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CROP PRODUCTION TECHNOLOGY

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UNIT 5

Production Practices of Horticulture crops

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PRODUCTION PRACTICES OF HORTICULTURAL CROPS

Important groups of horticultural crops in Tamil Nadu such as vegetable crops, fruit crops, flower crops; Cultivation practices of representatives of each group; Special features of production of horticultural crops - green house cultivation.

Important vegetables of South India

Being a land with abundant solar radiation the choice of crops are many and they may be grouped as:

1. Fruit vegetables

1. Tomato-*Lycopersicon esculentum,* **Solanacea**
2. Bhendi-*Abelmoschus esculentus,* **Malvaceae**
3. Brinjal-*Solanum melongena,* **Solanaceae**
4. Chillies-*Capsicum annuum,* **Solanaceae**
5. Capsicum - **(Sweet pepper / Bell pepper)**- *Capsicum annuum***; Solanaceae**
6. Paprika-*Capsicum annumvar. longum* ,**Solanaceae**
7. Pumpkin-*Cucurbita moschata,* **Cucurbitaceae**
8. Snake guard-*Trichosanthe scucumerina,***Cucurbitaceae**
9. Ribbed guard-*Luffa acutangula,***Cucurbitaceae**
10. Bottle guard-*Lagenaria siceraria,***Cucurbitaceae**
11. Bitter guard-*Momordica charantia,***Cucurbitaceae**
12. Ask guard-*Beninca sahispida***Cogn,Cucurbitaceae**
13. Cucumber-*Cucumis sativus,* **Cucurbitaceae**
14. Gherkins-*Cucumis sativus* **var. angaria, Cucurbitaceae**
15. Watermelon-*Citrullus lanatus,* **Cucurbitaceae**
16. Muskmelon-*Cucumis melo,* **Cucurbitaceae**
17. Tinda-*Citrullus vulgaris* **Schrad** *var. fistulousus,* **Cucurbitaceae**
18. Chowc how-*Sechiu medule,***Cucurbitaceae**
19. Cluster bean-*Cyamopsis tetragonoloba, Fabaceae*
20. Vegetable cowpea-*Vigna unguiculata, Fabaceae*
21. Lablab-*Lablab purpureus* **var.** *typicus, Fabaceae*
22. French bean-*Phaseolus vulgaris,Fabaceae*
23. Broad beanpeas- *Vicia faba, Fabaceae*
24. Peas-*Pisum sativum,* Fabaceae
25. Annual Moringa-*Moringa oleifera,* **Moringaceae**

2. Root and Tuber vegetables

1. Carrot-*Daucus carota*, **Umbelliferae**
2. Beetroot-*Beta vulgaris*,**Chenopodiaceae**
3. Radish-*Raphanus sativus*,**Brassicaceae**
4. Colocassia-*Colocasi aesculenta*,**Araceae**
5. Dioscorea-*Diosco reaalata*&*Dioscoreaesculenta*, **Dioscoreaceae**
6. Potato-*Solanum tuberosum*, **Solanaceae**
7. Sweet potato-*Ipomoe abatatas*,**Convolvulaceae**
8. Chinese potato-*Coleus parviflorus* also *Soleno stemonrotundifolius*, **Labiatae**
9. Tapioca –*Manihot esculenta*,**Euphorbiaceae**
10. Elephant foot yam-*Amorpho phallus companulatus*,**Araceae**

3. Green leafy vegetables

1. Amaranthus-***Amaranthus sp,Amaranthaceae***
2. Curry leaf-***Murraya koenigii,Rutaceae***
3. Celery-Apium graveolens

4. Cole crops

1. Cabbage-*Brassica oleraceavar.capitata*,**Brassicaceae**
2. Cauliflower-*Brassica oleraceavar.botrytis*,**Brassicaceae**

5. Bulb vegetables and

1. Small onion/A*ggregatum-Alliumcepa* **var.***aggregatum*, **Alliaceae**
2. Bellary onion-*Allium cepa var.cepa*,**Alliaceae**

6. **Minor vegetables:** There are many vegetables given at the end of the packages

1. **TOMATO**

Solanum lycopersicum

Varieties:

- PKM1,**CO.1**,**CO.2**,**CO.3**,(Marutham)and Paiyur 1
- **Hybrids: COTH.1**,COTH2 and TNAU Tomato Hybrid CO 3

Soil

- Well drained loamy soils rich in organic matter with a pH range of 6.5-7.5.

