

Thar Avani: A novel variety of round shape bottle gourd

Thar Avani was developed at ICAR-Central Horticultural Experiment Station (CIAH-RS), Godhra, Gujarat through hybridization followed by selection. The fruits are round in shape with 22.8 cm length, 39.4 cm girth, 8.1-8.7° TSS, 21.6 mg/100g ascorbic acid and 12.91 kg fruit weight. It has comparatively higher antioxidant contents and activity in fruit, epicarp, mesocarp and leaves. It also recorded comparatively higher potassium (1641.14), magnesium (155.36), iron (12.42) and copper (0.24) in fruit, and calcium (610.73), magnesium (158.17), iron (1.86), and copper (0.29) in leaves (mg/100 g dw).

BOTTLE gourd [*Lagenaria siceraria* (Mol.) Standl.] variety Thar Avani was developed at ICAR-Central Horticultural Experiment Station (CIAH-RS), Godhra, Gujarat through hybridization followed by selection from the segregating population of LS-4 × LS3-2 and advanced to F8 and identified/released at institute level. Plants are highly vigorous with dense foliage, male and female flowers emerge from 7th and 11th nodes, respectively. Each plant produces about 24-32 female flowers and set harvestable sized fruits between 57-62 days after sowing. The fruits are round in shape with 22.8 cm length, 39.4 cm girth and weight of each fruit ranged between 750-860 g. The fruits are characterized with high flesh thickness, TSS (8.1-8.7°), ascorbic acid (21.6 mg/100 g) with attractive creamy white flesh colour. Each plant produces about 12.91 kg with 43.0 t/ha under rainfed semi-arid conditions. Fruit attain harvestable stage at 54-63 days after sowing for culinary purposes and 120-140 days for seed purpose.

Soil and field preparation

It is a warm season crop, requires fertile, aerated soil with pH 5.5 to 6.5 for its better growth. The soil with high organic matter is suitable for high yield; the low organic matter soil exhibits poor vine growth. Sandy loam with well drained soil favours good vegetative growth followed

by fruit development. Its growth and development in clay soil is comparatively poor. The field should be ploughed 3-4 times using tractor and made the soil fine tilth and weed free. The flat bed or ridges and furrow system is followed to plant the crop.

Seed sowing and planting

It is propagated through seed. The seeds of freshly harvested fruits record higher seed germination under field condition than older ones. The seeds are rich in oil and have hard seed coat, which causes more viability loss and poor germination. Hence, soaking of seed over night in water enhances seed germination. The seeds are either sown directly in the field or the seedlings are raised in the polythene bags or plug trays in mid December to mid January for early summer crops. The 1-2 true leaf stage of seedlings is transplanted in the main field. The best time to plant bottle gourds is late June or early July for *kharif* season while in spring-summer, sowing should be done in the month of February-March. For direct sowing, four seeds are sown in each pit at a depth of 2 cm. About 1-1.5 kg seed is required to cover 1 ha area. The pointed side of the seed facing down is good for better germination and the seeds start germinating after 4th day. After germination,



Thar Avani fruit ready for culinary purpose



Field view of Thar Avani with checks at developing stage

the two healthy seedlings are maintained in each pit and the remaining unhealthy seedlings are thinned out. It grows up to 3.0 m; hence more plants can be accommodated by planting at 2.0×1.5 m or 2.0×1.0 m spacing.

Training and pruning

It requires proper training and pruning for getting good quality fruits with higher yield. Training plants to bower helps to tap sunlight more effectively to increase yield. After germination of seed, the vine is to be trailed on bower system with the help of jute string. Axillary buds of growing vines should be removed till vines reach the bower height. When vine is likely to touch bower, apical bud is removed at 10-15 cm below bower to allow 2 or 3 branches to spread over bower. After formation of 4-5 fruits, vines are again pruned allowing 2-3 axillary buds only to grow on primary vines. It is also advisable to remove all yellow and pale coloured older leaves near bottom portion.



First female flower emergence at 7th node and flowering pattern of Thar Avani

Fertilizer management

Organic manure is beneficial for better growth and fruit development. Hence, soil is applied with 15-20 tonnes of FYM by spreading method at the time of



Thar Avani at farmer's field on pandal system

field preparation with half dose of nitrogen and full dose of phosphorus and potassium. The application of 60-80 kg N, 40-60 kg P and 60-80 kg K is ideal recommended dose/ha. The application of 50:25:50 g urea, single super phosphate and murate of potash, respectively to each pit at 30 days after sowing is used to enhance the yield.

