PAPAYA

**Botanical name:** Carica papaya L. **Family:** Caricaceae.

**Origin:** Tropical America

Papaya is one of the important fruit crops of tropical and subtropical regions of the world. It has originated in tropical America and was introduced from Philippines through Malaysia to India in the latter part of 16th century by Portuguese. It is one of the few fruit crops that flowers and fruits throughout the year giving early (9-10 months after planting) and high yields (about 100 tonnes per hectare). Besides its use as a fresh fruit, Papayas can be processed as Jam, Syrup, Preserves, Papaya candy, canned fruits, salad, and jelly. Papaya is also a commercial source of protease enzyme, —Papain—. Papaya fruit is highly nutritive and is very rich in Vitamin A. It improves digestion and said to cure chronic constipation, piles and enlarged liver and spleen.

**Climate:** Papaya is essentially a tropical fruit crop and grows best in sunny places. It is very sensitive to frost but withstands extremes of temperature. Temperatures below 10°C will affect the growth and fruit set. It grows well in regions where summer temperature doesn’t exceed 38°C but it can stand up to 48°C. It also flourishes well in regions up to an elevation of 1100m. It is adapted to a wide range of rainfall conditions ranging from 35cm to 250cm annually; however, excessive moisture adversely affects the crop as well as fruit quality. It does not stand strong (80Km/Hour) or hot winds. Dry climate during flowering often causes sterility while the same conditions during fruit maturity add to the sweetness of the fruit.

**Soils:** It can be grown on a variety of soils provided the soils are well drained. Under water stagnated conditions and in soils with poor drainage foot rot disease may cause heavy mortality. Hence, heavy soils should be avoided as papayas cannot withstand water stagnation for more than 48 hours. A loamy soil with a pH of 6.5 to 7.2 is considered ideal. It can be grown in poor soils also provided with heavy manuring and irrigation.

**Varieties:** As the crop is grown entirely almost from seed, varieties are not well defined. Varieties with medium sized fruits are generally preferred to those with very large fruit. Since papaya is a highly cross-pollinated crop, seeds taken from a fruit would rarely breed true to type. If a variety is to be maintained pure, controlled pollination between selected female and male progenies of the same
parent, i.e. sibmating (i.e. crossing of sister and brother) has to be done. This consists of collection of pollen from the male parent and applying it on the previously bagged female flower. Seeds from such crossed or sib-mated fruit should be used for further multiplication. Seeds from open pollinated fruits should not be used.

Based on the sex expression, papaya varieties can be either classified as dioecious or gynodioecious. The dioecious varieties produce male and female plants in 1:1 ratio whereas gynodioecious types produce plants of female and bi-sexual (Hermaphrodite form) in 1:2 ratio. Some of the commercially grown improved varieties of papaya are: CO1, CO2, CO-3, CO-4, CO-5, CO-6, CO-7, Washington, Coorg Honeydew, Honeydew, Pusa dwarf, Pusa delicious, Pusa giant, Pusa majesty, Surya, Red lady etc.

**Propagation:** It is mainly propagated by seeds. Since it is a highly cross-pollinated crop, the plants raised from seeds have a mixed inheritance, which makes the highly variable. So, genetically pure seeds should be collected from the sib mated or selfed fruits. Vegetative methods of propagation like cuttings, layering, grafting and budding are not possible on a commercial scale due to the hollow and fragile nature of its stem. Raising of seedlings: Freshly extracted seeds germinate better and grow quicker. The fresh seeds are cleaned of the pulpy material adhering them, dried in shade. About 400-500 grams of seed is required for raising crop in one hectare. Seedlings can be raised in nursery beds or in polythene bags. Among these, the seedlings raised in polythene bags are found good. Seeds are sown at a spacing of 5 cm within the row and 15 cm between rows. Seeds germinate within 15-20 days. In about 2 months, seedlings grow to a height of 15 to 20 cm and are ready for transplanting. Raising seedlings in polythene bags is more desirable for better establishment, after transplanting.