Season of sowing

- May-June and November–December

Nursery bed preparation

- Apply FYM 10 kg, Neem cake 1 kg, enriched Superphosphate 100 g and Furadon 10 g per square meter before sowing

Seed rate

- Varieties:300-350g/ha
- Hybrids:100-150g/ha

Seed treatment

- Treat the seeds with Carbendazim 2 g per kg of seeds 24 hours before sowing.

- Sow in lines at 10 cm apart in raised nursery beds and cover with sand.

Field preparation

- Plough the land to fine tilth. Thoroughly prepare the field with the addition of FYM @ 25 t/ ha and form ridges and furrows at a spacing of 60 cm.

- Apply 2 kg/ha of Azospirillum and 2 kg/ha of Phosphobacteria by mixing with 50 kg of FYM.

Spacing for varieties

- PKM1 , COTH2, TNAU Tomato Hybrid CO3 : 60x45 cm
- CO3: 45x30 cm

Mulching

- Mulch with black LDPE sheets of 25 micron thickness and bury both the ends into the soil to a depth of 10 cm

Weed control

- Apply Pendimethalin 1.0 kg a.i./ha or as pre- emergence herbicide, followed by hand weeding once at 30 days after planting.

Micro nutrient spray

- Foliar spray of ZnSO4 @ 0.5 per cent thrice at 10 days interval from 40days after planting.
- Spray19:19:19+Mn@ 1%at 60 days after planting.

Irrigation

- After establishment of seedlings, irrigate at weekly intervals.

Manuring

- **Varieties**
  - Basal dose:FYM25t/ha,NPK75:100:50kg/ha
- **Hybrids**
  - Basaldose:FYM25t/ha,NPK50:250:100kg/ha

Duration

- 110-115 days from transplanting (135-140 days from sowing)

Harvesting

- Tomatoes are harvested twice a week when the plants are about three months old.

Yield

Varieties:30-40t/ha Hybrids:
80 - 95 t / ha

Boom flower- Nspray at 2ml /litre in three sprays – 30days, 55daysand75 days after planting increase the yield.

2. BHENDI

Abelmoschus esculentus

Varieties

- MDU1, Arka Anamika, Arka Abhayand Parbhani Kranti

Hybrid

- CO3, CO Bh H1

Soil

- It is adaptable to a wide range of soils from sandy loam to clayey loam.

Season

- Planting can be done during June-August and February

Preparation of field

- Plough the land 4-5 times and apply FYM 10kg, during last ploughing.
- Form ridges and furrows at 45 cm apart

Seed rate

- Varieties : 8.0kg/ha
- Hybrids : 2.5kg/ha

Seed treatment

Seed treatment with Pseudomonas fluorescens @ 10 g/ kg of seeds and again with 400 g of Azospirillum using starch as adhesive and dried in shade for 20 minutes.

- Sow three seeds per hill at 30 cm apart and then thin to 2 plants per hill after 10 days

Sowing

Sow three seeds per hill at 30 cm apart and then thin to 2 plants per hill after 10 days

Spacing

Seeds are sown at a spacing of 45 x 30cm

Irrigation

Irrigation is done at weekly intervals.

Application of Fertilizers

Apply Azospirillum and Phospho bacteria each at 2 kg/ha mixed with 100 kg of FYM

before sowing.

Varieties

Basal dose FYM @ 25t/ha, N @20 kg, P@ 50 kg and K @30kg/ha as basal and 20 kg N/ha at 30 days after sowing

Hybrids

Basal dose FYM @ 40 t / ha, N @ 100 kg, P @ 100 kg and K @ 100kg/ha as basal and 100 kg N / ha 30 at days after sowing.

Weed control

- Spray Oxyflourfen at 0.15 kg a.i./ha or Fluchloralin at 1.0 kg a.i./ha or Metolachlor at 0.75 kg a.i./ha as pre emergence application on third day after sowing.
- Herbicide application should

  Be integrated with one hand weeding on 30 days after sowing.

