

Swagata: A New High-Yielding Variety of Elephant Foot Yam

Elephant foot yam [*Amorphophallus paeoniifolius* (Dennst.), syn. *A. campanulatus* (Roxb.) BL. ex Dence] is herbaceous, and one of the tropical perennial vegetables that originated in Southeast Asia. It is C₃ in nature, vegetatively propagated and commercially cultivated for its underground modified stem or corm which has long been used as a local staple food in many countries. The corms are usually consumed after frying, boiling or baking and are rich in vitamin A phosphorus and calcium. The petioles and leaves are also eaten in India by local tribes as they too contain a high concentration of vitamin A. The corms are reported to have blood purifying properties and are used in medicines for the treatment of asthma, piles, dysentery and other abdominal disorders. Navsari Agricultural University started a crop improvement programme on elephant foot yam by collecting germplasm from local as well as from different parts of India and evaluated them to discover elite genotypes for the farmers of tribal regions and all over Gujarat. Following the breeding method of clonal selection, one elite genotype was developed and after the recommendation of 51st State Seed Sub-Committee, Gandhinagar, Gujarat it was released by the name of Swagata. Farmers of Gujarat prefer this variety specifically for higher productivity, disease resistance, excellent corm flesh colour and palatability.

TUBER vegetables contribute a considerable share of the world's food supply and are an important source of fodder and industrial products too, particularly in developing countries. They are potential functional food primarily providing staple carbohydrate sources, second to cereals and contain several bioactive constituents like phenolic compounds, saponins, bioactive proteins, glycoalkaloids, phytic acids and hydroxycoumarins. Tuber crops are bestowed with resilience to global warming and climate change, potential for better return under adverse soil and weather conditions, fit to diverse industrial applications and most of all have exceptionally high CO₂ fixation capacity. Despite being a part of subsistence agriculture, they are also excellent cash crops for local and export markets. Globally, most of the tropical tuber vegetables are cultivated in Africa, Asia and South America. Among them cassava, sweet potato, greater yam, elephant foot yam and colocasia are major ones. Elephant foot yam is a vegetatively propagated tropical tuber crop that offers excellent scope for adoption as a cash earner due to its production potential, high net returns, higher shelf life and popularity as a vegetable in various delicious cuisines. Besides the source of high energy, the tuber is also rich in potassium, phosphorus, calcium, iron, manganese, zinc, antioxidants, and

flavonoids. The tubers have blood purifying property and it is used in medicines for the treatment of piles, asthma, dysentery, and other abdominal disorders. High dietary fibre and low glycemic index make it a rich food for the treatment of heart ailments as well as diabetes. It also possesses an excellent amount of omega fatty acids which regulate the good cholesterol level in the body. It is low in fat containing only essential fatty acids, thus, helps in reducing the risks of obesity and diseases associated with it. In India, this crop is traditionally cultivated in Kerala, Andhra Pradesh, West Bengal, Tamil Nadu, Bihar, Gujarat, and Jharkhand. Southern Gujarat, particularly the forest tracts of Dang district and adjoining parts possess immense diversity in tuber crops like elephant foot yam, greater yam, sweet potato and colocasia. Keeping in view the above facts, Navsari Agricultural University, started a crop improvement programme on elephant foot yam by collecting germplasm from local as well as from different parts of India and evaluated them to discover elite genotypes for the farmers of tribal region and all over Gujarat. Following the breeding method of clonal selection one elite genotype was developed and after the recommendation of 51st State Seed Sub-Committee, Gandhinagar, Gujarat it was released by the name of Swagata.

VARIETAL CHARACTERS

Morphological traits

This variety has a stout upright pseudo stem with Y type of rachis pattern. Petiole texture is rough with light pink ground colour. Petiole colour is green with white patches. Speckles on petiole are small and contiguous. Bract colour of main bud is light pink. Corm shape is elliptical with brown epidermis. Flesh of corm is light orange in colour. At its highest vegetative peak plant height is 94.96 cm with culm girth 11.75 cm, east west canopy spread 92.90 cm, north south canopy spread 90.21 cm and corm circumference 52.56 cm. Leaflets in adult plant are 20.20 cm in width, 3 partite. Inflorescence is terminal and very large. Male part is obconical and 7.50 cm long. Stamens are light yellow. Female part of the spadix is 12.60 cm long. Stigmas are large, orange-yellow in colour. This variety takes 23.67 days for 50%



Variety Swagata (NEFY-7): Field view of plant and harvested corm



Comparison of corm shape, size and flesh colour (Left: Swagata; Right: Gajendra)

sprouting. Number of leaflets per plant at 150 days after planting is 210.93

Corm yield

This variety falls under the medium maturity group for fresh consumption at different locations in Gujarat (170-180 days after planting). Average corm weight is 1706.12 g. Swagata (NEFY-7) has been evaluated for four years from 2016-17 to 2019-20 in multilocation trials. On



Yield comparison: Plot yield difference between Swagata (NEFY-7) and national check Gajendra

average, the genotype recorded 44.84 t/ha corm yield which is 26.10 % higher over the national check Gajendra and 18.91 % superior to the local check Chikhli Local.

