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INFLUENCE OF *MORUS ALBA* LEAF QUALITY ON THE BIOLOGICAL AND PRODUCTIVE PERFORMANCE OF THE SILKWORM *BOMBYX MORI*

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Abstract: *Sericulture is closely associated with the availability and quality of mulberry leaves, which represent the primary food source for the silkworm Bombyx mori. The nutritional value of mulberry leaves is determined by their content of proteins, carbohydrates, lipids, fiber, minerals, and other biologically active compounds that may influence feed intake, larval development, nutrient utilization for cocoon formation, and silk synthesis. However, leaf composition is not constant, as it is influenced by mulberry genotype, developmental stage, pedoclimatic conditions, water availability, fertilization, season, and harvesting and storage practices. This review examines the relationship between mulberry leaf quality and the biological and productive responses of Bombyx mori, focusing on larval growth and development, feed utilization efficiency, silk gland development, and the main quantitative and qualitative characteristics of cocoons and silk. Particular attention is given to how variations in environmental factors, including those associated with climate change, may alter the nutritional properties of mulberry leaves and, consequently, affect silkworm growth and development. The review highlights the importance of mulberry leaf quality as a key factor determining the biological and productive efficiency of sericultural systems, while identifying relevant research directions for the adaptation and sustainable development of sericulture.*

Keywords: sericulture, nutritional value, larval development, environmental factors

Introduction

Mulberry leaves (*Morus alba* L.) represent the primary food source for the silkworm *Bombyx mori*, and their nutritional quality plays a key role in larval development and silk production. Leaf composition and digestibility vary according to cultivar, maturity, soil fertility, and growing conditions, potentially influencing nutrient utilization and cocoon characteristics (Singh et al., 2021; Doliș et al., 2024; Nguyen et al., 2025). Mulberry leaves (*Morus alba* L.) provide essential nutrients required for silkworm growth, metabolism, and silk production. Their nutritional value is determined by the content and availability of proteins, amino acids, carbohydrates, lipids, minerals, and water. However, nutrient composition alone does not fully describe leaf quality, as digestibility and nutrient utilization also influence biological performance. Differences in mulberry cultivar and leaf maturity may affect these characteristics, with potential consequences for larval development and cocoon production (Doliș et al., 2024; Hăbeanu et al., 2024).

Table 1

Main nutritional components of *Morus alba* leaves and their biological relevance (Doliș et al. 2024)

Nutritional component	Biological relevance for *Bombyx mori*
Proteins and amino acids	Larval tissue growth and synthesis of silk proteins
Carbohydrates	Energy supply for metabolic processes
Lipids	Cellular structure and metabolic functions
Dietary fiber	Influences leaf digestibility and nutrient availability
Minerals	Support physiological and enzymatic processes
Water	Hydration, leaf freshness, and feeding suitability

Mulberry leaf quality is influenced by genetic, physiological, environmental, and agronomic factors, which can modify its nutritional composition and digestibility, with potential implications for silkworm growth and silk production (Singh et al., 2021; Doliș et al., 2024; Nguyen et al., 2025).

