

## Growing Pawpaws

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In areas where fresh fruit is sometimes scarce and always expensive, an alternative is the pawpaw (*Carica papaya*), a plant probably native to Central America. Just when it was introduced into the NT is not known. The fruit, besides being extremely palatable, has considerable nutrient value being high in vitamin C, which is much higher than in either tomatoes or oranges. Pawpaw may be utilised as fresh fruit, or cooked in a variety of ways as a vegetable. It is also an attractive addition to garden landscaping.

### SOIL TYPES

Although the pawpaw is seen at its best in tropical rain forest soils, which have a high organic content, it is adaptable to a wide range of soil types. However, one factor which is of paramount importance when selecting growing sites is that of drainage as pawpaws will not flourish in areas that are subject to waterlogging.

### TREE TYPES

The pawpaw has three tree types: female, male and hermaphrodite. Female plants produce female flowers only. These are large, situated singly or in clusters near the trunk of the tree and close to the base of the leaf stalk. When the female flower is opened it will be found that each petal is distinct as it rises from the base of the ovary. There are no stamens, so cross pollination is necessary for the fruit to set.



Male plants produce only male flowers, which are borne in large numbers in long, drooping branches up to 1 m in length. The true male flower produces pollen only and it is essential for the development of fruit from the female flower. Occasionally male plants will produce

hermaphrodite flowers and set fruit on the ends of the branches; however, these fruits are usually of poor quality.

Hermaphrodite plants produce flowers which have male and female parts. The flower, having both sexes, is capable of self-pollination. The flower of this type closely resembles the female flower, except that the petals are fused together at the base of the ovary and there are short stamens present. Bisexual fruits are usually long and narrow, and although the eating quality may be excellent, the shape presents some problems for commercial handling.

## **VARIETIES**

There are named varieties of pawpaw in Queensland and NSW, but it is important to select a strain which has been proven locally. A local strain which produces good quality fruits and has shown some disease resistance would perhaps be preferable to a named variety which may be excellent under sub-tropic conditions, but will not perform well here.

## **SEED**

Although some authorities recommend that seed be thoroughly washed clean of pulp and membranes, it has been found that under local conditions the unwashed seed, placed in a simple bag or envelope of fly gauze and hung in a dry well ventilated place, will remain viable for a long period. Fresh wet seed will germinate well and may be sown straight from the fruit.

Seed may be sown in seed-beds, flats, trays, pots, or any other suitable container, e.g. fibre or peat pots. It can also be sown direct to the growing site. In containers a peat, coarse sand and soil mixture may be used in a ratio of 2:2:1. An application of chemical fertiliser at the rate of 60 g per square metre should be incorporated with the soil several weeks prior to sowing. A standard mixture of N P K in the ratio of 5:15:5 would be suitable. Seed should be sown to a depth of about 1 cm and lightly covered with vermiculite, untreated sawdust or sand. Whatever method is practised, the soil should be kept moist at all times to ensure satisfactory germination. Under some weather conditions it may be necessary to water several times daily.

If plants are direct-seeded in the growing site, 8-10 seeds should be sown; these may be thinned down to three to four plants on germination. When plants are advanced to the stage that it is possible to identify sex (by flower formation), the surplus male plant should be removed. There is no way of identifying male plants from females until flowering commences.

## **PLANTING**

Plants that have been grown in seed-beds should, in addition to being hardened off (reduce irrigation), be provided with some simple cover when transplanted to the growing site. It is good practice to reduce the leaf area of the plant at transplanting so that transpiration is reduced while the root system is re-established. If possible planting should be done in the late afternoon. Transplanting should be at the same depth as the seedlings were previously growing; deeper planting may cause some loss from stem rots. Two to three plants should be established on each site.

Plants propagated in containers are less subject to stress and subsequent loss than those produced in seed-beds. However, these will still require attention until they are established. Whatever method is used, seedlings should be planted into moist soil and watered as soon as

possible afterwards. Daily watering will be required for sometime. Optimum planting time is in the early dry season as those planted before the wet grow too tall too quickly.

The ratio of male trees to female trees should not be less than 1 to 10. Male pollinators should be in such a position that the pollen will drift through cropping trees on the wind at the time of flowering (dry season).

