



Carbon Sequestration Potential of Mulberry Trees in Silk Farming

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As climate change intensifies, mulberry cultivation in silk farming emerges as a promising carbon sequestration strategy. Mulberry trees (genus *Morus*) possess high biomass production and photosynthetic efficiency, making them effective carbon sinks. This article examines the factors influencing the carbon sequestration potential of mulberry, including photosynthetic efficiency, biomass accumulation, soil management practices, and environmental conditions. Strategies to enhance carbon capture, such as selecting high-yielding varieties and adopting sustainable practices, are discussed. Integrating these methods into sericulture offers dual benefits: mitigating climate change and supporting sustainable silk production.

Introduction

As global climate change intensifies, the search for effective carbon sequestration methods has become paramount. Among various agricultural practices, mulberry cultivation, particularly in silk farming, presents a promising avenue for carbon capture. Mulberry trees (genus *Morus*) are not only vital for sericulture but also serve as significant carbon sinks due to their high biomass production and photosynthetic efficiency. This article explores the carbon sequestration potential of mulberry trees, the factors influencing their effectiveness, and the implications for sustainable agriculture and climate change mitigation.

The Role of Mulberry Trees in Carbon Sequestration

Mulberry trees are recognized for their unique ability to absorb carbon dioxide (CO₂) from the atmosphere through photosynthesis. This process, coupled with their substantial biomass, makes them effective in sequestering carbon. Studies indicate that mulberry can fix a significant amount of atmospheric CO₂, enriching both above-ground biomass and soil carbon stocks. For instance, research shows that the carbon sequestration potential (CSP) of mulberry can vary based on cultivation practices and environmental conditions, with estimates suggesting a range of 1.20 to 1.46 Mg ha⁻¹ year⁻¹ under optimal conditions (Yadav et al., 2020).

Factors Influencing Carbon Sequestration

Several factors affect the carbon sequestration capacity of mulberry trees:

- 1. Photosynthetic Efficiency:** Mulberry trees are C3 plants, which means they can utilize atmospheric CO₂ more efficiently under certain conditions, particularly in temperate climates. This efficiency is crucial for maximizing carbon uptake during the growing season.
- 2. Biomass Accumulation:** The growth rate and biomass production of mulberry trees directly influence their carbon storage capabilities. High-yielding varieties of mulberry

have been developed to enhance biomass production, thereby increasing their carbon sequestration potential (Indrani Nath et al., 2024).

- 3. Soil Management Practices:** The method of cultivation significantly impacts carbon sequestration. Practices such as reduced tillage, mulching, and efficient irrigation (e.g., drip irrigation) have been shown to improve soil health, enhance water retention, and increase nutrient availability, all of which contribute to higher carbon sequestration rates (Li et al., 2020).
- 4. Environmental Conditions:** The local climate, soil type, and topography play critical roles in determining the carbon sequestration potential of mulberry plantations. For example, regions with adequate rainfall and favorable temperatures tend to support better growth and higher carbon capture.

Carbon Sequestration Strategies in Mulberry Cultivation

To optimize the carbon sequestration potential of mulberry trees, several strategies can be employed (Indrani Nath et al., 2024):

- **Selection of High-Yielding Varieties:** Utilizing improved mulberry varieties that produce more biomass can significantly enhance carbon capture. These varieties are bred for higher leaf yield, which is essential for silkworm feeding and carbon sequestration.
- **Adoption of Sustainable Agricultural Practices:** Implementing sustainable practices such as organic farming, crop rotation, and agroforestry can improve soil health and increase carbon storage. Mulching and cover cropping can also reduce soil erosion and enhance carbon retention in the soil.
- **Irrigation Management:** Efficient irrigation techniques, such as drip irrigation, not only conserve water but also promote healthier plant growth, leading to increased carbon sequestration. These methods help maintain optimal soil moisture levels, crucial for photosynthesis and biomass accumulation.
- **Phytoremediation:** Mulberry trees can also play a role in phytoremediation, where they help clean contaminated soils, thus contributing to environmental health while sequestering carbon.

Implications for Silk Farming and Climate Change

The integration of carbon sequestration practices in mulberry cultivation has significant implications for both silk farming and climate change mitigation. By enhancing the carbon sink capacity of mulberry plantations, sericulture can contribute to reducing atmospheric CO₂ levels, thereby combating global warming. Furthermore, the economic benefits of improved mulberry cultivation practices can lead to increased silk production, providing livelihoods for farmers while simultaneously addressing environmental concerns. This dual benefit positions mulberry cultivation as a sustainable agricultural practice that aligns with global climate goals.

Conclusion

The carbon sequestration potential of mulberry trees in silk farming is substantial and presents a viable strategy for mitigating climate change. By optimizing cultivation practices, selecting high-yielding varieties, and adopting sustainable agricultural methods, mulberry plantations can enhance their role as carbon sinks. As the world grapples with the challenges of climate change, integrating carbon sequestration strategies in sericulture not only promotes environmental sustainability but also supports economic resilience for farmers. Future research should focus on quantifying the carbon sequestration potential of various mulberry cultivation practices across different regions, as well as developing guidelines for farmers to implement these strategies effectively. By harnessing the capabilities of mulberry trees, we can make significant strides toward a more sustainable and environmentally friendly approach to agriculture.

References

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