



FACULTY OF AGRICULTURAL SCIENCES & ALLIED INDUSTRIES

Botanical name	: <i>Annona Squamosa</i> Linn.
Family	: Annonaceae
Chromosome No	: 2n = 14
<u>Origin</u>	: Tropical America - Peru

The custard apple has been growing in India from time immemorial. It is found growing wild in sub-tropical and tropical parts of India. The edible part of anona is areoles. It has about 120 species, five of them having pomological significance and 4 of the 5 species are important in the commerce and are originated in South America and one seems to have originated from Eastern Africa. The first group includes –

- *Annona cherimola* – Cherimoya/Lakshmanphal
- *A. muricata* – Soursop/ Mullu Ramphal/Mamphal
- *A. reticulata* – Bullock’s heart/Ramphal
- *A. squamosa* – Custard apple/Sitaphal/Sweet Sop/Sugar apple
- *A. glabra* – Pond apple/Hanumanphal/Monkey apple

The African species *A. senegalensis* – wild soursop

A. *atemoya*

- Atemoya is a cross between *A. squamosa* x *A. cherimola*.
- Annonaceous fruits have morphological affinity for each other, but each type is unique in its taste, flavor, colour and texture.
- Custard apple is cultivated mainly in Maharashtra, Andhra Pradesh, Karnataka, Madhya Pradesh, Uttar Pradesh, Bihar, Assam and Orissa.

Uses and Composition

The custard apple fruits are mostly used as table fruits or pulp is mixed with milk or ice-cream. It is rich in CHO’s and provides good amount of proteins and minerals. It is a good source of Vit-A and C. Its calorific value ranges from 822 to 1050 K Cal/kg (as compared to 741 K cal/Kg of mango).

The different parts of plant are widely used in folk medicine because of bioactive compounds, mainly acetogenine, alkaloids, flavonoids found in leaves, roots, fruits and seeds.

- Acetogenins are potential anticancer property compounds as they have cytotoxic effect.
- Flavonoids found in seeds, roots, bark, stems are potential chemopreventive agents, given evidence that they decrease tumour incidence.
- Ethanol extracts of cherimoya seeds are used as insecticides and antiparasitic properties.

- The roots are used to treat acute dysentery, depression and spinal marrow diseases.

Soil and Climate

- Custard apple grows well on sandy, rocky gravel, even on heavy soils.
- It does not require deep soil, but drainage should be proper.
- Soils with rich in organic matter with a pH of 6.0 – 6.5 are ideal.
- Custard apple is a hardy plant, prefers dry climate with mild winter and very sensitive to frost.
- The tree goes to dormancy in November-January after harvesting.
- The tree can be grown successfully 1000m from mean sea level.
- Moist climate is favourable for proper growth and development of fruits.
- The plant can tolerate extremes of heat but the yield goes down as shedding of flowers occurs above 39°C.

Propogation

- It is commercially propagated by grafting and also propagated by sexual methods, Since the seeds loose viability; they should be sown, after removal from ripe fruits.
- The seeds of cherimoya treated with 10000ppm GA3 significantly increased germination by 70%.
- It is propagated easily by budding, through shield, patch, chip budding in early spring on the commencement of sap flow or in the autumn.

Species and Cultivars

Varieties

Balanagar

- It is a popular variety of Andhra Pradesh, grows to a height of 3.5 to 4.0 m tall.
- The yield potential of this variety is very high with the fruit size of 350-450 g with less number of seeds (40-80), pulp is white buttery sweet with TSS of 29 percent, acidity of 0.24 percent.

Mammoth

- This is a high yielding variety with prolific bearer, plant is dwarf compare to other varieties.
- Fruits are irregular in shape.
- The average fruit weight is about 180-200 g.
- The areoles are medium to big in size, very smooth and round. The mesocarp is white in colour small to medium segment.
- The number of seeds is less (15-30 seeds/fruit). The fruit has a good keeping quality.

Red sitaphal

- The fruits are medium in size (170-250g) the rind is pink, slightly acidic and sweet, TSS-25 percent with good quality fruits, acidity 0.21 percent with small size seeds.

Barbados

- The fruits are of small to medium in size (170-200 g), fruits are spherical in shape.

- The mesocarp with medium areoles with creamy white pulp, moderately sweet, with the TSS of 24 percent acidity of 0.21 percent.
- This is a high yielding variety.

British Guinea

- This is high yielding variety; the fruits remain green at ripening, medium in size (170-340 g).
- The mesocarp is white and soft, pulp is white, moderately juicy and sweet with 25 percent TSS.

