. arjuna* and *Shorea robusta* and secondarily on *Lagerstroemia parviflora*, *L. indica*, *Zizyphus jujuba*, *Syzygium cumini*, *Bauhinia variegata*, *Careya arborea*, *Tectona grandis*, *Bombax malabaricum*, *Madhuca indica* and *Anogeissus latifolia*. Genus *Terminalia* may rightly be called as the backbone of tasar industry as almost 90 per cent production of tasar silk depends on *T. arjuna* and *T. tomentosa* trees. This genus comprises 100 species widely distributed in the tropical and sub-tropical regions of the world. More than a dozen species of *Terminalia* occur in India. While all efforts to utilise *T. paniculata*, *T. chebula* and *T. belerica* in Bihar, Madhya Pradesh, West Bengal, Orissa and Maharashtra as secondary food plants of *A. mylitta* D. have not met with much success, tribals of Andhra Pradesh, Karnataka and Kerala have successfully reared on these three species especially on *T. paniculata*. Several other indigenous species of *Terminalia*, viz., *T. muelliariana*, *T. glabra*, *T. mucronata*, *T. pyrifolia* and *T. foetidissima* still await their evaluation for tasar culture. Besides, *T. procera and T. manii* are also found in India alongwith *T. bialata and T. catappa in* the forests of Andaman and Nicobar islands. While *T. citrina* and *T. myriocarpa* are distributed in foot hills of Himalayas from north Bengal eastwards to Assam, Khasi hills and Arunachal Pradesh, *T. pallida* extensively occurs in South India.

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*T. arjuna* and *T. tomentosa* exhibit distinct variation in nature and show occurrence of natural hybrids between different species/sub-species, varieties or ecotypes (Hooker, 1878; Hains, 1961; Bahadur and Gaur, 1980). *T. tomentosa* has been divided into three taxonomical varieties, viz., *typica* (*alata*), *crenulata* and *coriacea* (Hooker, 1878; Bahadur and Gaur, 1980). Likewise *T. arjuna* also has two varieties, viz., *arjuna* and *angustifolia* (Hooker, 1878). In *T. tomentosa* and *T. arjuna,* variations occur in nature for bark colour, leaves and fruits. Variations occur in bark (grey, dark-grey or black), leaves (hairy or non-hairy with thin or thick texture) and shape of the leaves (elongate, oblong, cordate, obovate, elliptic etc.). Present investigations revealed that there are more than 25 biotypes of both taxa which can be isolated and maintained separately. Non-hairy *T. tomentosa* are nutritionally more rich than hairy forms (Sinha *et al.*, 1989). Further, *T. arjuna* and *T. tomentosa* can also be distinguished on the basis of number of wings (3-12) in fruits (Srivastav & Priya Ranjan, 1988).

The temperate *tasar* food plants include various species of *Quercus,* viz., *Q. serrata* (syn. *Q. acutissima*), *Q. semicarpifolia, Q. incana, Q. dealbata, Q. himalayana, Q. ilex* and *Q. lanigenosa* which occur at elevation of 900-2400 m. The rearing performance of these taxa not only differs at various altitudes but also in eastern and western sub-Himalayan belts. *Q. incana* and *Q. himalayana* give better performance in western sub-Himalayan belt while *Q. serrata* gives the best results in eastern zone. Further, *Q. semicarpifolia* has ensured second crop rearing of *A. procylei* in Himachal Pradesh where it occurs as climax species above 2100 m elevation.

## Muga food plants

The primary food plants of *muga* silkwork are *Machilus bombycina, M. odoratissima* and *Litsaea polyantha*. There are more than 16 biotypes of *M. bombycina* in nature. Depending upon the leaf shape and size, four varieties have been identified in *Machilus bombycina*. They are *naharpatia* (leaves resemble with nahar tree), *ampatia* (leaves resemble with mango tree), *jampatia* (leaves resemble with *jamun* tree) and *kathalpatia* (leaves resemble with jackfruit tree). The variety *naharpatia* has been considered as the best variety for cultivation of *muga* silkworm. Rearers recognize two varieties of *Machilus bombycina*, sweet and bitter or sour, on the basis of leaf taste, out of which sweet variety gives better rearing results. Similarly, two varieties have been identified in *Litsaea polyantha* on the basis of leaf shape, size and texture. The oblong variety is characterised by oblong, narrow and thin leaves while ovate variety is identified by its oval, broad and thick leaves. The ovate variety is preferred by *muga* silkworm.

The other food plants which are used less frequently for rearing could be considered of secondary importance include *Litsaea citrata, L. salicifolia, L. nitida, Actinodaphne obovata, A. angustifolia, Zanthoxylum rhesta, Celastrus monosperma, Magnolia sphenocarpa* and *Zizyphus jujuba*. The *muga* silkworms reared on *L. citrata* yield white silk instead of golden yellow.