3. BRINJAL

***Solanum melongena* L**

Varieties

- CO1, CO 2
- MDU1 ,PKM1
- PLR1, PLR(B)2
- KKM1, PPI1
- VRM1,COBH 1andCOBH2

Soil

- Well drained soil rich in organic matter with pH of 6.5-7.5.

Season of Sowing

- December–January and May–June.

Nursery bed preparation

- Apply FYM 10 kg, neem cake 1 kg per square metre before sowing. Area required for raising seedling for planting 1.0 ha is 100 sq.m

Seed rate

- Varieties:400g/ha
- Hybrids:200g/ha

Seed treatment

- Treat the seeds with Trichodermaviride @ 4g/kg or Pseudomonas fluorescens @ 10 g / kg of seed.
- Treat the seeds withAzospirillum @ 40 g / 400 g of seeds using rice gruel as adhesive.
- Irrigate with rose can.In raised nursery beds,sow the seeds in lines at 10 cm apart and cover with sand.
- Transplant the seedlings 30 – 35 days after sowing at 60 cm apart in the ridges

Field preparation

- Thoroughly prepare the field with the addition of FYM @ 25 t / ha and form ridges and furrows at a spacing of 60 cm.
- Irrigate the furrows and transplant 30-35 days old seedlings at 60cm apart on the ridges.

Spacing

- Varieties:60x60cm
- Hybrids:90x60cm

Mulching

- Mulch with black LDPE sheets of 25 micron thickness and bury both the ends into the soil to a depth of 10 cm.

Weed control

- Apply Pendimethalin 1.0 kg a.i. / ha or Fluchloralin 1.0 kg a.i / ha as pre- emergence herbicide, followed by hand weeding once at 30 days after planting

Manuring

- Apply 2 kg each of Azospirillum and Phosphobacteria in the main field at planting.

Varieties

- Basal dose: FYM25t/ha,NPK50:50:30kg/ha.
- Top dressing : 50 kg N/ha on 30th day of planting or during earthing up.

Hybrids

- Basal dose: FYM 25t/ha, NPK 100:150:100kg/ha.
- Top dressing: 100 kg N/ha on 30th day of planting or during earthing up.

Irrigation

- After establishment of seedlings, irrigate at weekly intervals.

Harvest

- Harvest can be done 55–60 days after transplanting.
- Fruits are harvested attender stage at 4–5days intervals.

Yield

- Varieties: 25to30t/ha

- Hybrids: 60-80t/h

4. Snake Gourd

Trichosanthes cucumerina

Varieties
CO1, CO2, PKM1, MDU1, PLR (SG)1 and PLR2.

Soil
Sandy loam soils rich in organic matter with good drainage and the pH ranging from 6-5-7.5

Season
July and January are highly suitable for cultivation.

Seed treatment
Treat seeds with *Trichoderma viride* 4 g/kg or *Pseudomonas fluorescens* 10g/ kg or Carbendazim 2g/kg of seeds before sowing.

Seed rate
1.5 kg of seeds /ha is required.

Preparation of field
Plough the field to fine tilth and dig pits of size 30 cm x30cm x 30 cm at 2.5x 2 m spacing and form basins.

Sowing
Sow the seeds (5seeds/pit) and thin the seedlings to two /pit after 15 days of sowing.

Irrigation
Irrigate the basin before dibbling the seeds and there after once a week.

Application of fertilizers
Apply 10 kg of FYM, 100 g of NPK 6:12:12 mixture as basal dose per pit and N @ 10 g pit 30 days after sowing. Apply Azospirillum and Phosphobacteria @ 2 kg/haandPseudomonas2.5kg/ha along with FYM 50kgand neem cake @100 kg before last ploughing.

After cultivation
Hoeing and weeding can be done thrice or as and when necessary. Provide stakes and train the plants to reach the pandal height (2 m). Pandal is not essentialforCo2 variety. Spray Ethrel100 ppm(1 mlin10 lit of water) four times from 10 to 15 days after sowing at weekly intervals.