**Planting:** The land should be ploughed deep, harrowed and levelled. Pits of size 45 cm X 45 cm are dug and spaced about 2.5 m apart each way. The pits after weathering are filled with top soil mixed with 5 kg. of FYM, 100 grams of neem cake and 40 grams of super phosphate. Four seedlings should be maintained per pit till the identification of female and male progenies. Finally one female plant per pit and one male plant for every 10 female plants should be retained in dioecious type. Normally male plants flower earlier than female on pendulous hanging inflorescence with branched stalk. The best time for planting
in most parts of India is the beginning of the monsoon in the light rainfall tracts and close of the monsoon in the heavy rainfall tracts.

**Manuring:** Papaya is a quick grower and heavy feeder. To maintain vigour and continuous fruiting manures and fertilizers are required. Doses differ with variety, soil, rainfall etc. After thinning of male and female plants, first dose of 50 grams each of N, P and K per plant (110 g of urea, 310 g of super phosphate and 80 g of muriate of potash) should be applied. The same dose should be applied at 2 months interval from second month of planting.

**Irrigation:** Papaya is very specific in its irrigation requirements. Fruitfulness depends on its vigour which in turn depends on irrigation and manuring. For high and successful production regular irrigation is needed. Lack of moisture results in stunted growth and poor fruiting. During summer, irrigations are to be given at 5-6 days interval and during winter 8-10 day’s interval. Ring system of irrigation is better. This method prevents water coming in contact with the trunk. So, it prevents collar rot disease.

**Inter culture:** Land should be ploughed and harrowed cross wise at least twice in a year. Frequent weeding around the stems is necessary. When the entire area is covered by the foliage the weeding may not require.

**Inter cropping:** When papaya is grown as a pure crop. Vegetables can be profitably grown as intercrops for about 6 months from planting of papaya seedlings.

**Flowering and fruiting:** Starts flowering in 5-6 months after planting. Normally papaya plants are Dioecious which bears male and female flowers separately on different plants. There are Gynodioecious forms also which bears female (Pistillate) and Hermaphrodite (Bisexual) flowers separately on different plants. Male flowers are borne on long stalks and female and perfect flowers in small clusters in leaf axils. Fruit setting commences a fortnight after flowering. Fruit takes 4 to 5 months to reach full maturity. Fruiting continues throughout its life.

**Harvesting:** Starts in about 9-10 months after planting. The maturity is well indicated by colour change and the consistency of latex. The latex of mature fruits becomes watery. Fruits for local consumption should be picked when the green colour is half way changed into yellow; for export it is necessary to pick
sooner, after the blossom end has turned colour Individual fruits should be harvested by twisting by hand without damage.

**Yield:** Average yield is about 75-100 tonnes per hectare. Peak yield during 2nd year and decline by third year. Economic life of papaya is 2 to 3 years.

**Papain:** Papain is the proteolytic enzyme present in the milky latex obtained from green fruits of papaya. This enzyme is exclusively exported and there is great demand in the international market. Papain is used in breweries, especially for clarification of beer, medicines, cosmetics, tanning industry, tenderization of meat and fish, extraction of animal and plant protein from various animals and plants etc. In the medicinal field, papain finds use in the treatment of insect bites, itching of skin, cancer, displaced disk in the spinal cord, dyspepsia and other digestive ailments, ring worm infection, skin lesions and disorders of kidney. Several proprietary pharmaceutical preparations using papain are available in the market now.

**Papain extraction:** The latex should be tapped from 75 to 90 days old immature papaya fruits early in the morning up to 10.00am. On the selected fruit, four longitudinal incisions should be given using a razor blade attached to bamboo splinter. The depth of the cut should not be more than 0.3cm. The tapping has to be repeated four times on the same fruit at an interval of 4 days. The latex should be collected in aluminum trays and shade dried. The dried latex is then packed in polythene bags. Before drying, potassium meta-bisulphate (KMS) 0.05% has to be added to the latex for better colour and keeping quality. The latex can also be dried in oven at a temperature range of 50-55 OC. Papain yield ranges from 1.23g to 7.45g per fruit and the cultivar. Washington variety recorded the highest mean yield of 7.45g per 100-150g of dried latex / tree / year. Varieties suitable for Papain: CO-2, CO-4, CO-5, Coorg honeydew, Pusa majesty and Pusa delicious. Time for papain extraction: Cool and wet period–gives more papain. July to August is the best period.