As is obvious, *Litsaea* and *Machilus* genera seem to be of prime importance for *muga* culture, every attempts should be made to enrich the germplasm of *Litsaea*.

## Eri food plants

*Ricinus communis*, *Heteropanax fragrans*, *Evodia flaxinifolia*, *Manihot utilissima*, *Plumeria acutifolia*, *Jatropha curcas*, *Ailanthus glandulosa*, *Sapium ellgeniafolium*, *Zanthoxylum rhesta*, *Hodgsonia heteroclita*, and *Carica papaya* are the most important species used as food plants of *eri* silkworm. Castor (*Ricinus communis*), keseru (*Heteropanax fragrans*), payam (*Evodia flaxinifolia*) and tapioca (*Manihot utilissima*) are important in the order of choice of food plants. Castor is considered the best food plant as *eri* silkworms reared throughout on castor leaves, yield large size cocoons, rich in silk content. Although improved varieties of castor exist in India for oil seed production, 'high leaf yielding' varieties from sericulture point of view are meagre. Usually the red variety is preferred by rearers but the choice is probably due to its red colour which is more aesthetic in appearance than the green variety. The green castor plant is delicate and cannot stand adverse weather. The castor is available in both annual and perennial types. The perennial green variety is preferred by some rearers due to the quality, quantity and duration of the leaves. The perennial variety lasts 3 to 4 years, branches profusely and grows almost like a tree yielding abundance of seeds and leaves.

The Germplasm collection of mulberry food plants should have many species/ sub-species/varieties belonging to genera such as *Terminalia*, *Shorea*, *Quercus*, *Litsaea*, *Machilus*, *Ricinus* and *Heteropanax* and their germplasm should be maintained in the field in regions environmentally suitable for them. As most of the production of tasar, oak tasar, muga and eri silk comes from Bihar, Madhya Pradesh, Manipur, Himachal Pradesh and Assam, the genepools of *Terminalia*, *Shorea*, *Quercus*, *Litsaea*, *Machilus*, *Ricinus* and *Heteropanax* may be established at some suitable centres in Madhya Pradesh, Bihar, Himachal Pradesh and Assam.

All the non-mulberry plants being forest taxa, exhibit wide area of distribution. For exploration of various species of *Shorea* and *Terminalia*, Madhya Pradesh, Bihar, Orissa, Maharashtra and West Bengal states should be given prime importance as these states possess good variability in these genera. Besides, Garhwal and Kumoun regions of Himalaya need to be explored for *Terminalia* which exhibits striking variability and remain unexplored from tasar cultivation point of view. Several other species of *Terminalia*, *viz.*, *T. manii*, *T. catappa*, *T. pallida*, *T. procera*, *T. bialata*, *T. muelliariana*, *T. glabra*, *T. mucronata*, *T. pyrifolia*, and *T. foetidissima* still await their survey from north-eastern region; foot hills of Himalayas to north Bengal eastwards to Assam, Khasi hills, Arunachal Pradesh and Andaman and Nicobar islands. The exploration of *Quercus* species may be conducted in whole of north-west to north eastern Himalayan belts. *Machilus* and *Litsaea* are also distributed in western and eastern Himalayan belt. While species of eastern Himalayas have been exploited for commercial purposes, the varieties of western Himalayas are yet to be utilised for *muga* silk production. Hence exploration of both the species should be done throughout the sub-Himalayan belt.

More than a dozen species of *Terminalia* occur in Sri Lanka, India, Myanmar, Cambodia, Vietnam with the extended distribution in Indonesia, Malaysia, New

Guinea and Australia. No attempt has practically been made to introduce exotic germplasm from above countries except from USA and Central America. Attempts are required to be made to enrich the collection by introducing *Quereus*, *Machilus*, *Litsaea* and castor cultivars from other countries.

## REFERENCES

Bahadur, K.N. and R.C. Gaur, 1980. A note on *Terminalia tomentosa* complex. *Ind. J. For.* **3** : 367-369.

Hains, H.H. 1961. The Botany of Bihar and Orissa II. BSI, Calcutta.

Hooker, J.D. 1878 (1973 reprint), Flora of British India II. M/s Bishan Singh Mahardra Pal Singh, Dehradun.

Sinha, A.K., U.P.S. Sinha., B.N. Brahmchari. and K. Sengupta. 1989. Studies on the constituent of hairy & non-hairy leaves of *T. tomentosa* W & A. *Ind. J. Seri.* **28** (1) : 115-117.

Srivastav, P.K. and Priya Ranjan. 1988. Pleiotropism in *Terminalia*. *Proc. All India Conf. Cyt. Genet.* **2** : 139-144.