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Micropropagated / Tissue culture (TC) Papaya: 'DAWN DELIGHT'

CULTIVATION PACKAGE

Season: **Spring** (February-March), **Monsoon** (June-July) & **Autumn** (October-November)

TRANSPLANTING:

- Micropropagated / TC papaya selection '**Dawn Delight**' is supplied in company labeled polybags. They are ideal for transplanting when 20-25 cm tall with 6-10 leaves (smaller plants would require more care; > 30 cm is also alright)

Spacing:

- A spacing of 2.4 x 2.1 m. (8 ft x 7ft) or 2.1 m x 2.1 m (7 x 7 ft) is normally recommended (About 750-800 plants/ acre)
- Higher density cultivation with spacing of 1.8 x 1.8 m (6 ft x 6 ft) enhances the returns

Land preparation:

- Dig-up or plough the soil well and level the land
- Ensure irrigation facilities (drip or conventional)
- Prepare pits of 45 x 45 x 45 cm size (or trenches with a JCB: 45 cm wide & 45 cm deep)
- Apply 10 kg well decomposed farmyard manure or compost & 50 g superphosphate
- Mix 1 g of Redomyl and 1 g Dithane M-45/ Indophil to the FYM (to avoid fungal foot-rot)
- Cover the pit / trench with top soil and mix well
- Top part apply 250 g Neem cake and 1 kg Vermicompost/ Cocopeat (per plant) enriched with *Trichoderma* and mix well

Planting method:

- Water the papaya plants well one day before transplanting.
- Transplanting on a cloudy day or late afternoon is preferred
- Cut the base part of the polybag with a blade and remove the plastic to expose the soil (bearing with the roots)
- Make a 10- 15 cm hole at the centre of the pit / trench
- Plant keeping the shoot base at the ground level (Take care not to plant too deep to avoid collar-rot disease) and leave the upper part of the poly bag around the leaves (this part is removed with a blade / pair of scissors after 1-2 weeks once the new leaves emerge)

Note: It is advised to retain the polybag strip displaying the label 'TC papaya' and the company name around the base of the plant at and after planting as the proof of supply by the company.

- Provide shade with green twigs, coconut leaves or 50% green shade nets (If shade nets are used, remove after one week)
- Water immediately after planting
- Give a drenching with about 200 ml of fungicide mixture per plant (1 g of Redomyl + 1 g Dithane M-45/ (Indophil) in one litre of water
- Avoid water stagnation at the shoot base

Manure/ Fertilizers:

- Needs continuous fertilizer application as fruiting is a continuous process; 200-250 g each of Nitrogen, P₂O₅ and K₂O per each papaya plant are recommended per year for high yields

The following schedule is fine for tissue culture (TC) plants:

- 1 month after planting: apply about 10 g 20:20:20 (NPK) mixture per plant
- 3 months: apply about 25 g 20:20:20 (NPK) mixture per plant
- 6 months: apply about 1-2 Kg Vermicompost & 25g 20:20:20 (NPK) mixture per plant
- 8 months: apply about 35-40 g 20:20:20 (NPK) mixture per plant
- 10 months: apply about 40-50 g 20:20:20 (NPK) mixture per plant
- 12 months: Open a 15-20 cm base about 15-20 cm away from base; Apply 2-3 Kg Compost/ FYM & 500 g Neem cake per plant; about 50 g NPK (20: 20: 20 mix)

After one year:

- Repeat fertilizer application: 40-50 g/ plant after every 3 months
- Ensure irrigation after fertilizer application
- Apply fertilizers in the trench (10 cm deep and 15 cm wide) around the outer of tree crown, fill back the soil. Alternatively top dress at furrows after irrigation

Cultural operations:

- Weeding should be done on regular basis especially around the plants. Deep hoeing is recommended during the first year to check weed growth. (Application of pre-emergence herbicide two months after transplanting can effectively control the weeds for a period of four months)
- Earthing-up is necessary before the onset of monsoon to avoid water-logging, to cover the roots, and also to keep the plants erect.

Irrigation:

- Practice varies according to soil, climatic conditions, and irrigation methods

- Drip irrigation is the ideal method (Goes well with trench planting & poly-sheet mulching) About 2-3 litre/ plant on alternate days
- Ring method / furrow irrigation is fine; avoid water coming in contact with the stem
- Intercropping: Marigold around the base leaving 15-20 cm or in between the rows

Pest and disease management

Insect Pests:

