

Thar Prabha: A new high-yielding wood apple variety for dryland

The wood apple tree (*Feronia limoni* L.) is an underutilized fruit crop which is locally known as elephant apple, monkey fruit, curd fruit, kata and kaithbel in different part of the country. It belongs to citrus family Rutaceae. It is native to south India and grows naturally in scattered manner in dry land and forest area in all parts of the country excluding high altitude and in cold region. It prefers dry hot condition at flowering and fruit setting stage. The tree is tolerant to both drought and waterlogging condition. The mature fruit have creamy-brownish, sticky, resinous, astringent, acidic-sweet pulp. The fruit pulp has pleasant aroma and seed scattered throughout fruit. The fruit and plant parts (leaf, stem, bark, fruit and seed) have good medicinal and curative values.

GLOBALLY, it is found growing naturally in moist tropical to sub-tropical countries (Nepal, Bangladesh, Sri Lanka, Africa etc.). Keeping above facts in view, large numbers of germplasm were established in field gene bank of the institution, after evaluation, variety Thar Prabha was developed to provide prosperity and nutritional security to resource poor farmers of dryland areas of the country.

Salient features of Thar Prabha

It was developed through selection method. This selection was collected from Bhopal district of Madhya Pradesh in 2005 and established through soft wood *in-situ* grafting under field condition. The selected genotype was evaluated under field conditions for 16 years (2005-2020) in western India at Central Horticultural Experiment Station (ICAR-CIAH), Vejalpur, Panchmahals (Godhra), Gujarat. The selection performed well in respect of growth, flowering and fruiting, yield and fruit quality attributes as well as fruit self-life. It was identified as variety at institute level in 2022. It has spreading growth habit, starts flowering in 4th year, regular bearer, and ripens in 2nd fortnight

of December to late January. It has 452.25 g average fruit weight, 58.37% fruit pulp, 3.23% acidity and 19.82° Brix T.S.S., the average fruit yield per plant was recorded 183.25 kg during 15th year after planting under rain-fed semi-arid ecosystem. It can be used as table purpose as well as in value added products, owing to rich in TSS, high pulp percentage with remarkable pectin and protein content. The plant growth, fruit quality and yield were recorded normal and stable even during the years that received less precipitation up to 300 mm.

Plant growth behaviour

It is medium-dwarf tree having spreading growth habits. The plant height, stem girth and plant spread were recorded 6.80 m, 74.36 cm and 6.22 m × 6.52 m during 15th years of plant age. The trunk is cylindrical with a symmetrical crown of foliage. The plant bark is thick rough dark grey colour with longitudinal furrow. The branches have axillary and average spine length is recorded 2.10 cm and the spine density was recorded 12.21 per meter shoot. The plant leaves odd pinnate, 8.53 cm x 7.25 cm size, no of leaf (50.34) per meter shoot petiole and rachis flat have been noted.



Bearing in 5 year old Thar Prabha tree



Bearing in 8 year old Thar Prabha tree

The plant leaves are generally deciduous, alternate, dark green, leathery with minute toothed. Leaves have 5 to 9 leaflets which were opposite, sessile or very short petiole, 2.86 cm x 1.51 cm size, obovate tip and cuneate base. The tree sheds its leaves for a short period during January to February at arid, semi-arid and dry land condition of western India.

Flowering

The dry and hot season is most suitable for the initiation of flowers bud and anthesis of flowers. The flowering mostly occurs on new and old shoots of the



Fruit development in bunch



Flowering behaviour and fruit setting



Mature fruits in bunch



plant in the month of March-April. The budded or grafted plant of Thar Prabha starts flowering in 3-4th year after planting while seedling plant takes up to 8-9 years for first flowering. The flowers are born in small, loose, terminal or lateral panicles which contain 25.58-145.23 flowers per panicle. The flower panicle contains both staminate and hermaphrodite with 9-12 stamens of equal size and length. Flower colour varies from light green to deep red in colour. The green calyx is very small with 5-6 lobes and 5-6 elliptic-oblong petals are green to red in colour with spreading or bent downwards. The peak period of flowering takes place in 2nd fortnight of April to May month while the peak time of anthesis was observed around 8-10 AM under semi-arid condition. The flower anthers were noted as basifixed dehiscing with a slit between two pollen sacs of each lobe. The fresh pollen grains of flower are light green to yellow in colour.