Irrigation

Bottle gourd is a deep rooted crop, it has been observed that the roots may reach even 1.5 m below ground level to get water; hence, it can tolerate dry conditions fairly well. However, extended dry periods will result in poor fruit set and/ or poor fruit development and size. The seeds are sown in dry soil and light irrigation is advocated. The life saving irrigation is advocated on 3rd day of sowing and subsequent irrigation is done at 7 days interval during summer or depending on prevailing agro-climatic conditions for other season. Flowering to fruit development is the sensitive phase of the crop growth, ensuring sufficient moisture in the soil is essential as the proportion of male blossoms usually increases when plants are under stress.

Weed management

Clean cultivation is highly advisable as the bottle gourd likes to grow vigorously. Hence, controlling weeds through frequent, shallow cultivation or 3-4 hand-weeding and hoeing is usually advocated during crop growth. Pre-emergence herbicide Pendimethalin 2.0 l/ha is advocated to control weeds before sowing or planting of seedlings in the main field.

Harvesting and yield

It attains harvestable stage at 52-63 days after sowing for green fruits and 120-140 days for ripe fruits for seed extraction. The fruits picked every 3-4 days interval. Its fruit has good shelf life with less weight loss, firmness and colour retention up to 3-5 days during summer and 10-12 days of storage during winter under room temperature. It gives 12.9 kg fruits by producing 16-20 fruits per plant and weighing about 700-800 g each with yield potential of 43.0 t/ha.



Tender fruit ready to harvest



Field view of mature fruits of Thar Avani for seed

Plant protection

Bottle gourds are infested with many pests and diseases. The main pest of bottle gourd is fruit fly, the adult flies make a sting on young immature fruit and lays the eggs. White coloured maggots start developing inside the fruit. Hence, placing bait to attract the adult flies is advisable to control them. Powdery mildew is the serious diseases affecting rainy season crop, while this variety is

very less affected (5-10%) under semi arid condition of western India.

For further interaction, please write to:

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Multi-Layer Farming Systems (Multiple Cropping)

Shri Akash Chaurasiya belongs to a marginal farmer's family in Tilli village of Sagar District of Madhya Pradesh. After being trained at KVK, Sagar, he adopted multilayer farming system with organic farming, in which he grows at least four to five crops in the same field, like ginger, ivy gourd, leafy vegetable, papaya and potato at the same time. Ginger is planted at the depth of 2.5 inches and width of 6 inches under the surface, as the first crop taking in the month of February. Then he grows any one of the leafy vegetables like Amaranthus or Spinach or Coriander etc. densely on the surface as second crop at the same time, which acts as green mulching and prevents the growth of weeds and moisture. As a third crop, he grows specially ivy gourd (Kundru), having a distance of 5-6 feet from each other on the wire net, locally-made from bamboo and grass, and constructed at a height of 6.5 feet from the surface level. The structure provides protection and partial shade to other crops like ginger and leafy vegetables for better growth at the same time in the month of February. Hence, all three crops are grown at the same time, with the same cost of labour & others expenses materials. As the fourth crop, he grows papaya in the month of April, which gives fruit above the net. After digging of ginger in September-October, potato is also planted in the month of October as a fifth crop. During this time, he sells ginger (as an off-season crop) at a higher price, that is ₹ 60 to 100 per kg, in the market. All of these crops were grown on wire constructed (MANDAP) which are fixed parallels on the bamboos, having a distance of 1.5 feet from each other. So, in this way, by growing of four to five crops together, then it can have 3-4 times more earning. Total expenditure on bamboo and wire-made structure, running up to five to six years, happened to be ₹ 1,50,000/acre, that is, ₹ 30,000/year. Total cost of cultivation of crops was ₹ 2,05,000 for cultivation of all crops, viz. Ginger, Ivy gourd (Kundru), Leafy vegetables (Amaranthus/Spinach/Coriander/Fenugreek etc.), Papaya and Potato per year per acre. The net income obtained, thus, was found to be ₹ 4,95,000/acre with 3.41 BCR.

Besides income, four-layer multiple cropping model gave other benefits also, such as, reduced insect-pest, no effect of climate change (i.e. from frost cold and heat waves etc.), and less requirement of manures due to multi crops being grown at the same time.



A view of multi crops in four layer farming system



A view of leafy vegetables before emerging of ginger crop in four layer farming system

Source: ICAR Annual Report 2022-23