



Impact of Plant Growth Regulators on Mulberry Host Plant

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Sericulture is one of the important agro-based rural industries in India, providing employment and livelihood opportunities to a large number of rural households. The term *sericulture* is derived from the Greek word *sericos*, meaning silk and *culture*, meaning rearing (Ganga and Chetty, 1997). Silk, often described as the “queen of textiles”, is valued for its exceptional strength, natural lustre, softness, purity and attractive appearance. Sericulture is not limited to silkworm rearing alone; it includes a series of interconnected activities such as cultivation of host plants, silkworm rearing, cocoon production and post-cocoon processing. India is the second-largest producer of raw silk in the world after China and has the unique distinction of producing all the commercially important varieties of silk. The major silk-producing insects include the mulberry silkworm (*Bombyx mori* Linnaeus), eri silkworm (*Samia ricini* Donovan), muga silkworm (*Antheraea assamensis* Helfer), temperate tasar (*Antheraea proylei* Jolly) and tropical tasar (*Antheraea mylitta* Drury). According to recent production estimates, India produced about 30,614 MT of raw silk, of which mulberry silk contributed approximately 75.55% (23,131 MT), followed by eri silk with 20.32% (6,217 MT), tasar with 3.52% (1,079 MT) and muga with 0.61% (187 MT) (Anon., 2025). These figures clearly indicate the dominant contribution of mulberry sericulture to India's silk industry.

Importance of Mulberry in Sericulture

The mulberry silkworm, *Bombyx mori*, is a monophagous insect and feeds almost exclusively on mulberry (*Morus* spp.) leaves. The quality and quantity of mulberry leaves directly influence larval growth, cocoon formation and ultimately the quantity and quality of silk produced. Although numerous mulberry species, varieties and cultivars are available, only a limited number are commercially suitable for silkworm rearing. Major mulberry silk-producing states include Andhra Pradesh, Karnataka, Tamil Nadu, Uttar Pradesh, West Bengal, Maharashtra, Telangana and Jammu and Kashmir, which together account for a major share of India's mulberry silk production (Gadge *et al.*, 2024). Based on the number of generations completed in a year, *B. mori* is broadly classified into three categories: univoltine, bivoltine and multivoltine. The choice of silkworm breed or hybrid is closely associated with the climatic conditions of the region, as temperature, humidity and seasonal variations influence the voltinism and performance of the silkworm. Mulberry leaves form the primary nutritional base of the silkworm and supply the nutrients required for larval growth and silk protein synthesis. Therefore, maintaining a healthy mulberry plantation with adequate leaf production throughout the year is one of the most important requirements for successful sericulture. Mulberry growth and productivity have a direct influence on silk yield and quality (Ananya *et al.*, 2015).

Leaf Senescence and Its Significance

Leaf senescence is a natural stage of plant development in which leaves gradually lose their physiological activity and eventually die. It is a common biological phenomenon and represents the final stage of leaf development (Hughes and Reynolds, 2005). During

senescence, chlorophyll degradation results in visible colour changes, while important cellular components such as proteins, nucleic acids, lipids and pigments undergo degradation. The nutrients released during this process are subsequently redistributed to developing plant parts. Although senescence is a natural and essential process, premature senescence can adversely affect crop productivity. In mulberry, early ageing and deterioration of leaves can reduce the availability of nutritious foliage for silkworm feeding. The process of senescence is influenced by several factors, including leaf age, plant hormones, nutritional status, temperature, drought, salinity, light conditions, disease and other environmental stresses. Among these, leaf age is considered one of the major factors governing natural senescence. Both biotic and abiotic stresses can accelerate leaf ageing and consequently reduce plant biomass and productivity. The availability of good-quality mulberry leaves throughout the year remains one of the major challenges in sericulture. Climate variability, water scarcity, poor soil fertility, pest and disease incidence and limited availability of cultivable land can affect mulberry growth and leaf production. Reduction in leaf availability ultimately affects larval health, cocoon characteristics and silk yield. Hence, improving mulberry growth, leaf production and tolerance to environmental stress is essential for maintaining stable silk production.

