

Good Agroforestry Practices of Malabar Neem (*Melia dubia*) in India

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Abstract

Melia dubia is commonly known as Malabar Neem which has emerged as a prominent species in agroforestry systems due to its rapid growth, multifarious uses, and adaptability to wide range of climatic conditions in India. This article aims to provide a comprehensive overview of *Melia dubia*, highlighting its botanical characteristics, ecological requirements, benefits in agroforestry systems, good agroforestry practices, and its economic and environmental impacts. The paper synthesizes existing research to offer insights into the potential and challenges of integrating *Melia dubia* into sustainable agroforestry practices in India.

Keywords: Malabar Neem, Multifarious uses, Adaptability, Agroforestry systems, Sustainable agroforestry

Introduction

Agroforestry is defined as the integration of trees and shrubs into agricultural landscapes which offers a multitude of benefits, including enhanced biodiversity, productivity, improved soil health, and increased economic returns for farmers. Among the various tree species used in agroforestry, *Melia dubia* preferred by farmers due to its fast growth, high timber quality, and multiple uses (Parthiban *et al.*, 2009). Its wood is mainly used in pulp and plywood industry. *Melia dubia* has gained popularity in various regions in India for its adaptability in wide range of climatic conditions and economic potential. This article explores the role of *Melia dubia* in agroforestry systems, examining its characteristics, cultivation practices and benefits.

Botanical Characteristics

Melia dubia belongs to the family Meliaceae. It is a deciduous tree and can reach heights of 20-30 meters with a straight trunk and a broad, spreading canopy. The leaves are pinnately compound, and the tree produces small, fragrant flowers that are typically white or pale green. The fruit is a drupe, containing a single or more seeds, which is an important characteristic for propagation.

Growth and Development

Melia dubia is renowned for its rapid growth. The young tree is capable of reaching up to 4-5 meters in height within a year under optimal climate conditions. This fast growth rate makes it an attractive agroforestry species for timber production and carbon sequestration in different agroforestry systems.

Climate

Melia dubia thrives in tropical and subtropical climates, with an optimal temperature range of 25-35°C. It requires moderate rainfall, between 800-1500 mm annually. It can tolerate a range of soil types, although it prefers well-drained, loamy soils.

Soil

The tree grows well in soils with pH levels ranging from 5.5 to 7.5. It can tolerate drought conditions once established but is sensitive to waterlogging. Proper site selection and soil management are crucial for maximizing growth and productivity.

Good Cultivation Practices

- ✚ **Propagation:** *Melia dubia* can be propagated through seeds, cuttings, or tissue culture. Seed propagation is the most common method. Seeds of Malabar Neem are requiring pre-treatment to enhance germination rates. Nursery management practices are essential to produce healthy seedlings for field planting.
- ✚ **Planting and Spacing:** In agroforestry systems, *Melia dubia* is typically planted at a spacing of 8-10 meters between rows and 5-7 meters between plants for the purpose of timber. However, closer spacing can be used for the purpose of pulp wood. This spacing allows for optimal growth and minimizes competition for resources. Proper spacing also facilitates intercropping with agricultural crops (Arya *et al.*, 2023).
- ✚ **Management:** Regular management practices, including pruning, thinning, and pest control, are essential for maintaining tree health and productivity. Pruning helps in

shaping the tree and promoting a straight trunk, while thinning reduces competition and ensures adequate space for health of each tree.

Benefits in Agroforestry Systems

- ✚ **Timber Production:** *Melia dubia* produces high-quality timber that is used in furniture, construction, and plywood industries. Its timber is valued for its durability, workability, and aesthetic purposes. The fast growth rate ensures a steady supply of timber, providing economic benefits to farmers.
- ✚ **Environmental Benefits:** Integrating *Melia dubia* into agroforestry systems enhances biodiversity, improves soil fertility through leaf litter decomposition, and aids in carbon sequestration (Pankaj *et al.*, 2024). The deep root system helps in preventing soil erosion and improving water infiltration.
- ✚ **Economic Benefits:** *Melia dubia* offers multiple income streams for farmers, including timber, fodder, and non-timber forest products. Its leaves and fruit can be used as livestock fodder, providing an additional source of income. The economic returns from *Melia dubia* can significantly enhance the livelihoods of smallholder farmers in India.

Challenges and Limitations

- ✚ **Pest and Disease Management:** *Melia dubia* is susceptible to various pests and diseases, including leaf-eating caterpillars, stem borers, and fungal infections. Effective pest and disease management strategies are essential to protect the trees and ensure high productivity.
- ✚ **Market Access and Value Chain:** While *Melia dubia* has high economic potential, access to markets and value chains can be a challenge for smallholder farmers. Developing efficient value chains and market linkages is crucial for maximizing the economic benefits of *Melia dubia* in India.
- ✚ **Knowledge and Capacity Building:** Successful integration of *Melia dubia* into agroforestry systems requires knowledge and capacity building among farmers and extension workers. Training programs and extension services are essential for disseminating best practices and improving cultivation techniques.

Conclusion

Melia dubia presents a promising option for agroforestry systems, offering multiple environmental and economic benefits. Its rapid growth, high-quality timber, and adaptability



to various climatic conditions make it an attractive agroforestry species for farmers. However, addressing challenges related to pest management, market access, and capacity building is essential for realizing its full potential. Future research and policy support can further enhance the role of *Melia dubia* in sustainable agroforestry practices in India

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