Snake gourd grown in pandal system

Nursery raising

Sow the snake gourd seeds in pro trays containing well decomposed cocopeat medium. Sow only one seed per cell. Keep the trays under shade net house. Waterregularlywiththehelpofrosecan.Transplantabout12daysold seedlings to main field.

Planting

Spread the lateral tubes on the raised beds of 120cm wide at 150cmspacing. Irrigatethebedsbyoperatingthedripsystemcontinuouslyfor8-12 hrs. Plant the seedlings in the holes made at 60cmspacing.

Fertigation

Apply a dose of7 5:100:100 kg NPK/ha throughout the cropping period through split application. Apply 75% of the phosphorus as super phosphate as basal dose.

Yield

18 t/ha in 135–145 days.

5. BOTTLE GOURD

Lagenaria siceraria

Soil

Sandy loamy soils rich in organic matter with good drainage and the pH ranges from 6.5 to 7.5 is suited for bottle gourd cultivation. This crop requires a moderate warm temperature.

Season

July and January are suitable for sowing

Seed rate

Varieties

CO1, Pusa Megdoot and Arka Bahar ,TNAU Bottle gourd Hybrid CO1

Seed treatment

Treated with *Trichoderma viride* 4gor *Pseudomonas fluorescens* 10 g or Carbendazim 2 g/kg of seeds

before sowing

Preparation of field
Plough the field to fine tilth and dig pits of the 30 cm x 30cm x 30cm size at 2.5x2m spacing.

Sowing
Sow the seeds @ three seeds/ pit and thin the seedlings to two /pit after 15 days.

Irrigation
Irrigate the field before dibbling the seeds and there after once a week.

Application of fertilizers
Apply 10 kg of FYM (20t/ha), 100 g of NPK 6:12:12 mixture/pit as basal and10 g of N/pit 30 days after sowing.

Field preparation
Form raised beds of 120 cm width and place laterals in the centre of bed.

Nursery raising
In hi-tech horticulture, plant 15 days old healthy seedlings raised in shade net houses. Raise the seedlings in portrays having 98 cells or in polythene bags. Transplant about15 days old seedlings in the main field.

After cultivation
Weeding can be done by hoeing as and when necessary. Fruit rot during rainy season can be checked by training the plants over the bamboo stick or dried branches.

Harvest
Fruits are harvested at tender stage and before 100% maturity.

Yield

15-20t /ha in 135 days.

6. ONION

Allium cepa

Soil

Red loam to black soils with good drainage facilities is highly suited for onion cultivation. It performs well at a soil pH range of 6-7 and a mild season without extremes of heat and cold.

Season

- Sow the medium sized bulbs during April – May and October – November. It requires sufficient soil moisture during its growing period but heavy rains during bulb germination and bulb formation affects the crop growth

Varieties

- CO1 to CO4 and MDU1

Seed rate

- 1000 kg/ha is required. Medium sized bulbs are to be chosen for planting. Seeds @ 8kg/ha

Raising seedlings and transplanting

- This is the most common method practiced for irrigated crop as it results in high yield and large size bulbs.
- In plains, seeds are sown during October-November for a *rabi* crop.
- In hills, seeds are sown from March to June.
- Seeds are first sown in well prepared nursery beds of 90-120 cm width, 7.5-10.0cm height and convenient length.
- Ratio between nursery area and main field is about1:20.
- Seed rate varies from 8 to10kg/ ha.

Preparation of field

- Plough the land to a fine tilth and form ridges and furrows at 45 cm spacing. Sow the bulbs on both the sides of the ridges at 10 cm apart.

Planting design

- Bulbs or seedlings are planted in rows of 20 cm spacing and 12 cm between plants.
- Planting is done at 6 rows in each bed, thereby it accommodates 55,560 plants in one hectare.
- Irrigation is done after transplanting or planting the bulbs. Complete wetting is necessary to maintain uniform moisture level.

Application of fertilizers

- Apply FYM 25 t/ha, *Azospirillum* 2 kg and *Phosphobacteria* 2 kg/ha, N 30 kg, P 60 kg and K 30

kg/ha as basal and 30 kg N/ha on 30th day of sowing.