Islander

- Large fruit (410 g), TSS 26 percent with less seeded.

Hybrids

Atemoya

- Hybrid between *A. squamosa* x *A. cherimoya* – sweet pulp, with few seeds.

Arka Sahana (Island Gem x Mammoth)

- It is progeny of island gem (*Annona atemoya*) x mammoth (*A. squamosa*). Fruits will mature in the month sep-oct.
- Matured fruits weigh 210 g and take 6-7 days to ripe.
- The skin has a waxy bloom, light green in colour with creamy white flesh which is juicy with pleasant aroma.
- An average of about 12 tonnes of fruits can be harvested /ha

Planting

- Planting of seedlings is done during monsoon; About 6-12 months old seedlings and grafts are selected for planting.
- The pits of 45-60 cm³ are dug and filled in with a mixture of good soil and compost, planting is done at different spacing based on varietal requirement.

Cherimoya	: 6.0 x 4.0 to 8.0 x 6.0 m
Custard apple	: 3.0 x 3.0 to 5.0 x 5.0, 5.0 x 7.0 m
Sour sop	: 4.0 x 4.0 to 8.0 x 8.0 m
Bullock's heart	: 5.0 x 5.0 m

Manuring and Irrigation

Manure and Fertilizers

- Green manure crop like moong and other leguminous crops can be raised.
- Application of caster cake and bone meal, in 2:1 ratio is found beneficial.
- Application of 250:125:125 g NPK in two splits along with 50 kg FYM/Plant/Year.

Irrigation

- Custard apple is mainly grown as rainfed fruit crop in India.
- This crop is benefited from the rainfall that is received during the fruiting season.

- One or two irrigations during fruit development improve the size and quality of fruits.

Training and Pruning

- Newly planted seedlings/grafts are supported with wooden sticks.
- Generally, pruning is not recommended in custard apple.
- Fruits are borne on old as well as current season growth.
- Light pruning helps in inducing better branching.
- Where pruning can be done to avoid over crowding or remove dead/diseased wood.

Flowering and fruiting

Flowering

- Annona plants starts bearing from 3 years of planting and economic yields starts from 5-6 years after planting.
- Flowering periods extends from spring to the end of the rainy season.

Factors affecting fruit set

- Failure of many flowers to form fruits due to lack of pollination.
- It is desirable to set fruits early in the season, but in India the early flowers produce no pollen and hence natural pollination is difficult. Hand pollination gives about 85 percent fruit set compared to natural pollination (30 percent).
- **Dichogamy:** The stigmas are not receptive when the pollen is shed and the receptivity also remains for a short period. Some custard apple trees shed pollen on the morning and others in the afternoon.

Increase in fruit set is possible by application of NAA at 20ppm during flowering for 3-4 times at 8-10 days interval and spraying with GA3 at 50ppm.

Pests and Diseases

Pests

- Mealy bug: *Planococcus pacificus*
- Sometimes, new growth of custard apple tree during spring is severely affected by Aphids and Jassids – these pests are effectively controlled with the spray of Monocrotophos at 0.2% or Rogar at 0.1% concentration.

Diseases

- **Collar rot and Root rot:** *Pithium sp.*, *Phytophthora sp.* – The seedlings are affected, incidence is more severe when there is problem with drainage.
- **Anthraxnose:** *Glomerella cingulata* – It affects on fruits, infections start at blossom end and later spreads on entire fruit surface, affected fruits may fall down from tree.
- **Leaf spot:** *Cercospora anonae* – Brown spots on leaves, under severe condition leaves fall down.
- **Fruit rot:** *Phomopsis anonacearum* – Rotting of fruits in storage condition.

Maturity Indices

- Custard apple fruits are climacteric, therefore they are harvested when they are mature, firm and plumpy, on maturity, fruit turn light green.

- The inter areolar space widens the fruits turn creamy white, the skin between the segments or tubercles turn into light yellow colour.
- For transporting over distant market, the fruits are to be picked before full ripening and are packed in single layer, well ventilated wooden boxes with soft cushioning material.
- A good bearing tree gives about 100-150 fruits i.e., about 8-10 tonnes/ha.
- The fruits are highly perishable and cannot be stored for long duration.
- It can be stored in good condition up to 7 days by treating them with 8% wax emulsion.

Harvesting and Yield

Custard apple matures/ripens during October-November/December in dry region, whereas in humid areas harvesting is done during August.