Role of Plant Growth Regulators

Plant growth regulators (PGRs) are organic compounds that influence plant growth and development even when applied in very small quantities. They regulate several physiological and biochemical processes and can be broadly classified into growth-promoting and growth-inhibiting groups. Important plant hormones and regulators include auxins, cytokinins, gibberellins, abscisic acid and ethylene. Their effects depend considerably on the concentration applied, environmental conditions and genetic characteristics of the plant. In mulberry cultivation, PGRs have attracted considerable attention because of their potential to improve leaf production, plant growth, physiological efficiency and stress tolerance. Appropriate application of PGRs can influence processes such as cell division, cell elongation, root initiation, shoot development, leaf expansion and chlorophyll maintenance. They can also affect the movement and utilisation of nutrients within the plant, thereby supporting the production of healthy and nutritious foliage. Growth-promoting substances can stimulate sprouting, leaf expansion and vegetative growth under favourable conditions. On the other hand, growth-retarding or stress-associated hormonal responses can help plants cope with adverse environmental conditions by influencing transpiration, water balance and other physiological processes (Saranya, 2024). Thus, PGRs have potential as an important component of improved mulberry production practices.

Among the different PGRs, auxins and cytokinins have been widely studied for their role in improving vegetative growth and leaf quality. Indole-3-butyric acid (IBA), an auxin, is particularly associated with root initiation and successful establishment of stem cuttings. It promotes rooting and can therefore contribute to better vegetative propagation of mulberry. Kinetin, a cytokinin, promotes cell division and is associated with shoot development, chlorophyll maintenance and delayed leaf senescence. The combined or individual use of such regulators may therefore improve plant establishment, growth and leaf quality. However, the response of mulberry to PGR application is not uniform. It may vary depending on the concentration of the regulator, method and time of application, prevailing environmental conditions and the genetic constitution of the cultivar. Therefore, determining the optimum concentration and suitable application method is essential before recommending PGRs for commercial mulberry cultivation.

S-1635: A Promising Mulberry Cultivar

Among the high-yielding mulberry cultivars, S-1635 is an important triploid variety widely cultivated in Eastern and Northeastern India. It is considered suitable for irrigated conditions and is recognised for its vigorous growth, good branching and strong sprouting ability (Ganga and Chetty, 1997). The cultivar is often regarded as a unique and valuable variety because of

its stable performance and high leaf-producing capacity. The leaves of S-1635 are large, unlobed, succulent and dark green, with desirable nutritional characteristics for silkworm rearing. Its vigorous growth and abundant branching contribute to greater leaf biomass production. The cultivar also possesses good rooting ability from stem cuttings, making it suitable for rapid vegetative multiplication and nursery establishment. Under recommended agronomic practices and proper irrigation management, S-1635 can produce approximately 40–45 tonnes of leaves per hectare per year (Rajanna *et al.*, 2005). Apart from its high productivity, the cultivar possesses considerable tolerance to drought and shows resistance or moderate resistance to certain important pests and diseases. It is reported to be resistant to leaf spot disease and moderately resistant to mealy bug and leaf rust. These characteristics make S-1635 a suitable cultivar for sustainable mulberry cultivation, particularly in regions where environmental conditions may fluctuate.

Scope of IBA and Kinetin Application in Mulberry

Improving the productivity and quality of mulberry leaves is directly linked with better silkworm performance and silk production. In this context, the application of PGRs such as IBA and kinetin offers a promising approach for enhancing the physiological efficiency of mulberry plants. IBA can play an important role in root initiation and vegetative propagation, which is particularly useful for the rapid multiplication and establishment of mulberry plants. A well-developed root system can improve water and nutrient uptake and thereby support better plant growth. Kinetin, on the other hand, can promote cell division, shoot development and chlorophyll retention and may delay premature senescence. Improved chlorophyll content and prolonged maintenance of physiologically active leaves can contribute to greater availability of nutritious foliage for silkworms. The use of PGRs should, however, be approached scientifically, as excessive or inappropriate concentrations may produce undesirable effects. The optimum dose should be determined based on the cultivar, environmental conditions and intended objective. Therefore, cultivar-specific studies are necessary to identify suitable PGR concentrations that can improve plant growth without adversely affecting leaf quality.

Conclusion

Mulberry is the foundation of successful *Bombyx mori* sericulture, and the availability of healthy, nutritious leaves throughout the year is essential for maintaining silkworm growth and cocoon productivity. Although leaf senescence is a natural process, premature ageing and environmental stresses can reduce the availability and quality of mulberry foliage. Plant growth regulators provide a potential means of managing plant growth, improving leaf production and maintaining physiological activity under different growing conditions. S-1635, with its high leaf-yielding potential, vigorous growth, good sprouting capacity and adaptability, offers considerable scope for productivity enhancement through appropriate agronomic management. The use of IBA and kinetin may further improve root development, vegetative growth, chlorophyll retention and leaf quality. Therefore, systematic evaluation of these PGRs under suitable concentrations and application schedules can contribute to developing an efficient and sustainable production strategy for S-1635.

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