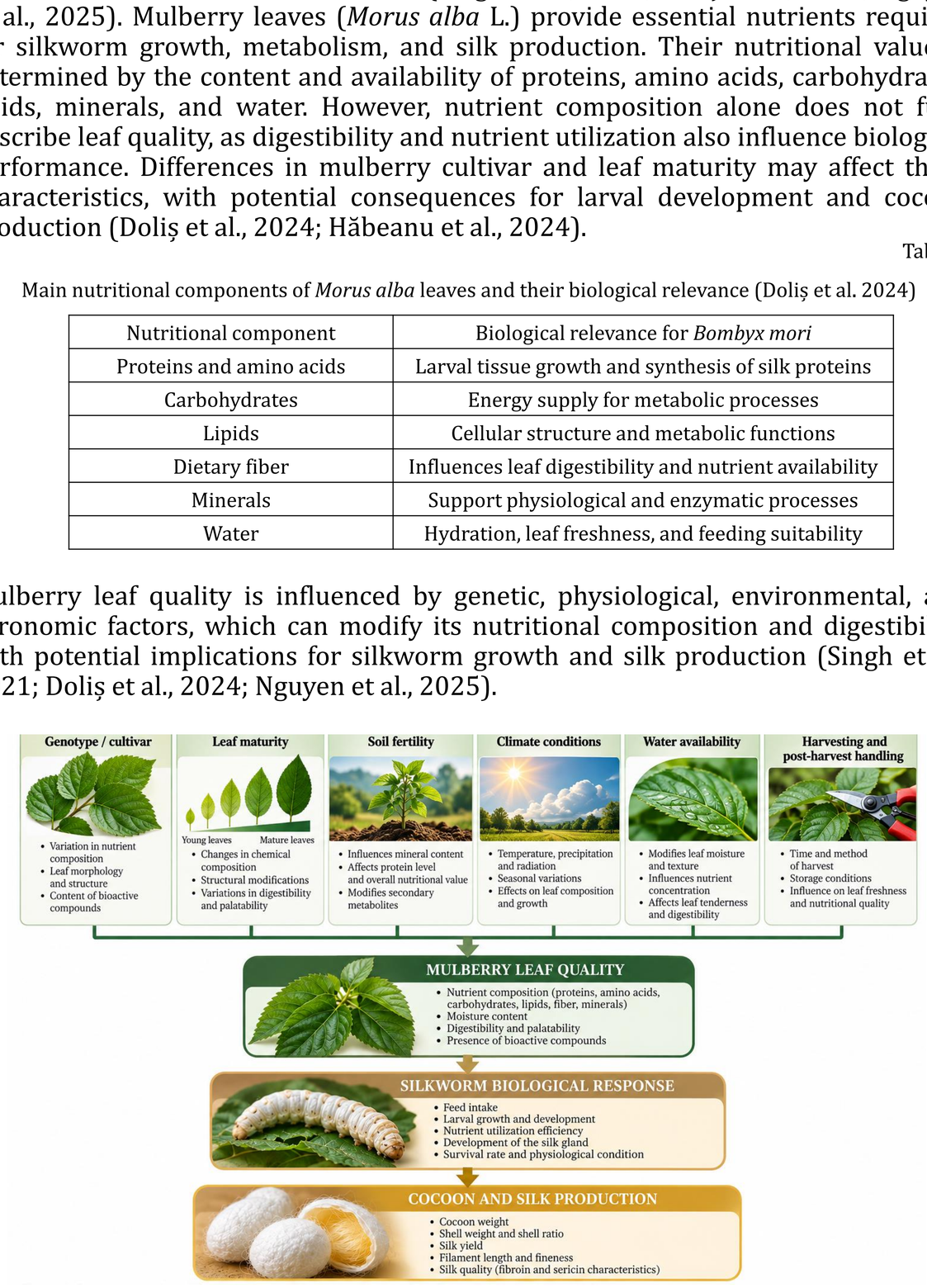


Figure 1. Conceptual relationship between agronomic factors, mulberry leaf quality and sericultural productivity.

The nutritional quality of mulberry leaves significantly influences silkworm growth and cocoon productivity. Variations in leaf composition, moisture content, and digestibility may influence nutrient utilization, larval development, and silk production, highlighting the importance of optimized mulberry cultivation and leaf management practices (Singh et al., 2021; Doliș et al., 2024; Nguyen et al., 2025).

The efficiency of nutrient utilization is an important indicator of the relationship between mulberry leaf quality and silk production. Doliș et al. (2024) evaluated the conversion efficiency of digested nutrients into cocoon silk shell dry matter in *Bombyx mori* larvae fed two mulberry cultivars, Kokuso 21 and Eforie.

Tabel 2

Comparison of nutrient conversion efficiency in *Bombyx mori* larvae

Indicator	Kokuso 21	Eforie
Ingested dry matter / silk shell dry matter (g/g)	10.06	10.14
Digested dry matter / silk shell dry matter (g/g)	5.57	5.42
ECIS (%)	9.90	9.87
ECDS (%)	17.94	18.45

The results indicate a slightly higher efficiency of digested nutrient conversion (ECDS) in larvae fed Eforie leaves (18.45%) compared with Kokuso 21 (17.94%), while the efficiency of ingested nutrient conversion (ECIS) was similar between the two cultivars. These findings suggest that mulberry cultivar characteristics may influence nutrient utilization and silk production efficiency (Doliș et al., 2024).
The nutritional characteristics of mulberry leaves influence several physiological processes in *Bombyx mori*, including larval growth, nutrient utilization, and silk protein synthesis. Table 3 summarizes the main nutritional factors and their potential effects on biological development and cocoon productivity.

Table 3

Nutritional factors affecting biological and productive performance in *Bombyx mori*

Leaf quality factor	Biological response	Potential productive outcome
Protein and amino acid availability	Supports tissue growth and silk protein synthesis	Cocoon shell development
Carbohydrate availability	Supplies metabolic energy	Supports larval growth and cocoon formation
Leaf moisture and tenderness	Influences feed acceptance and intake	May affect growth uniformity
Leaf maturity	Modifies leaf composition and digestibility	May influence nutrient conversion efficiency
Nutrient digestibility	Determines the proportion of nutrients available for utilization	Influences silk production efficiency
Mineral availability	Supports enzymatic and physiological functions	Indirect contribution to larval development

The effects of mulberry leaf quality extend beyond larval growth, influencing nutrient conversion and cocoon formation. Adequate nutrient availability and digestibility support the physiological processes involved in silk synthesis, whereas differences in leaf maturity and nutritional characteristics may contribute to variations in productive performance. These relationships emphasize the importance of evaluating leaf quality through both nutritional and sericultural indicators.

Conclusions

Mulberry leaf quality is an important determinant of silkworm biological performance and cocoon productivity. Evidence from published studies indicates that leaf cultivar, maturity, and soil-related factors influence nutritional characteristics and nutrient utilization. Differences in digestibility and conversion efficiency highlight the importance of selecting appropriate mulberry leaves and adapting feeding practices to larval requirements. Further research integrating leaf biochemical composition, environmental conditions, and silkworm productive traits is needed to support more efficient and sustainable sericulture.