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Thar Amrit: A new high-yielding custard apple variety for dryland

Thar Amrit variety of Custard apple is precocious, regular bearer, and starts bearing in 2nd year. It has fruit weight of 320.12 g, having high pulp content (63.58%), and can be used for both table and processed purpose owing to high fruit pulp TSS (29.12°Brix). It is drought hardy and capable to give stable economic yield during aberrant agro-climatic conditions (350 mm). Fruits emit strong aroma at full ripening stage. It belongs to late maturing group (2nd week of November) with high yield (24.80 kg/plant in 11th year) under rainfed semi-arid conditions of western India. The fruit is rich in ascorbic acid (45-50 mg), iron (1.70 mg), phosphorous (26.0 mg), potassium (285.55 mg) and calcium (18.21 mg) content. It is a heavy yielder, and fruit bearing occurs on lateral and terminal branches in this variety. It was developed at Central Horticultural Experiment Station, Godhra, Gujarat and identified and released at Institute level (ICAR-CIAH) in 2022.

CUSTARD apple (*Annona squamosa* L.) is important underutilized and drought hardy fruit crop which is cultivated in tropical and subtropical climate. It belongs to family Annonaceae and is native of the West Indies. In India, it is naturally grown in forests, wastelands, rocky slopes, and other uncultivated lands. Its cultivation is spread over arid to semi-arid areas of Andhra Pradesh, Assam, Karnataka, Maharashtra, Madhya Pradesh, Odisha, Rajasthan, and Tamil Nadu as a shrub or hedge plant. It grows throughout the plains of India at elevations not exceeding 4,000 ft. It mostly prefers a tropical climate, but can be grown successfully in hot to mild winter condition. The fruit plant tolerates wide soil and climate conditions, from saline soils to droughts. Farmers usually cultivate custard apple on hill tracts or barren lands. It is a deciduous or semi-deciduous tall woody shrub of about 5-6 meters height having irregularly spreading branches.

Immature developing fruits

USES

- In ice creams and other milk products
- As jam and jelly
- In Ayurvedic and Unani systems of medicine
- Seeds as abortifacient and roots as
- strong purgative
- Seed oil (30%) in soap and paint industry
- Seed cake (4% N) as cattle feed and as manure
- As insecticide with Neem oil

The fruits are rich in carbohydrate mainly in the form of sugars (23.5%), protein (1.6%), calcium (17 mg/100 g), phosphorus (47 mg/100 g) and iron (1.5 mg/100 g). The tree sheds its leaves during April to June at arid, semi-arid and dry land condition of western India.

Salient features of Thar Amrit

Flowering: Thar Amrit were earmarked and collected from the existing diversity rich population of custard apple in area of Panchmahal district, Gujarat in 2009-10; which were evaluated under rainfed semi-arid field condition for their growth, yield and qualitative characters. Grafted and budded plant started flowering in 2nd year. It takes 4-5 years to develop full canopy and economic yield. The flowers appeared on old and current season's growth (new emerging young shoots). Flowering occurs in July to August in semi-arid region of Western India. Flowers may be terminal or axillary and borne solitary, paired or in multi-flowered fascicles either on new branches, older branches or on the main trunk. The flowers are hermaphrodite and dichogamous in nature. The anthesis takes place in morning 5:30 AM to 8:30 AM and anther dehiscence at 12 PM to 2 PM of next day of the anthesis and stigma receptivity starts a day prior to anthesis and

Branches laden with fruits

continues up to day after anthesis, but the maximum receptivity is at the day of anthesis. The petal colour is light green to yellow. It is self-fruitful variety and gives good fruit set and fruit yield under semi-arid condition of western India.

Maturity, ripening and yield: It is heavy yielder, fruit bearing occurs on lateral and terminal branches in this variety. It has spreading growth habit, regular bearer, and ripens in 1st fortnight of November. Fruit ripens after 85-90 days from fruit set. It has 320.12 g average fruit weight, 63.58% fruit pulp, and 29.12° Brix TSS, the average fruit yield per plant was recorded 24.80 kg during 11th year after planting under rain-fed conditions of semi-arid ecosystem. It is precocious and high yielder with big size fruit. It is suitable for both processing and table purpose, and ripened fruits have strong aroma with golden yellow colour at maturity. No major diseases/pest were noticed under field condition.