Trees should produce their first crop at 9-12 months in the monsoon area and, under reasonable conditions, should yield well for two years, after which production declines. Therefore it is advisable to make fresh plantings each year to ensure continuity of supply.

## PLANT SPACING

Spacing can vary from single row crops where the rows are 3.5 m apart with planting stations being 1.5 m apart in the rows, which gives a plant population of 1,900 plants per hectare.

Double row spacings with planting sites planted on the triangle of offset give higher plant populations. For a plant population of 2,200 plants per hectare plant double rows, the distance between the double rows is 3.5 m, but the distance between rows is 1 m with 2 m between planting sites in the row.

## FERTILISER

Pawpaws do not thrive on very acid soils. The optimum soil pH for this crop is 6.0 to 6.5. If the soil is more acid than this, then dolomite should be applied and incorporated with soil sometime prior to planting, at a rate of 100-200 g/m<sup>2</sup>.

Apply 250 g of a pre-plant or basal fertiliser (such as N12-P14-K10 or a similar mixture) into each plant site. Mature trees should receive regular monthly side dressings alternating between a mixed fertiliser high in potassium, e.g. 6.3% N 6.6% P 32% K, at 200 g per site and urea + muriate of potash at 30 g each per site.

Yellowing of the lower leaves of the plant could indicate a magnesium deficiency. When established trees show these symptoms 50 g of magnesium sulphate per tree should be applied twice yearly.

Bumpy fruits are an indication of boron deficiency and poor fruit flavour is also associated with boron. This can be treated by 6 monthly (2 p.a.) applications of borax at the rate of 3 g/m<sup>2</sup>. Alternatively the boron can be applied in the form of a foliar spray using Solubor<sup>®</sup> and a wetting agent Agral 60<sup>®</sup> at the following rates:

Solubor <sup>®</sup>	5 g - 15 g	per 10 litres
Agral 600 <sup>®</sup>	5 mL - 10 mL	per 10 litres

This is sprayed over the leaves and fruit to the point of run off.

## IRRIGATION

Pawpaws will require irrigation during the dry season. Without it yield and fruit quality will be adversely affected. Two irrigations of about 200 L each per week should be sufficient in most Top End situations. Trees growing on sandy soils will require more frequent applications. Mulching with organic material will do much to conserve moisture.

## PESTS AND DISEASES

By comparison with some pawpaw growing areas, the NT is relatively free of a number of pests and diseases which are a problem elsewhere.

### PESTS

#### **Oriental Scale**

These insects are flat, circular and yellow-orange to pink-orange in colour. This pest will not only disfigure the fruit, but in some cases will damage the trunk to the extent where secondary infection and insect intrusion will cause a complete collapse of the tree.

#### *Control*

White oil at 20 mL/L with malathion at 1 mL/L of water. Ensure that the trunk, leaves and fruit are sprayed to run-off. Several applications will be necessary until the scale is observed to be dead (live scale exude fluid when a thumb nail is pressed into the top of them).

#### **Red Spider Mite**

This is a small mite, usually found on the undersurface of the leaf. Leaves that are attacked may become chlorotic and die prematurely. Spray applications of dicofol (Kelthane®) at the rate of 2 mL/L will give rapid control. Be sure to wet both sides of leaves thoroughly.

### DISEASES

#### **Root Rot and Trunk Rot**

This is caused by the fungus *Pythium* sp. Symptoms are yellowing and wilt of the leaves, starting with the older leaves first. The root system is much reduced and the remaining roots have a soft rot which may extend into the trunk. The disease is associated with poorly drained situations. Avoid such situations, or install suitable drains. Trunk rot is usually associated with scale infestation, often with quite light levels of infestation.

#### **Ripe Fruit Rot**

The main fruit rot occurring locally is caused by the fungus *Colletotrichum* sp. This disease is sometimes referred to as anthracnose. The fungus can infect the fruit when it is green and remain dormant until ripening commences, when sunken lesions appear on the fruit. A zone of soft rot extends into the fruit below each lesion. The disease is more serious when fruit ripens slowly.

Fruit rot can be reduced by:

- a. Picking the fruit early and ripening it artificially.
- b. Selecting seed for planting, by avoiding trees which are known to be particularly prone to ripe fruit rot.

#### *Control*

Post harvest dipping of fruit in prochloraz at the rate of 55 mL/100 L (Sportak®).

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