- **Mealy Bugs (*Paracoccus marginatus*):** A major problem in South India. Bugs normally colonize the underneath of lower/ older leaves. They are highly damaging on tender TC plants in the nursery and young plants in the field. Appear as white powdery patches under the leaves and on the stem in small plants. Curling or the twisting of young leaves is a typical symptom.
 - **Check the underneath of such leaves for the bugs. Effective way to control them in the nursery and on young field plants is periodic inspection and physical removal.**
 - Spray Applaud (Buprofesin 25EC) 1-2 ml per liter or Rogor (Diamethoate 30EC) 2-3 ml per litre.
 - Older plants: Maintain field hygiene rigorously to avoid the out-break by collecting and burning the bug-colonized older leaves
 - Fruit colonization: Release biocontrol agents wherever available from reputed insectaries (Encyrtid wasp *Acerophagus papayae* or the predator *Cryptolaemus*). Do not apply any chemical pesticides 21 days before & after releasing the parasitoid.
 - Maintain field hygiene rigorously to avoid the outbreak by collecting and burning the bug-colonized older leaves.
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- **Other insect pests include:**
 - Red spider mite (*Tetranychus cinnabarinus*),
 - Aphids (*Aphis gossypii*),
 - Stem borer (*Dasyses rugosellus*)
 - Grey weevil (*Mylloceris viridans*)
 - Fruit flies (*Bactrocera cucurbitae*) and
 - grasshopper (*Poekilocerus pictus*).
 - In all cases the infected parts need to be destroyed along with application of prophylactic sprays of Dimethoate (0.3%) or methyl demeton (0.05%).

Red spider mite is a common problem characterized by loss of bright green color / yellow dots. Underneath the leaves, small motile mites could be seen. Spider web on the leaves is an indicator of the presence of mites.

Remove the spider webs and apply dicifol 20 EC @ 2 ml/ one litre water or wettable sulfur @ 2 g/ one litre on the underneath of leaves

Diseases

Major virus diseases: Papaya ring spot virus, Papaya leaf curl and Papaya mosaic

These viral diseases are difficult to control

- Remove the infected plants soon to avoid the lateral spread
- Providing green shade nets round the field / in between acts as barriers to the movement of vector insects and the horizontal spread.
- Major fungal diseases are Collar rot (*Pythium* in early stages and *Phytophthora* and *Colletotrichum* in older plants), powdery mildew (*Oidium caricae*), anthracnose (*Colletotrichum gloeosporioides*) and damping off
- Collar rot: Ensure good drainage; Avoid water stagnation; Drench with a mix of Redomyl 1g / one litre water + Indophil (1 g/ one litre water) if disease symptoms are noticed in some plants in the field. Uproot and remove the infected plants with the fungicide drenching of infected soil area.
- Anthracnose: Infection of fruits affect the quality and market value; Pre-harvest application of fungicides reduces the losses (ensure safe waiting period/ no residues; wash & dry the fruits). Carbendazim/thiophanate methyl (1 g/ one litre water) and Kavach/Mancozeb (2 g/ one litre water) are effective in controlling the diseases
- Powdery mildew (*Oidium caricae*): Application of wettable sulphur (2 g/ one litre water)

Other Management Practices

- Remove the old, dry, or disease leaves and petioles
- Cut off the side shoots and maintain only single stem
- remove the malformed or pest-infected fruits
- Support the plant with bamboo stake in heavy bearing plants & in windy areas
- Cover the fruits with newspaper or white shade nets to avoid sun burn / bird damages
- Spray 0.5% urea or side dress the fertilizers
- Boron Deficiency is common in the sandy or gravel soil. Indicators: Latex exudation on the surface of immature fruits and gall-like malformation of the fruits in severe cases. Fruits become hard, leathery, difficult to ripen and turn tasteless
Remedy: Spray borax (0.1%)
- ZnSO₄ (0.5%) spraying helps to increase growth and yield

Harvest

- Fruits are harvested at near full maturity; Streaks of orange appear towards the apical end. Latex ceases to be milky and become watery at this stage

- For distant market : Harvest when 2-3 streaks appear
- For local market: Allow 4-6 streaks to appear for more sweet fruits
- Fruits are easily harvested manually
- Wiped off any latex on the fruit surface
- Wrap individual fruits in newspaper and pack in cartons

Ripening: 'Dawn Delight' fruits remain firm with good keeping quality for 7-10 days at room temperature when harvested at 3-5 yellow-streaks stage

- For consumption: the outer skin should turn full orange for proper sweetness and color development
- Keep the fruits wrapped in newspaper in a well aerated room with 25-35°C for faster ripening

Yield

- Flowering commences in 4-6 months depending on the location in the country and the management practices
- Fruit set to harvest: 120-130 days
 - 1st year: about 20-40 fruits / tree
 - 2nd year: about 60-100 fruits / tree (average: 1 kg/ fruit)
 - Yield per tree: 100-150 kg / tree (1st 2 years)
 - Total Yield of 100-200 T /ha.

Life span

- Papaya plants can be maintained for 3 to 4 years if free from viral diseases. Usually, it is more economical to maintain for 2-3 years (depending on the viral disease incidence).