Maturity, ripening and yield

The fruits shows greenish-white colour with rough skin at full maturity whereas ripe fruits gives strong pleasant aroma. Fruits attain maximum size in month of October then more or less stationary phase until the fruits are harvested. It is drought hardy and capable to give economic yield during aberrant agro-climate condition. Fruits are generally ready to harvest after 225-240 days of fruit setting (November). Plant and fruits are completely free from any disease and pest. The mature fruits can be stored for 12-15 days under normal condition. It gives high yield (58.58 kg) in 7th year while 124.36 kg/plant in 12th year under rainfed semi-arid condition.

Fruit quality

This selection has very good fruit quality and fruit taste. The average fruit characters such as fruit weight (g), fruit size (mm), pulp (%), shell weight (g), TSS (^oBrix), acidity (%), total sugar (%), reducing sugars (%), fruit pectin (%), fruit protein (%), seed protein (%), phosphorous (%), potassium (%), calcium (%) and iron (mg) are 452.25, 103.67x96.66, 50.92, 180.12, 14.12, 3.85, 3.07, 1.42, 1.76, 18.13, 24.38, 0.07, 1.73, 0.30 and 16.72 respectively. The fruit characters in term of fruit shape, fruit and pulp colour are oblong, greenish-white and brownish, respectively. The fruits of this selection are generally bigger in size having better self life 12-15 days at normal conditions. The fruit may be used as table purpose and for value added products like pickles, RTS, chutney and powder.

Distinct characters of Thar Prabha

- It is precocious bearer having dense canopy, and starts bearing in 4th year.
- It has bigger size fruit (452.25 g). It is used as table fruit and processed as well.
- It is drought hardy and capable to give economic yield during aberrant agro-climatic condition.
- Fruits emits strong pleasing aroma at full maturity. It belongs to early maturing group (1st week of

November) with high yield (115.05 kg/plant in 10th year) under rainfed semi-arid condition.

- The fruit is rich in pectin (1.76%) and protein (pulp, 18.13% and seed, 24.38%), phosphorous (0.07%), potassium (1.73%), calcium (0.30%) and iron (16.72mg) content.
- It is highly suitable for making of value added products like pickles, RTS, jelly and powder etc.

PRODUCTION TECHNOLOGY

Soil and climate

The wood apple can be grown in wide range of soils. For high yield potential and good plant growth, sandy loam or deep loam with 7-7.5 pH and well-drained soils are needed. It is adapted to a wide range of ecological conditions, reflecting its wide geographical distribution from tropical and subtropical to arid and semi-arid regions. It is highly suitable for semi-arid and arid ecosystem.

Plant propagation

It can be multiplied through soft wood grafting and patch budding during the month of March-April. In wood apple, *in-situ* soft wood grafting with 6-8 month scion shoot on 10-12 month old rootstock gives >92% success and patch budding with 3-4 month scion bud giving 75.36-70.12% success under semi-arid condition of western India. Therefore it is advised to propagate wood apple tree by *in-situ* soft wood grafting under rainfed semi-arid condition for better success and survival.



in-situ softwood grafting

Orchard establishment

The pits of 90 × 90 × 90 cm are usually dug out during summer months. Well-decomposed organic matter is mixed with soil and pits are filled. Planting is done during the raining 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 8m × 6m for high productivity.

Irrigation management

It can be grown successfully without irrigation under

semi-arid conditions. In the early age (up to 2 year), plants should be irrigated during summer for good growth and better establishment of plant. Although, wood apple can be grown in rainfed semi-arid condition without irrigation but the planting should be done just after onset of rain so that plant could establish during rainy season. Water harvesting techniques during the rainy season should be considered, which encourages subsequent growth and fruiting during post-monsoon season.

Nutrient management

An annual dose of about 50 kg of FYM, 1.0 kg N, 500 g P and 500 g K per plant per year should be applied in full grown tree. It should be applied each year in two splits during first week of July and last week of August.

Training and pruning

Generally, wood apple is not trained, but at initial growth stage of plant, grafted plant are vulnerable to lanky and uneven spreading in growth habits. Hence, initial two to three year training and pruning is essentially required for proper framework. The wood apple generally not require pruning, but it is essential to remove dry, dead and cross branches during December-January.

Harvesting practices and yield

The fruit ripens in the month of November. The main characteristic of ripe fruit is strong and pleasant aroma. The mature fruits are picked individually by hand picker 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/plant was recorded 124.36 kg/plant in 12th of planting under rainfed conditions of semi-arid ecosystem.



Harvested fruits of Thar Prabha



Transverse section of mature fruit

Transverse section of immature fruit

For further interaction, please contact to:

Dr A K Singh (Principal Scientist), Central Horticultural Experiment Station (ICAR-CIAH), Vejalpur, Godhra, Panchmahals, Gujarat.
*Corresponding author email: aksbicar@gmail.com