Irrigation

- Irrigate at the time of planting of seedlings and third day and later at weekly intervals. With hold irrigation 10 days before harvest.

Harvest and Yield

- Spray Cycocel @ 200ppm + carbendazim @ 1000 ppm 30 days before harvest to extend the shelf life of onion.
- Harvesting is done by pulling out plants when tops are drooping but still green
- During hot days when soil is hard, bulbs are pulled out with a hand-hoe.12- 16t/ha in 70 to 90 days
- 18t/ha in 90 days for CO(On) 5onion. Clean and dry the bulbs for 4days in shade soon after harvest

GREEN LEAFY VEGETABLES

7. Amaranthus (*Amaranthus spL.*)

Varieties

- Co 1 (Thandukeerai)
- Co 2 (Thandukeerai)
- Co 3 (Clipping)
- Co 4 (Grain)

Soil

Well drained loamy soils with slightly acidic nature and warm climate are suitable for amaranthus cultivation.

Season and sowing Sowing can be done throughout the year.

Seed rate

2.5kg/ ha of seeds broadcasted evenly on the beds after mixing with sand.

Preparation of field

The field is prepared to a fine tilth and form beds of 2 x1.5 m size. After germination thin the seedlings to have a spacing of 12 – 15 cm.

Irrigation

Irrigate before and after sowing and at weekly intervals after germination.

Application of fertilizers

Apply FYM 25 t/ha, *Azospirillum* 2 kg and *Phosphobacteria* 2kg/ha, N 75kg and K 25 kg/ha as basal dose.

Harvest and yield Leafy types

25 days after sowing for CO1, CO2(10t/ha) 40 days after sowing for CO5 (16 t/ha)

Clipping types
10 clippings at weekly intervals (30t /ha)
Grain types
Co4: 2.4 t grains/ha +8tonnes of tender greens.

8. CURRY LEAF (*Murraya koenigii* Linn. Sprenga l)

Varieties

Dharwad-1 and Dharwad-2

Soil and climate

Red sandy loam soils with good drainage are ideal for better leaf yield. The optimum

temperature requirement is 26° to 37°C.

Season of sowing and planting

The main season of availability of curry leaf fruits is July–August.
One year old seedlings are suitable for planting. One seedling is planted at the centre of the pit.

Preparation of field

The field is ploughed 3-4times to get a fine tilth. Before last ploughing well decomposed FYM is applied @ 20 t/ha. Pit size of 30 x30x30 cm is dug one to two months before planting at a spacing of 1.2 to 1.5 m.

Irrigation

Immediately after planting the pits are irrigated. On the third day these condirrigation is given and then the irrigation is given once in a week.

Application of fertilizers After each harvest 20 kg of FYM /plant is applied and

mixed with soil.

Inter cultivation

Periodical hoeing and in the first year intercrop like pulses can be grown. Ten to twelve

months after planting the first harvest starts.

Harvest and yield

At the end of first year 250-400 kg of leaves /ha can be harvested.

In II year :Once in 4 months everytime 1800kg /ha which would workout to 5400 kg/ha/year

III year :Yield 5400kg/ha

IV year :2500kg/ha once in 3 months which would work out to10,000 kg/ha/year

V year onwards: 5000 kg/ha once in 3months which work out to20,000kg/ha/year

FRUIT CROPS MANAGEMENT

Mango, Banana, Sapota, Papaya, Guava, Acidlime, Sweet orange, Orange, Grape, Pine apple, Pomegranate, Jack, Amla and Jamun

1. Mango

Mangifera indica

Varieties

Neelum, Bangalora, Alphonso, Rumani, Banganapalli, Kalepad, Peter, PKM 1, PKM 2, Sendura, Jahangir, Mulgoa, Himayuddin, Paiyur 1,Mallika, Amrapali and Salem Bangalora, Arka Anmol, Arka Aruna, Arka Neelkiran, Arka Puneethand Sindhu are popular varieties in mango.

Varieties suitable for Tamil Nadu

Banganapalli, Bangalora, Neelum, Rumani, Mulgoa, Alphonso, Senthura, Kalepad, Imam Pasand

Soil