

# *Melia dubia* :

## An ideal tree for commercial agroforestry

**Sushil Kumar\*, Ashok Yadav and Ayyanadar Arunachalam**

ICAR-Central Agroforestry Research Institute (CAFRI), Jhansi, Uttar Pradesh 284 003

*Agroforestry or trees outside forests are vital for ensuring environmental resilience in terrestrial landscapes. In this regard, growing trees on farmlands i.e. agroforestry ensures livelihood security to the farming communities. Nonetheless, there are a few bottlenecks in the farmers' adoption process of agroforestry trees as they ought to be fast-growing, deciduous straight bole, high market value, assured buyback, and low maintenance cost, etc. On these counts, and based on tree ideotypes for agroforestry, Melia dubia has both structural and functional traits for agroforestry, and essentially has market value as well. This study thus demonstrates various benefits of Melia dubia due to which it is gaining interest among the farmers and emerging as a sustainable and promising raw material for commercial agroforestry.*

**Keywords:** Agroforestry, Land Management, Melia, Tree

**A**GROFORESTRY is a sustainable land management system that increases the overall yield of the lands by combining the trees and shrubs with crops and livestock on the same unit of land, either simultaneously or sequentially. Besides enhanced yields per unit area, agroforestry also helps in the conservation of natural resources, increases farm income and also makes the agricultural system climate-resilient. In the present-day context, any increase in tree cover can work as a carbon sink and subsequently help in maintaining CO<sub>2</sub> concentration in the atmosphere. For exploring the possibility of planting trees, we need to augment potential wastelands and degraded lands including the farm landscapes. The role of agroforestry is imperative to increased green cover that offset the adverse effect of climate change. Despite myriad benefits of agroforestry, it has not been widely adopted as should have been by the farming communities due to the yield penalty of associated crops, a long gestation period of tree components

and difficulty in performing cultural operations, and of course, the market. This calls for the promotion of commercially viable tree species for integration in farm landscapes. In this regard, *Melia dubia* emerges to be an economically viable species and fetches a handsome price in the market. This could help remove the above-listed constraints of adoption by the farmers owing to its short gestation period, assured buyback, and low maintenance cost. *Melia dubia* is a fast-growing, deciduous tree with stout, straight, tall bole and wide-spreading branches. The block planting of 300–400 *Melia* trees per acre can ensure a minimum profit of ₹1 lakh per year. Hence, *Melia dubia* is considered highly suitable for farm forestry and agroforestry to generate higher income per unit area besides increasing green cover. It is one of the fastest-growing tree species in the world and is considered a money-spinning tree of short rotation due to its high demand in pulpwood, plywood, and timber industries. A few reports reveal the fuel, fodder, and medicinal values of *Melia dubia* as well.

### **Tree ideotype for agroforestry system**

- It should not interfere with soil moisture.
- It should have very little water requirement.
- It should not compete with crops for resources/nutrients.
- It should not be nutrients exhaustive.
- It should help in building soil fertility.
- It should have a tap root system and root growth characteristics.
- It should have a light branching pattern.
- It should withstand pruning operations.
- It should have a high survival rate.
- It should have fast-growing habit and easy management.
- It should have a short rotation.
- It should have wider adaptability.
- It should have high palatability as fodder.
- It should have capability to withstand management practices.
- It should have nutrient cycling and nitrogen fixation attributes.

- It should be free from chemical exudations.
- It should have easily decomposable leaves.
- It should have multiple uses.
- It should have high yield potential.

*Melia dubia* has all positive characteristics that makes it an ideal tree species for agroforestry. Among them few important characteristics have been described here :

**Root:** The roots of *Melia dubia* are reported to have less interference with crop in agroforestry systems and are mostly concentrated below the crop root zone with minimal lateral expansion. It has been stated that the root distribution of woody components grown with annual crops in agroforestry systems should be below 40 cm soil layers and have little lateral expansion because most of the roots of annual crops are concentrated in the upper 30–40 cm soil layer only. The dissimilar root distribution pattern of tree and crop components in agroforestry systems avoids competition for nutrients and water and helps in soil working.

**Crown:** *Melia Dubia* is a large tree that attains a height of 20 meters with a spreading crown and a cylindrical straight trunk (9 m length  $\times$  1.2–1.5 m girth) after 10–12 years plantation. It has a thin to moderate crown that passes enough light to understory crops. It has been established that a tree with dense crown does not pass enough light on the understory crops canopy in agroforestry systems which adversely affect its photosynthesis process and ultimately results in low yield of the understory crops. Therefore, light crown tree species are considered suitable for the agroforestry system as these tree species pass enough light to the understory crops for their photosynthesis activity.

**Bole:** Generally, tree species with straight, clean, and long bole are preferred for agroforestry. In addition, the chosen tree species should also have either self-pruning characteristics or tolerate a high incidence of artificial pruning because it helps in developing a clear bole and enhances timber quality. *Melia dubia* has rounded, cylindrical

knot-free, clean and straight bole of up to 9 m length. Besides, it also has inbuilt self-pruning, termite resistant, frost and drought resistant qualities. Altogether, these characteristics make *Melia dubia* an ideal and farmer-friendly agroforestry tree species.



Straight, clean and clear bole of *Melia dubia*

**Phenology:** Phenological characteristics namely leaf fall and emergence of the new leaf are considered important for the selection of a tree species for the agroforestry system. The deciduous nature of trees allows their leaves to avoid competition for light, nutrients and moisture with crops are preferred for agroforestry systems. Therefore, better crop growth is observed with trees that have a longer period of leaflessness. Furthermore, leaf litter of deciduous trees adds organic matter to the soil which ultimately helps to improve the health and productivity of the soil. In this context, *Melia dubia* being a deciduous tree species sheds leaves in winter (December-January) and new flushing occurs in February-March along with flowers. This short leafless period provides enough light, nutrients, and moisture for winter crops to flourish well. The litterfall of *Melia* also adds organic matter to the soil which enhances fertility and productivity of the soil.

**Fast growth:** *Melia dubia* is a fast-growing tree and can be managed through short rotation. It achieves up to 40 feet height within two years of planting. It is reported that a 10-year-old plantation of *Melia dubia* has the potential to yield on an average up to 40 tonnes of biomass per acre per year. Being a short rotational industrial tree, its cultivation period generally ranges between 6–12 years for a good economic yield.

**Allelopathic effect:** *Melia dubia* either has ephemeral or no allelopathic effect on crops at early stages. Hence, *Melia dubia* fits well to the criteria of agroforestry ideotypes and is considered an ideal tree species for agroforestry.

**Shelter to insect, pest, and disease:** The tree species selected for the agroforestry system should not harbour insects, pests, and diseases as these may damage the associated crops. As per available literature, *Melia dubia* is not susceptible to pest and insect attacks and also does not harbour major insects, pests and diseases. However, mite infestation in the off season plantation of *Melia dubia* has been observed in parts of dry climatic regions.

These quality characters ideate *Melia dubia* to be a potential agroforestry tree species for integration in the farm landscape, and so warrant nursery techniques to mass propagate quality planting material.

## SUMMARY

*Melia dubia* is a promising tree highly suitable for farm forestry and agroforestry. This is a fast-growing tree whose wood is readily used in plywood industries. This timbre species has gained a lot of interest among farmers in India as it is known to fetch a good income with minimal investment and maintainance due to its positives such as straight stem without much branching, less shade effect, not being susceptible to insect attack and its ability to grow in all types of soil and even in areas of low rainfall.

\*Corresponding author's e-mail:  
Sushil.Kumar1@icar.gov.in