



PRODUCTS OF SERICULTURE AND SUSTAINABLE DEVELOPMENT – A PERSPECTIVE

Dr. Anil Kumar M.

Lecturer in Zoology, Faculty, Department of Zoology, Government Degree College, Mulugu – 506 343, Telangana India

ABSTRACT OF THE PAPER

Sericulture is a part time ancient, miraculous agro based industry for below poverty and unskilled labourers in our country dating back to 2nd century B.C. It involves various step wise activities and every step generates value added benefits to the sericulturist. Nearly massive quantum of by products waste is generated in this sector, through better management we can provide bread and butter to the farmers engaged in silk industry. Traditional to modern research on medicinal plants and insects revealed the potentiality of different medicinal properties in both moriculture and sericulture. This research paper to be discussed Diversified Sericulture by products and its value Addition. It is a well established fact that integrity of ecosystem and sustenance of various agro based cultivations including sericulture depends mostly upon climatic conditions prevailing in that region as its impact differs from place to place and also within a places it is not uniform. This research article to be discussed about products of sericulture and sustainable development.

Key Words: *Supplement products, Rural Sericulture Programme, moisturizing Capacity, Multipurpose Usage, Mulberry Fruit.*

Statement of the Problem

“Nature is a brilliant engineer and builder. It knows how to create seashells that are twice as strong as the most resistant ceramics human beings can manufacture, and it produces silk fibers five times stronger than steel. Nature also knows how to create multipurpose forms”

Neri Oxman

A plethora of research studies have shown that the climatic changes imparts negative effect to a certain extent on sustainable development which is true in case of labour intensive agronomed like sericulture. Hence in rural areas steps are being undertaken not only for sustainable development but also for eradication of poverty alleviation around the country. Provision of minimum amenities and infrastructure facilities helps in better living conditions in an areas, where livelihood is a necessity. The strengths of sericulture are low investment, short gestations period and high returns, which improve their better living conditions.

India is a home to vast variety of silk secreting fauna including can amazing diversity of silk moths thus achieving a unique distinction for producing all five commercially traded species. It not only occupies second largest position next to China with 17 – 19% share in global raw silk production, but also provides employment to about 7.5 million people that include landless, small and marginal farmers and other weaker sections of the society. Out of the global share, raw silk production in India, mulberry (79.1%) assumes a major contribution followed by Tasar (6.9%), Eri (13.5%) and muga (0.6%) respectively. Maximum production of quality silk is due to ancient techniques, modern innovations, a great contribution of scientists globally, while Asian countries consider it as a tradition and living culture. Therefore, if appropriate policies are initiated and implemented including Rythu Bandu schemes to silk worm rearers, there would be a sea change in the rural areas where sericulture is undertaken as the scheme would act as a harbinger of prosperity for all round sustainable development in our newly formed Telangana State.

From time immemorial, a plethora of research studies have been carried out globally including India, where climate changes pose significant challenges for production of quality silk leading to flourishing of silk industry. Silk, the queen of textiles is preferred in comparison to other fibers due to its properties like scroop, heat resistance, water absorbency, cluster dyeing efficiency etc. Despite of wide fluctuations in climatic changes, most of the insects show a remarkable adaptations but mulberry silkworm is unable to survive under such conditions because of their domestication since 4500 years.

Erratic and wide fluctuations in temperature are dangerous for silkworm growth as the physiological activities drastically change with climate changes. Silkworm rearing at high temperature accelerates larval growth and shortens larval duration. But with decline in temperature, the growth slows down with extended larval period. So it is proved that normal silkworm growth requires optimum



temperature (23 - 28°C) for maximum productivity but if it exceeds 30°C or deceeds below 20°C it directly effects the physiological activity of silkworms making the worms weak and consequently making them prone to various diseases.

Table – 1

Reflects the quantum of required temperatures for rearing silkworms.

Instars	Temperature °C	Humidity %
Ist instars	28°C	85 – 90%
IInd instars	27°C	85%
IIIRD instars	26°C	80%
IVth instars	25°C	80%
Vth instars	24°C	70 – 75%
Spinning	25°C	70%

Source: Suresh Kumar et al., 2011

During winter and rainy season, room heater are required and particularly thermo regulators or fitted electrical heater which doesn't emit injurious gases. On other hand during summer season, all window are kept open with wet gunny cloths hung on doors and windows to maintain suitable optimum temperature conditions by the rearers. To rear bivoltine races in a tropical country like India with suitable cocoon crop even under high temperature environment with normal biological processes.