Fruit quality: Thar Amrit has excellent fruit quality characters and fruit taste at mature stage. The average fruit quality trade like fruit weight (g), fruit size (cm), pulp (%), TSS (°Brix), acidity (%), total sugar (%), reducing sugars (%), total seed per fruit, core length (cm) are 320.12, 9.12 × 8.81, 63.58, 29.12, 0.33, 16.64, 14.40, 47.23, and 3.95, respectively. The fruit characters like fruit shape, fruit and pulp colour were recorded as broadly cordate, golden yellow and creamy white, respectively. Fruits are generally bigger in size, having better shelf life of 4-5 days under normal conditions.

View of transverse section

Mature fruit of Thar Amrit

Production technology

Soil and climate: The custard apple can be grown in wide range of soils, although for better plant growth and yield, sandy loam or deep loam well-drained soils with 7-7.5 *p*H are considered as most favourable. It survives wide range of ecological conditions, reflecting its wide geographical distribution from tropical and sub-tropical to arid and semi-arid regions.

Plant propagation: It can be multiplied through soft-wood grafting and patch budding during the month of March-April under rainfed semi-arid condition of western India.

Orchard establishment: The pits size 1.0 × 1.0 × 1.0 m is usually considered as better for plant establishment, and are dug out during summer months (May). Well-decomposed organic matter and loamy soil (1:1) are observed as good pit filler. Planting is usually done during rainy season, when the soil in the pits has already settled. The plants should be irrigated immediately after planting. It can be planted at the distance of 5 m × 5 m for high productivity.

Irrigation management: It can be grown successfully without irrigation under semi-arid condition. In the early age (0-2 year), plants should be irrigated during summer for better growth and establishment. Water harvesting techniques during the rainy season should be considered, which encourage subsequent plant growth and fruit development during post monsoon season.

Nutrient management: An annual dose of about 50 kg of FYM, 1.0 kg N, 500 g P, 500 g K and 200 g micro-nutrient mixture per plant per year should be applied in full grown tree (5 year old) and it should be applied each year in two splits during first week of July and last week of August.

Training and pruning: In order to maintain single stem plant, training is essential for proper framework development which enables the plant to grow straight. Usually, in untrained plants, bending of plant and multiple stem growth during monsoon season occur. Custard apple plant should be trained with removing cross branches at initial growth stage because grafted plant are vulnerable to lanky and uneven spreading in growth habits. Hence, initial to three years training and pruning is essentially

Germplasm block of custard apple at CHES, Godhra

Harvested fruits: Thar Amrit

required for proper framework. Generally, the custard apple plant does not require pruning but it is essential to remove dry, dead and cross branches during May and June.

Harvesting practices and yield: The fruit ripens during 1st fortnight of November. The main characteristic of ripe fruit is turning of fruit protuberance surface colour from green to yellow and spreading of protuberances of fruit. The mature fruits are picked individually by hand and in all cases care should be taken to avoid all possible damage to fruits during harvesting and storage to avoid post harvest losses. The average fruit yield per plant was recorded 24.80 kg/plant in 11th year of planting under rainfed semi-arid condition of western India.

SUMMARY

That Amrit can be used for table and processing purpose. The fruit is rich in ascorbic acid, iron, phosphorous, potassium and calcium content. Fruits are generally bigger in size having better shelf life at normal conditions. Ripened fruits have strong aroma with golden yellow colour at maturity. It is precocious and high yielder, fruit bearing occurs on lateral and terminal branches in this variety. It is highly suitable to grow in rainfed hot semi-arid regions of the country.

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Vertical expansion of nursery under protected conditions using soilless rooting medium

An efficient technology for multiplication of clonal rootstock (M-9, MM-106, MM-111, P-22, B-9, M-27) of apple under greenhouse conditions was standardized. The technique involves wounding/incision on branches with diameter of 5 mm at 30 cm above ground level using sharp knife/blade to remove the bark followed by application of 2,500 ppm IBA as rooting hormone. The treatment starts from the second week of June till the last week of August. Small polybags (filled with rooting medium) are fastened at the points where rooting needs to be initiated. A lightweight substrate (cocopeat) having high moisture holding capacity is used as rooting medium. Staking is accomplished with the help of bamboo poles to hold the bags in a proper position and to keep the plants straight. This technology is very useful in promoting the vertical expansion of the nursery in greenhouse conditions and the multiplication of number of plants per unit area has increased by three to four times with minimum utilization of extra inputs and area. One more additional benefit of this technology is that under the greenhouse conditions, the rootstocks attain sufficient girth (> 6 mm) and all the plants are suitable for budding. The technology not only produced the additional 3-4 rootstocks but also the budded plants which have added advantage to this technology.

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