Scientific Cultivation of Mango (*Mangifera indica*)

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Introduction

Mango, often hailed as the "king of fruits," is a crucial tropical fruit. Its origins are traced to the Indo-Burma region, Siam and the Philippines and it has been cultivated in India for over 4000 years. In addition to being a delicious table fruit, ripe mangoes are used to make products like jams, jellies, squashes and syrups, while raw mangoes are utilized in pickles and chutneys. India boasts approximately 1000 mango varieties, each with unique taste, flavor, pulp consistency and yield potential.

Climate and Rainfall

Mango thrives in tropical climates but can also grow in subtropical regions up to an altitude of 1400 meters. It does not tolerate high humidity, heavy rain, or frost during flowering. Ideal conditions include an annual mean temperature of 21° to 27°C, though the plant can endure temperatures ranging from 5°C to 44°C. High temperatures during fruit development enhance fruit maturity and quality. Mangoes can handle annual rainfall between 250 mm and 2500 mm, though excessive rainfall before flowering can hinder flowering and promote pests and diseases. Optimal cultivation requires dry, cool winters, followed by hot summers and good post-harvest rainfall.

Soil

Mangoes preferred loamy soil with good drainage and a pH range of 6.5 to 8 is ideal.

Planting Season and Material

Planting is done from July to December using approach or softwood grafts.

Field Preparation

The field should be ploughed twice before pit preparation. Pits of size 1x1x1 meter are filled with topsoil mixed with 10 kg of farmyard manure (FYM) and 100 g of Lindane 1.3% dust per pit. Trees are spaced 7-10 meters apart, with high-density planting of 10 x 5 meters recommended for varieties like Alphonso, Banganapalli and Mallika to increase productivity.

Irrigation: Regular watering is necessary until the trees are established, with intervals of 10 to 15 days for better fruit development and yield. However, irrigation should be stopped 2 to 3 months before the flowering period to promote flowering.

Manures and Fertilizers

Chemical fertilizers are typically applied one year after planting. The application schedule is as follows:

1 Year Old Tree

- FYM: 10 kg
- N: 0.20 kg
- P: 0.20 kg
- K: 0.30 kg

Annual Increase

- FYM: 10 kg
- N: 0.20 kg
- P: 0.20 kg
- K: 0.30 kg

6th Year Onwards

- FYM: 50 kg
- N: 1.0 kg
- P: 1.0 kg
- K: 1.5 kg

Fertilizers are applied during September-October, 45-90 cm away from the trunk, up to the peripheral leaf drip line.

Intercropping

During the initial years, intercropping with short-lived, quick-growing fruit crops such as papaya, phalsa and guava is possible. Vegetables like onions, tomatoes, brinjal and chilies can also be grown.

Training and Pruning

Training: Remove rootstock sprouts and low-lying branches. Older trees may need pruning due to reduced bearing capacity from excessive vegetative growth and self-shading.

Pruning Techniques

- **Heading Back:** Trim heavy, criss-cross branches to open the canopy and remove dead branches to enhance sunlight penetration and aeration.
- **Thinning Out:** Remove excessive terminal shoots, retaining only one or two shoots per previous season's growth to redirect nutrients and hormonal flow to fewer shoots, thereby improving productivity.

Growth Regulators

- **Flowering:** Spray NAA at 20 ppm to increase fruit retention. In February, use 0.5% urea or 1% KNO3 to induce flowering if necessary.
- **Fruit Set and Retention:** Spray 2% KNO3 at mustard size.
- **Off-Year Yield:** Apply paclobutrazol at 10 g a.i./full bearing tree during the first fortnight of September to boost fruit number and yield.

Alternate Bearing: Alternate bearing refers to heavy fruiting in one year followed by a lean or no crop the next year. To manage alternate bearing:

1. Select regular-bearing varieties such as Neelum and Banglura.
2. Maintain regular ploughing, manuring and irrigation.
3. Ensure regular plant protection to prevent crop failure.
4. Practice proper thinning to avoid nutrient exhaustion.

Plant Protection

- **Plant Hopper:** Spray two rounds of acephate 75 SP at 1 g/liter.
- **Stem Borer:** Pad with monocrotophos and plug holes with carbofuran.
- **Mealy Bug:** Use monocrotophos at 1.5 ml/liter.
- **Nut Weevil:** Spray fenthion at 1 ml/liter during the marble stage and again 15 days later.

Diseases

1. **Powdery Mildew:** Use sulfur dust in the early morning.
2. **Anthracnose:** Spray mancozeb at 2 g/liter in three pre-harvest applications at 15-day intervals.
3. **Sooty Mould:** Apply phosphomidon 40 SL at 2 ml/liter combined with 5% maida (1 kg maida or starch boiled with 1 liter water and diluted to 20 liters). Avoid spraying in cloudy weather.

Harvesting: Harvest typically occurs from March to June.

Yield

- **Up to 15 Years:** 8-10 t/ha
- **13-20 Years:** 15-20 t/ha

Post-Harvest Treatment

Dip fruits in 52°C hot water for 3 minutes, followed by 8% plant wax (Fruitox or Waxol) to reduce anthracnose during storage. Two pre-harvest sprays of 0.2% mancozeb (2.0 g/liter) will also help reduce disease incidence.

Physiological Disorders

- **Mango Malformation:** Inflorescences transform into vegetative shoots due to malformins. Control with glutathione (2200 ppm) or ascorbic acid (2100 ppm) sprayed three times at 10-day intervals from panicle emergence.
- **Black Tip:** Appears as black discoloration near leaf tips, later spreading to fruits. This is often caused by exposure to certain environmental conditions.

Phanerogamic Parasite

- **Loranthus:** A partial stem parasite that grows on mango twigs.

Storage: Under ambient conditions, mangoes can be stored for 5-7 days. For extended storage, keep at 5.6°C to 7.2°C with 85-90% relative humidity for up to 4-7 weeks.

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