Table -2

Different types of silk and their insects along with their particular food plants

Type of silk	Type of Silk insects	Food plants
Mulberry	Bombyx mori	Moras alba (Mulberry)
	Antheraea mylitta	Terminalia arjuna (Arjun)
Tasar	" paphia	Terminalia tomentosa (Asan)
	" royeli	Sorea robusta (Sal)
	"pernyi " proyeli	Zizyphus jujuba (Plum) etc.
Eri	Attacus ricini	Ricinus communis (castor)
Munga	Antheraea assama	Tetraanthera monopetala (Som), Michalia oblonga (champa), Listea citrata(Moyankuri)

Out of the four different silk types the two i.e., mulberry and Eri are manufactured from domesticated silkworms, whereas Tasar and Munga silkworms are wild in nature, although attempts are in progress to domesticate them too. The life-cycle of these four types of silk moths are much in common, as they lay eggs, from which caterpillars hatches. They eat, grow and produces cocoon for their protection, then pupate inside cocoon. After sometime moths emerge from the cocoon, male and female mate, lay eggs, and repeat their lifecycles. The characteristic feature of these silk-producing moths is that they spin a cocoon of silk for the protection of their pupae. The man with his mental superiority has discovered the technique of robbing the silk threads from these cocoons for his own use.

Sericulture in India has become an important sector among many silk producing countries in the World, with an employment potential of about six millions in different sericulture activities. Though, India has been focusing on silk production with less focus on enhancing the cost benefits ratio for supplying value supplement products through its market to make the industry more feasible and practical. Cost of silk production can be proportionately brought down by converting sericulture waste into valuable products to elevate socio economic status of the rural sericulturist around the year.

The sericultural waste conversion to high value utility through various technologies among sericulture scientist with collaboration with other scientists of related industries can help in decreasing the cost of silk production, environmental pollution, recycling of wastes to other resources for the benefit of civilians who are skilled and creative with hands on innovatives during the spare time. Thus sericulture is a powerful weapon for moulding the life style and livelihood of the poor farmers. Hence, it is necessary



to study sericulture by product's utilization pattern for formulation of suitable methodologies and strategies to diffuse scientific information in silk industry. The present review also highlighted the medicinal properties of mulberries. The different parts of mulberry plants like leaves, stem, root, bark and fruits are being used in Ayurveda, Siddha and Unani for curing human related diseases.

Mulberry nutritional facts and health benefits

Mulberry, an ecological tree is a tradition grown whose plant parts are utilized for ecological benefits and also for yielding high income by integrating with other related industries. The major harvested forage resource has many kinds of mineral substance with high contents of calcium and potassium.

The presence of diversified medicinal values in this mulberry is a best tool which forms bridge between traditional and modern medicines with many side effects hence people are tracking back to traditional methodologies.

Composition and Properties

The mulberry leaves which are rich in nutrients are used as silkworm feed while on the other hand contains antioxidants for increasing immunity levels in mah. Based on research findings, the macro nutrients like carbohydrates, proteins, vitamins (A, B, C) and micronutrients like calcium, magnesium, iron, zinc, potassium, sodium, etc, The flavonoids, steroids, glycosides are the powerful natural herbal supplements that fights against many human and livestock related ailments cannot be ignored. The tender leaves are valuable source of ascorbic acid, tannin, adenine, choline which form base for many medicines of restoratives .

USES

Mulberry leaves have low caffeine percentage hence used as tea, jam, ice cream which are tasty and nutritious. The tea prepared from the forage not only relieves cold and cough, improves the functioning of vital organs like liver, kidney and eyes, prevents oxidation of cholesterol, atherosclerosis. Research studies have shown that crude protein, fat, ash, fibre, methionine, calcium content are higher when compared to grass, leguminous, fresh corn and alfalfa

High rate of digestion of mulberry leaves by live stock reaches nearly 70% - 90% palatability. When the cow's feed is supplemented with mulberry, milk output increases four folds in dairy farms, while in sheep rearing, 20 – 35 tonnes of mulberry leaves from one hectare of land can be utilized for raising 25 – 35 sheep units. The mulberry leaves (fresh or dry) can be utilized as live stock and poultry forage for economic benefits .

The leaf extract has moisturizing capacity and tannin free hence keeps human skin smooth and hair soft due to polyphenols and polysaccharides. Age born diseases like Alzheimer's, atherosclerosis, Hyperlididemia can be treated with mulberry leaf extract. Alzheimer disease can be treated by mulberry leaf extract through inhibition of amyloid beta-peptide (1 - 42) fibril formation. The studies by researchers showed that *Morus alba* completely reduced hyaluronolytic and proteolytic activities of Indian *Daboia russle venom*. *Morus nigra* leaves reduce blood sugar levels as it has effect on glycogenolysis and gamma amino butyric acid (GABA). The purified glycoprotein extracted are also used in blood grouping, purification of glycol conjugates. The deoxynojiri mycin of mulberry leaves inhibits the enzymatic properties of sugar breaking to control AID and treatment of Alzheimer diseases. Leaves of mulberry works as powerful natural herbal supplements to fight against many health issues which cannot be ignored. Mulberry leaf extract acts as excellent medicine for prevention of liver cancer due to presence of quercetin and chlorophyll, the healthy heart is maintained, resulting in overall maintenance of vascular health which is based on comprehensive studies undertaken.

