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# Organic Farming for Sustainable Agricultural Production

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**Lecture 27 : Organic Plantation Crop Management**

# Mango (*Mangifera indica*)

**Family:** Anacardiaceae

**Origin:** Southern Asia

## Climatic Requirements

- Mango trees can tolerate a wide range of climatic conditions.
- It can grow from very hot and humid to cool, dry and very hot and arid.
- For optimum growth and production, the average maximum temperature should be between 27 and 38 °C.

## Soil

- Mango trees grow and produce well on various soil types.
- The ideal soil texture for mango cultivation under irrigation is a sandy loam or loam (with a clay content of 15 to 25 %), but soils with a clay content of up to 50 % are also suitable.
- Mango trees grow best on a slight slope which enables runoff of excess water and prevents waterlogging
- Mango trees grow best in soils with pH values of 6 to 7.2.

## Land preparation

- The land is prepared by usual ploughing, harrowing and levelling.
- A gentle slope is provided to facilitate proper irrigation and prompt drainage to avoid the harmful effects of water stagnation.
- After marking of the points for the plants, pit size  $90\text{cm} \times 90\text{cm} \times 90\text{ cm}$  are prepared during summer months.
- While digging of pits, it is essential to keep the topsoil and subsoil separately in two heaps near each pit for two to four weeks.
- This helps in exposing the harmful soil organisms to weathering agencies, providing better aeration to the root zone and in making provision for nutritional requirements for healthy development of the soil.
- The pit is filled with 20 kg of FYM, 5 kg of vermicompost and Biofertilizers (Azospirillum and Phosphobacteria), Neem cake 500 g and Bone meal 500 g and covered with soil.
- Green manuring is also done with the onset of SW monsoon in July/August with Daincha and Sunhemp. Growing of leguminous green manuring crops helps in Nitrogen fixing besides providing excellent green cover to entire field, which in turn prevents moisture loss.

## Spacing

Spacing varies from 5 m to 7 m either way.

## Planting material

- Mango is propagated by grafting .
- Planting material is procured from nurseries, which propagate by organic means.

## Planting

- It is done with the advent of monsoon.
- The planting season could be July to December, depending upon the monsoon and availability of irrigation facilities.



Mango sapling



## Nutrient Management

- **Mulching:** Mulching materials used include bark, nut shells, weeds, grass, wood chips, silage, paddy/wheat straw, rice husk, coir dust, banana, sugarcane leaf trashes etc,. The fallen leaves of the same plant can also be used as mulch material
- **Green manuring:** Sun hemp (*Crotalaria juncea*) and dhaincha (*Sesbania aculata*) are ploughed into the field, mulched on the top soil and used as composting material.
- **Biofertilizers:** Apply PSB and azospirillum during the pit preparation and also as soil application during the crop growth period
- **Organic manures:**
  - Application of Organic manures (10-20 kg/tree/year) through Vermicompost, Biodynamic Compost or Microbe Mediated Compost
  - Growing of legume for green manuring or as inter/cover crops as per requirement
  - Mulching after application of 100 g Cow Pat Pit (CPP), Spray of cow horn manure (BD 500) and release of earthworms
  - Need based foliar spraying of biodynamic liquid manures/vermin wash/ (CPP)

# Tea (*Camellia sinensis*)

**Family:** Theaceae

**Origin:** China

## Climatic Requirements

- It requires moderate humid and cool climate conditions.
- The optimum temp should range between 21 °C to 29 °C. Temperature more than 35 ° C and less than 15 ° C causes reduction in growth.
- Annual Rainfall: 150 to 250 cm

## Soil

- It is able to thrive in well drained, deep and friable and loamy soils.
- The ideal soil pH is from 4.3 to 5.8.



## Nutrient Management

- Pit size: 45cm × 45cm × 60 cm, Spacing: 100cm × 75cm
- Nutrients dose as N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O is 200:60:120 kg/ha/year
- Apply Vermicompost at 13 t ha<sup>-1</sup>. Application per pit is about 01 kg vermicompost, 50 g neem cake and 100 g bone meal in planting year.
- Compost, oil cakes and rock phosphate are the main inputs to substitute the removal on nutrients.
- Manure and fertilizers are given, at least three times per year after plantation. The dose of manure should be maintained on the basis of soil status and crop demand.

## Use of botanical pesticides

- As a long-lived woody perennial and monoculture, plantation crops provides a stable microclimate and a continuous supply of food for rapid build up of phytophagous species that includes insects, mites and nematodes.
- Tea mosquito bugs, Red spider mite, Termites, Flushworm, Aphid, Jassid, Thrips and Nematodes are the major pests of plantation crops
- Botanical antimicrobials derived from plants are currently recognized as biodegradable, systemic, eco-friendly and non-toxic to mammals and are thus considered safe. Their modes of action against pests are diverse.
- Natural compounds are well suited to organic food production in industrialized countries and can play greater roles in the protection of food crops in developing countries.
- Some plant based antimicrobials (e.g. neem products, pyrethroids and essential oils) are already used to manage pest populations on a large scale.



## Use of botanical pesticides

Potential plant extracts:

- Neem
- Karanja
- Tobacco
- Rotenone
- Annona
- Lantana
- Datura
- Chrysanthemum

### Effective against several pests

- Neem: Root knot nematode
- Karanja: Root knot nematode and Helopeltis
- Tobacco: thrips, scales, aphids, looper caterpillars
- Rotenone: sucking pests, caterpillars and beetles
- Annona: Helopeltis
- Datura: Tea mosquito bug, thrips, jassids, aphids
- Lantana: Red spider mites, Aphids
- Chrysanthemum: Tea mosquito bugs, thrips, aphids, scale insects

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- Karanja
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### Preparation of aqueous plant extracts

Collection of Leaves/Seeds/Rhizomes



De-pulping and drying



Remove seed coat



Oven dry & make powder



Take 25 kg of powder , Add 250 ml adjuvant and  
Soak in 50 liter of water overnight



Extract and filter through fine cloth



Add 500 liter of water



Spray in 1 hectare area of plantation

# QUALITY OF ORGANIC TEA

The total phenol and catechin content of organically produced tea (Vermiompst + Vermiwash) was significantly higher than the conventionally produced ones (Palit et al., 2008)

Nutrient source	Total Content of Catechins (mg g <sup>-1</sup> tea leaves)	Percentage of Increase/Decrease of Catechins Content over Control Treatment
No application (Control)	14.79	-
Chemical	7.32	-51
Organic (vermicompost)	16.37	+11
Organic (vermicompost+Vermiwash)	18.69	+26

Palit, S. Ghosh, B. C. Dutta Gupta, S and Swain, D. K. (2008). “Studies On Tea Quality Grown Through Conventional And Organic Management Practices: Its Impact On Antioxidant And Antidiarrhoeal Activity”. *American Society of Agricultural and Biological Engineers*. 51(6): 2227-2238