Commercial Tree Cultivation of Divi-Divi for Tannin

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ABSTRACT

Divi-divi (*Caesalpinia coriaria*) is a leguminous tree native to the Caribbean, Central America, and parts of northern South America. Known for its high tannin-rich pods, it has significant applications in industries such as leather tanning, dye production and medicine. Establishing Divi-divi as a commercial plantation offers immense potential especially in arid and semi-arid regions. This document explores its cultivation, management, and economic potential as a sustainable tannin source.

INTRODUCTION

Caesalpinia coriaria (Jacq.) Wild is a small or medium-sized leguminous evergreen tree belongs to family Fabaceae. It is commonly called Divi-Divi or American Smac. It is distributed throughout Central America and north of South America. It has been introduced in Kolkata, India during 1834 as a shade tree in urban landscapes (Chacko *et al*., 2002). The species will thrive in areas having annual rainfall of 600 mm to 2500 mm and mean annual temperature 15-28˚C. It is a drought resistant, wind- resistant and fairly saline tolerant. It will attain 9 m in height with a dense low spreading umbrella like crown, somewhat resemblance to babul (*Acacia nilotica*) in appearance. It has short trunk and often crooked in nature (Troup, 1921 and Bose *et al*., 1998). Very recently the species have very much attention due to the anti-bacterial and antioxidants properties, apart

from this it has good tannins, fodder and avenue suitability (Mohana and Raveesha, 2006; Lokeswari and Sujatha, 2011). Due to its fodder and nitrogen fixing capacity it can be effectively included in Agroforestry system (CAB, 2005). The fruits and seeds characteristics have been considered as an important factor in the reproductive biology of plants. Floral phenology and reproductive biology are the base for the breeding programs and to regulate the genetic structure). This is the first kind of study from India, aims to investigate the floral phenology, developmental variation in fruit and seed, maturation period.

General Information

Divi-divi (*Libidibia coriaria*) is a shrub or small tree with a rounded, spreading crown. It typically grows up to 10 meters tall, with a bole diameter of up to 35 cm. The tree is often shaped by wind exposure, resulting in picturesque forms with flat-topped crowns and leaning trunks. Historically used in Central America as a tanning material, Divi-divi cultivation spread globally but declined after the 1950s. Today, it is grown ornamentally and for its tannins in many tropical regions.

Why Divi-divi for Tannin Extraction?

1. **High Tannin Content**:
   - Divi-divi pods contain 30–50% tannins, making them one of the richest natural sources. These tannins are widely used in leather tanning, textile dyeing, and pharmaceutical and cosmetic industries.
2. **Adaptability**:
   - **Drought Tolerance**: Thrives in arid and semi-arid regions with minimal water requirements.
   - **Soil Tolerance**: Grows well in poor, sandy, or rocky soils with a pH range of 5–8.
3. **Fast Growth**:
   - Begins producing pods as early as 3–4 years after planting.
4. **Nitrogen Fixation**:
   - Being a legume, Divi-divi fixes atmospheric nitrogen, enhancing soil fertility and promoting sustainable farming systems.

Propagation

Seed Propagation

- Collect mature pods when they turn brown.
- Extract seeds and scarify them by nicking the seed coat or soaking in warm water for 24 hours to enhance germination.
- Plant seeds in a nursery or directly in the field at a depth of 1–2 cm.
- Germination occurs within 1–2 weeks.

Vegetative Propagation

- Rarely practiced but can be done using cuttings if seeds are unavailable.

Planting

- **Spacing**: Maintain 4–6 meters between trees for optimal growth and canopy development.
- **Time of Planting**: Plant at the onset of the rainy season to ensure adequate water for establishment.
- **Method**: Dig planting holes 30–40 cm deep, and fill with a mix of soil and organic compost before planting seedlings.

Watering

- **Young Plants**: Regular watering during the first year ensure successful establishment.

- **Mature Trees**: Once established, Divi-divi is drought-tolerant and requires minimal watering.

Fertilization

- Divi-divi's nitrogen-fixing ability reduces the need for nitrogenous fertilizers. Apply organic compost or well-rotted manure annually to promote growth.

Pruning and Maintenance

- Regular pruning helps shape the tree and removes dead or diseased branches.
- Prune to correct the natural twisted trunk and asymmetric growth caused by wind exposure if necessary.

Pest and Disease Management

- Divi-divi is generally resistant to pests and diseases.
- Occasionally monitor for aphids or scale insects. Treat infestations with neem oil or insecticidal soap.

Harvesting and Tannin Extraction

Pod Harvesting

- Harvest pods annually, usually during the dry season when they are fully mature and brown.
- A single tree can yield 10–30 kg of pods annually under proper management.

Processing for Tannin Extraction

1. **Drying**: Sun-dry pods to reduce moisture content.
2. **Grinding**: Grind dried pods into powder for efficient tannin extraction.
3. **Extraction**: Extract tannins using water or solvents, depending on the industrial process.

Economic and Industrial Potential

1. **Market Value of Tannins**:
   - Growing global demand for natural tannins as eco-friendly alternatives to synthetic chemicals.
   - Major applications include leather tanning, adhesives, wine clarification, and health products.
2. **By-products**:
   - Residues from pods and bark can be used as animal feed or biomass for energy production.
   - The tree's wood is suitable for fuel and fencing.
3. **Carbon Sequestration**:
   - Divi-divi plantations contribute to carbon sequestration and biodiversity conservation, aligning with sustainable agricultural programs.

CONCLUSION

Divi-divi offers a sustainable and economically viable solution for tannin extraction, particularly in arid and semi-arid regions. Its high tannin content, adaptability, and environmental benefits make it an excellent choice for commercial cultivation. Addressing challenges like market access and mechanized harvesting will further enhance its viability as a profitable agroforestry crop.

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