MULBERRY ROOT

Composition and Properties

Mulberry roots contains important bio constituents such as alkaloids of deoxyjirimycin which assembles glucose and interferes with glucogenolysis by hindering the addition of sugar to the outer coat of human immuno deficiency virus. Where DNJ deteriorates the further cell damages, hence it seems to be potential medicine in treating AIDS. It has been reported that root extract has blood agglutination property. Root bark which is bitter in taste posses magnificent properties not only to restore nervous disorders in human beings, in addition posses athartic, anthelmintic and astringent properties. Ethanollic extracts of root bark of *Morus alba* named as sangbia pi is reported to contain morusin, mulberofuran, DGK and Kwanon G.H of which morusin an Kwanon H showed positive activity against HIV while morusin inhibited tumor promotion.



MULBERRY STEM

The stem of mulberry with its multipurpose usage has put this special plant on new lines in agriculture industry. Mulberry shoot are rich in nitrogen, phosphorous, potassium, enzymes and also micronutrients like iron, manganese, copper, zinc are used for extraction of chemicals and also as tool for manufacturing biodegradable polymers, paints, vinegar and high quality activated carbon. Supplementary cotton and jute which are used for making ropes and nets are extracted from shoot phloem of mulberry. The small branches are source for pulp in paper industry, bark for making of artificial leather and attractive bags in handicraft, sports material, household furnitures, latex as skin Ointment and fruits as fabric dyes from the mulberry wood, tannin is extracted which is used for the purpose of colouring the leather in tannery industry. The extracted vinegar checks the growth of fungi *Beauveria bassiana*, flaccheria and grassere in silkworms due to its stable alkaline effects. From sericulture, solid wastes, chemicals like ethyl alcohol, acetone, butyl alcohol, acetic acid, nucleosides, vitamins and amino acids are extracted. Lack of knowledge about the bye product value of mulberry plant refuse except for usage as cattle foliage and firewood had made scientist to give a second thought about this plant in comparison with other cash crops from different angles for revenue. The stem derivatives are curative against AIDS.

MULBERRY FRUIT

- A) The fruit of mulberry is a multiple one, as the inflorescence gives rise to a single fruit which is green later turns purplish through various shades of pink, red, brown etc due to certain water contained in the juice which is not only good for brain, heart, spleen but also helps in curing diarrhea and intestinal ulcers⁽¹⁹⁾. It is considered as a laxative and oral juice administered during convalescence after a fibrile illness. The fruit of Mulberry is well recognized as esteemed dessert fruit which have higher amount of vitamin C which is frequently used for the cooling beverages, wines, jams and jelly. The fruit has special flavour, tastes sour due to presence of Vitamin C. It contains moisture (85 %), proteins (0.7 %), fat (0.4 %), carbohydrates (12.2 %), calcium (80 mg), phosphorus (20 mg), iron (2.6 mg), carotene (Vitamin A), thiamin (58 gms), nicotinic acid (0.2 µg), riboflavin (2 µg) and ascorbic acid (10 µg) per 100gm. Besides these it contains mucilage, malic acid, pectin and colouring matter^(20,21). The mulberry fruits are rich in nutrients, hence used in pickles, tarts, puddings^(22,23,24). As mulberry fruits are rich in anti oxidants, they are used for treating skin paleness, hair greying and muscle tonifying in cosmetic industry. Fair juice reported that fruit drink is a good source of resvertol not only suppresses appetite and useful against obesity⁽²⁵⁾.
- B) **Mulberry fruit powder**
The fruit powder promotes healthy chlosterol, prevents heart diseases , cancer and inhibits mutation of normal healthy cells into cancerous cells^(26,27,28).
- C) **Mulberry fruit wine**
It is extracted from over ripened fruits which helps in getting rid of impurities and coproatasis, helps in body slimness and masculine vitality, Tut araghi, a potent liqueur is one of the national Azerbaijani that protects against stomach and heart diseases⁽²⁹⁾.
- D) **Fruit pigments as dietary modulators**
The pigments namely cyaniding 3-glucode and cyaniding 3-rutinoside hold potential as dietary modulator and natural food colorant which can be extracted and incorporated into food systems.

SUMMING UP

From the above discourse it is clear that sericulture industry is not only concerned with silk fabric but also with its diversified bye products can be changed into functional industry and finally into a futures biotechnology based industry with value addition as a whole.

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