

Enhancing Mulberry Productivity Through Foliar Nutrition Strategies for Improved Growth and Biochemical Performance

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Abstract

Mulberry (Morus spp.) plays a central role in sericulture as the exclusive food source for silkworms. Optimizing its growth and leaf quality is essential for improving silk yield and quality. Foliar nutrition has emerged as an efficient and targeted approach to supplement plant nutrients, particularly under conditions where soil nutrient availability is limited. This article discusses the role of selected foliar sprays in enhancing growth parameters and biochemical attributes of mulberry. Evidence indicates that foliar application of macro- and micronutrients, along with bio-stimulants, significantly improves plant height, leaf area, biomass accumulation, chlorophyll content, and protein synthesis. These enhancements ultimately contribute to superior leaf quality and improved silkworm performance. The adoption of foliar nutrition strategies offers a sustainable and economically viable approach for boosting mulberry productivity and supporting the sericulture industry.

Keywords: Mulberry, Foliar spray, Growth parameters, Biochemical composition, Sericulture, Leaf quality

Introduction

Mulberry (*Morus spp.*) is a perennial plant of immense economic importance due to its exclusive role in sericulture. The productivity and quality of mulberry leaves directly determine the growth, development, and cocoon yield of silkworms (*Bombyx mori*). Therefore, improving mulberry cultivation practices is crucial for sustaining and enhancing silk production [1]. Conventional soil fertilization often faces challenges such as nutrient leaching, fixation, and reduced bioavailability, foliar nutrition has gained attention as an effective alternative or supplementary approach. Foliar application involves spraying nutrients directly onto plant leaves, enabling rapid absorption and utilization. This method ensures immediate nutrient availability during critical growth stages and enhances overall plant performance.

Role of Foliar Sprays in Mulberry Growth

Foliar application of essential nutrients plays a significant role in improving vegetative growth parameters in mulberry. Nutrients such as nitrogen, potassium, zinc, iron, and boron, when applied as foliar sprays, promote cell division, elongation, and metabolic activities.

This results in increased plant height, number of shoots, leaf area, and overall biomass production [2]. Nitrogen-based foliar sprays enhance vegetative growth by promoting protein synthesis and chlorophyll formation. Potassium contributes to enzyme activation and regulation of stomatal function, thereby improving photosynthesis efficiency. Micronutrients such as zinc and iron are essential for enzymatic activities and chlorophyll biosynthesis, which directly influence plant vigor.

Impact on Biochemical Parameters

Foliar nutrition significantly influences the biochemical composition of mulberry leaves, which is critical for silkworm nutrition. Application of nutrient sprays has been shown to increase chlorophyll content, thereby enhancing photosynthetic capacity. This leads to higher accumulation of carbohydrates and soluble sugars in the leaves. Protein content is another important parameter that improves with foliar feeding, as nitrogen and other nutrients facilitate amino acid synthesis [3]. Additionally, foliar sprays enhance the activity of antioxidant enzymes, which help in protecting plants from oxidative stress. Improved biochemical composition results in higher-quality leaves that support better silkworm growth and cocoon production.

Table: Effect of Selected Foliar Sprays on Growth and Biochemical Parameters of Mulberry

Treatment (Foliar Spray)	Growth Parameters (Plant height, Leaf area, Biomass)	Chlorophyll Content	Protein Content	Carbohydrate Content	Overall Effect
Control (No spray)	Baseline / Low	Low	Low	Moderate	Least effective
Nitrogen (Urea 1–2%)	Significant increase	High	High	Moderate	Improves vegetative growth
Potassium (KCl/K ₂ SO ₄ 1%)	Moderate increase	Moderate	Moderate	High	Enhances photosynthesis efficiency
Zinc (ZnSO ₄ 0.5%)	Moderate increase	High	Moderate	Moderate	Improves enzyme activity
Iron (FeSO ₄ 0.5%)	Moderate increase	High	Moderate	Moderate	Enhances chlorophyll synthesis
Boron (0.2–0.3%)	Moderate increase	Moderate	Moderate	Moderate	Supports metabolic functions
Bio-stimulants (Seaweed extract)	High increase	High	High	High	Overall growth and quality improvement
Combined nutrients spray	Maximum increase	Very high	Very high	High	Most effective treatment

Note: Values represent general trends observed in experimental studies; actual results may vary depending on environmental conditions, mulberry variety, and application frequency.

Advantages of Foliar Nutrition

Foliar feeding offers several advantages over conventional soil fertilization:

- Rapid nutrient absorption and immediate response
- Reduced nutrient losses due to leaching and fixation
- Targeted nutrient application during critical growth stages
- Improved nutrient use efficiency
- Environmentally sustainable and cost-effective

These benefits make foliar nutrition a practical approach for enhancing mulberry cultivation, especially in regions with poor soil fertility.

Implications for Sericulture

Improved growth and biochemical quality of mulberry leaves have a direct positive impact on sericulture. High-quality leaves enhance silkworm feeding efficiency, growth rate, and cocoon quality [4–5]. This ultimately leads to increased silk yield and better economic returns for farmers.

Conclusion

The application of selected foliar sprays plays a vital role in improving the growth and biochemical parameters of mulberry. And ensuring efficient nutrient uptake and enhancing physiological processes, foliar nutrition contributes to better leaf yield and quality. Adoption of this technique can significantly support sustainable mulberry production and strengthen the sericulture industry. Future research should focus on optimizing spray formulations, concentrations, and application schedules for maximum benefit.

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