Papaya

Papaya, papaw or papita (Carica papaya L.) originated from tropical America, has become a popular fruit due to its fast growth, high yield, long fruiting period and high nutrient value as well. In addition it has been use as vegetable, fruit processing, and papain production at immature stage. It can be a highly profitable crop now.

The papaya plant has male, female, hermaphrodite (bisexual flower) and some other complex forms. Male plants do not bear any fruit, Normally the fruit shape from female plant is shorter, but the fruit shape from hermaphrodite (bisexual flower) plant is longer. The seeds of following varieties we offer in grow in mixture of female plants and hermaphrodite plants.

I. Climate and soils

Papaya is a tropical, plant, very sensitive to frost. Optimum temperature is 25 -30° C and minimum 16° C. The suitable ph value is between 6 and 6.5. The well-drained or sandy loam soil with adequate organic matter is most important for the papaya cultivation. In high rainfall area, if drainage is poor and roots are continuously drenched for 24 to 48 hours, it may cause the death of the plants. Sticky and calcareous soils are not good as rain water may accumulate in the soil even only for a few hours. In this case, higher raised bed and drainage ditch are recommended. Papaya being a tropical fruit grows well in the mild sub-tropical regions of the country upto 1,000 m. Deep, well drained sandy loam soil is ideal for cultivation of papaya.

The growing field should be irrigable and kept at suitable soil moisture which is necessary for the growth of papaya plants, although dry climate at the time of ripening is good for the fruit quality. Continuous cropping in the same field may result to poor growth and cause disease problem of papaya trees. Papaya does not like strong, cool, hot, dry or salty wind. It is better to grow in sheltered but full sunshine place. Staking and/or windbreak can decrease the damage to plants under strong wind.

II. Seedling production

A. Seed Source and varieties:

The seed must be from dependable source and sown as soon as possible. The remaining seeds must be sealed tightly and kept at cool (5 -10° C) and dry (under relative humidity 40%) place.

State	**Varieties grown**
Andhra Pradesh	Honey Dew, Coorg Honey Dew, Washington, Solo, Co-1,Co-2, Co-3, Sunrise Solo, Taiwan
Jharkhand	Ranchi selection, Honey Dew, Pusa Delicious & Pusa Nanha
Karnataka & Kerala	Coorg Honey Dew, Coorg Green, Pusa Delicious & Pusa Nanha
West Bengal	Ranchi selection, Honey Dew, Washington, Coorg Green
Orissa	Pusa Delicious, Pusa Nanha, Ranchi selection, Honey Dew, Washington, Coorg Green

B. Seed requirement:
One gram contains about 50 -80 seeds, mostly 65 -75 seeds. It needs 50 to 80 g seeds per hectare at one plant per hill average of 80 % seed germination and 80% successful seedlings.

C. Season:
The time of sowing depends upon the choice of fruiting season and danger of rain or frost. Papaya is planted during spring (February-March), monsoon (June-July) and autumn (October-November).

D. Seed germination:
It takes 1 -4 weeks from sowing to emerge depending on the temperature. The seed may be treated with Thiram (TMTD) W.P. before sowing to control the fungus diseases at young stage.

E. Sowing method:
It may be sown directly, but normally, it is better to be seeded to raise seedlings and transplanted.

1. Plastic bag or soft plastic pot sowing:
Transparent plastic bag in 8 -9 cm wide and 8 cm wide and 8 cm high or black soft plastic pot is used for raising seedlings. Drainage hole is required. Then fill with the mixture of sandy loam virgin soil and sand at the ratio3: 1. Sow 1 or 2 seeds each bag (pot)and cover with well fermented compost, then water fully. Cover the bags (pots) with plastic film or thatch such as straw sheets or used jute bags to keep warm and wet till emergence. Meanwhile, keep the air fresh and moist, and then remove the cover gradually for fitting the seedling under the sun shine.

2. Seedling Tray sowing:
The use of plastic seedling tray is new way of seedling culture to obtain the healthy seedlings which are easily for the transporting and transplanting. The Tray size may be 74 to 82 holes at 4.5 cm each in diameter. Fill the prepare media in the holes, sow 1 to 2 seeds in each hole, and cover the layer of media. Other procedures are similar to plastic bag (pot) sowing.

For purposes of controlling aphid, viral infection, rain and wing protection, and maintaining tolerable temperature during seedling stage, it is required to use screen house, greenhouse or tunnel covered with 0.07-0.10 mm plastic film or 32 -mesh net. Black plastic net is also usually used for shading. During the seedling stage, semi-humid environment is preferred. For better aeration, the film may be covered during the cool night or heavy rain period and opened in the warm day time. The site of the bag, pot or tray should be changed if the roots of seedling penetrate into the soil. In this way, it will induce more new roots and healthy seedlings.

III TRANSPLANTING

A. Transplanting stage:
When the seedling is 10 -15 cm tall, it should be transplanted, but 30-40 cm is also all right if it is grown in a larger container.

B. Spacing:
A spacing of 1.8 x 1.8 m. is normally followed. However higher density cultivation with spacing of 1.5 x 1.5 m./ha enhances the returns to the farmer and is recommended. A 40-60 cm high bed is required if the soil is not well drained.
High Density Planting : A closer spacing of 1.2 x 1.2 m. for cv. Pusha Nanha is adopted for high density planting, accommodating 6,400 plants/ha.

C. Pollinator Plants:
Minimum10-20% hermaphrodite plants are required for pollination.

D. Planting method:
The seedlings are planted in pits of 60x60x60 cm. size. In the summer months the pits are dug about a fortnight before planting. The pits are filled with top soil along with 20 kg. of farmyard manure., 1 kg. neem cake and 1 kg. bone meal. Tall and vigorous varieties are planted at greater spacing while medium and dwarf ones at closer spacing. Seedlings should be fully watered one day before transplanting. Transplanting on a cloudy day or late afternoon to minimize transplanting shock. Take care not to plant too deep, otherwise collar-rot disease may affect the buried part of the stem. Then water immediately after planting. Intercropping leguminous crops after non-leguminous ones, shallow rooted crops after deep rooted ones are beneficial. No intercrops are taken after the onset of flowering stage.

(E) Screen house cultivation:
For reducing virus infection during growing period, the following cultivation is recommended:
Use 3.0 -3.6 m long of bamboo stems or concrete stakes as supporters at a distance of 4.5 -5m, and connect with No.12 iron wire. Then tightly surround with 32-mesh white net, which contains anti-ultra violet material. After the construction is completed, the protected healthy seedlings are planted and planted and the virus-infected plants destroyed and buried immediately once found. Note that hand pollination for female trees is required (the central flower of the cluster on the bisexual plants can be taken as pollen supplier) and control the powdery mildew and mites well. The net may be taken off before the fruit is mature.

IV. Fertilization
The plant needs continuous fertilization, as fruiting is continuous upon maturity.
Recommended rate of fertilizers for papaya is as follows:
(it should be modified depending upon the soil conditions)

- Apart from the basal dose of manures (@ 10 kg./plant) applied in the pits, 200-250 g. each of N, P_2O_5 and K_2O are recommended for getting high yield.
- Application of 200 g. N is optimum for fruit yield but papain yield increases with increase in N upto 300 g.
- Boron Deficiency is common in the sandy or gravel soil. The latex could be found on the surface of immature fruits. Gall-like malformation of the fruit is also found in the severe plantation. The fruits are hard and not easy to get ripe, tasteless and having no commercial value. Micro-nutrients viz. $ZnSO_4$ (0.5%) and H_2 BO_3 (0.1%) are sprayed in order to increase growth and yield characters.
- For the young trees, apply fertilizers in the trench (10 cm deep and 15 cm wide) around the outer of tree crown, then fill back the soil, or top dress at furrows after irrigation

V. Intercultural operations

Deep hoeing is recommended during the first year to check weed growth. Weeding should be done on regular basis especially around the plants. Application of Fluchloralin or Alachlorin or Butachlorine (2.0 g./ha.) as pre-emergence herbicide two months after transplanting can effectively control the weeds for a period of four months. Earthing up is done before or after the onset of monsoon to avoid water-logging and also to help the plants to stand erect.

VI. Irrigation

Normally, irrigate every 15 days in winter or 10 days in summer, but practise varies according to soil, climatic conditions, and irrigation methods. Ring method, furrow or drip irrigation can be done. However, be sure to prevent the water from coming in contact with the stem. Irrigation may prevent the plants from the damage of frost.

VII. Pest and disease management

1 Insect Pests

The insect pests mostly observed are fruit flies (*Bactrocera cucurbitae*), ak grasshopper (*Poekilocerus pictus*), aphids (*Aphis gossypii*), red spider mite (*Tetranychus cinnabarinus*), stem borer (*Dasyses rugosellus*) and grey weevil (*Myllocerus viridans*). 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%).

2 Diseases

The main diseases reported are powdery mildew (*Oidium caricae*), anthracnose (*Colletotrichum gloeosporioides*), damping off and stem rot. Application of wettable sulphur (1 g./l.) carbendazim/thiophanate methyl (1 g./l.) and Kavach/Mancozeb (2 g./l.) has been found to be effective in controlling the diseases.

Some of the IPM measures are

- Select to grow the tolerant varieties to various pests and diseases.
- Select well drained soil
- Rotate with other crops
- Grow the seedlings and trees under the net house or screen house.

- Grow a healthy crop with proper hygiene
- Immediately eradicate and burry the whole infected plant once found

VIII. Other Management

- Remove the side shoots of the stem as soon as possible.
- Cut the old, dry, or disease leaves and petioles.
- Thin the fruits, which are poorly pollinated, malformed or pest-infected. Nevertheless, avoid transmitting the virus mechanically from infected plant to others through the above practices.
- Support the plant with stakes, which should tide with the rope, especially when bearing heavy fruits and during storm season.
- Pollinate by hand to increase the fruit setting and the percentage of large and normal fruits, especially when growing net house.
- Management after storm
  - Drain the plantation well.
  - Apply the fungicide to control phytophthora blight.
  - Spray 0.5% urea or side dress the fertilizers.
  - Support the fallen trees to keep them from the surface of the soil.
  - Cover the fruits with paper to avoid the sun scald.
  - Thin the small fruits if the trees are severely damaged.

IX. Harvest

Fruits are harvested when they are of full size, light green in colour with tinge of yellow at apical end. On ripening, fruits of certain varieties turn yellow while some of them remain green. When the latex ceases to be milky and become watery, the fruits are suitable for harvesting.

The economic life of papaya plant is only 3 to 4 years. The yield varies widely according to variety, soil, climate and management of the orchard. The yield of 75-100 tonnes /ha. is obtained in a season from a papaya orchard depending on spacing and cultural practices.

X. Post harvest management

- **Grading -** Fruits are graded on the basis of their weight, size and colour.
- **Storage -** Fruits are highly perishable in nature. They can be stored for a period of 1-3 weeks at a temperature of 10-13^0 C and 85-90% relative humidity.
- **Packing -** Bamboo baskets with banana leaves as lining material are used for carrying the produce from farm to local market.

Source : ***www.nhb.gov.in***