Quality traits

This variety reported to have appreciable amount of starch (17.89%), dietary fiber (1.34 mg/100g), energy (133 Kcal), protein (1.80%), Vitamin A (20 IU), Fe (8.40 ppm), Mn (11.00 ppm), Zn (41.00 ppm) and Ca (0.32%) in its fresh weight basis. No acidity has been found (10.53 mg / 100 g Ca-oxalate) while consumption after cooking. It becomes completely soft after boiling 20 minutes. In sensory qualities of cooked elephant foot yam cubes it scores 7.75 (liked very much) on the basis of 9-point hedonic scale.

Disease resistance

Phytophthora blight intensity was recorded in 0-5 standard scale and very little incidence was found. The collar rot severity was recorded in 1-5 standard scale and this variety was found field resistance in Gujarat condition.

SUMMARY

Swagata is a new high-yielding variety of elephant foot yam developed through clonal selection at Hill Millet Research Station, Navsari Agricultural University, Waghai, The Dangs, Gujarat. After the recommendation of 51st State Seed Sub-Committee, Gandhinagar, Gujarat





Comparison of disease appearance (Phytophthora leaf blight)



Comparison of disease appearance (Collar rot)

Production technology

Land preparation	Two to three ploughing followed by planking then digging of pits (20 cm deep, 20 cm length and 20 cm width) for planting of corms
Propagation	Seed corm of 200-250 g weight
Seed treatment	Dithane M-45 or Redomil or Carbendazim @ 2.0 g per litre of water for 1 kg corm or <i>Trichoderma</i> @ 5.0 g in 1.0 kg of fresh cow dung slurry for 1.0 kg of seed corm
Planting Time	15 May to 15 June (onset of monsoon) during <i>kharif</i> for rainfed crop and 15 February to 15 April during summer for irrigated crop
Seed corm rate (kg/ha)	30 to 35 q/ha depending on spacing, having 200-250 g corm weight
Spacing (cm)	60 × 60 cm
No. of seed corm / pit	One whole corm/one piece corm
Gap filling	Gap filling is required after germination of corms. Planting of corms should be done in plastic bags (30 cm deep, 30 cm length and 30 cm width) at the same date on which planting is carried out in the main field and gap filling should be done with those plants grown in plastic bags
Fertilizer	Recommended dose of fertilizers: FYM @ 20 t/ha 100:50:150 N:P:K kg/ha (Full dose of FYM/Compost, P, K & 1/2 dose of N to be applied in pits before planting and remaining dose of N to be applied during intercultural operation and earthing up on 45 days after planting in ring)
Weed management	Pre-emergence weedicide Metribuzin @ 0.25 kg ha ⁻¹ should be applied on 1-2 days after planting with 2 intercultural operations at 30 & 45 days after planting and one hand weeding in later stage
Irrigation	As per requirement
Plant protection	<i>Insect:</i> Mealybug (storage pest): harvested corm treatment (dip/spray) with cow dung slurry (2 kg cow dung in 1 L of water) or clay slurry (1 kg of clay in 1 L of water) or salt (NaCl) solution (1,000 ppm) or dimethoate (0.05 %) and methyl parathion (0.05 %) <i>Disease:</i> Phytophthora leaf blight: Spray (four times) the crop with Mancozeb (0.2 %) or Metalaxyl (0.05 %) twice a month starting from September (rainfed) or June (summer) Collar rot: Soil drenching with Captan (0.2%) and Ridomil MZ (0.2%)
Harvesting for fresh consumption	170-180 days after planting
Harvesting for seed corm	200-210 days after planting when the plants become yellow, wilt and dry
Expected yield of the variety per hectare	40-45 tonnes

it was released by the name of Swagata in the year 2021 for commercial cultivation. This variety falls under the medium maturity group for fresh consumption (170-180

days after planting). Average corm weight is 1706.12 g with a total yield of 44.84 t/ha which is 26.10 % higher than the national check Gajendra and 18.91 % superior



Propagation and planting technique of elephant foot yam

to the local check Chikhli Local. This variety is reported to have an appreciable amount of starch, dietary fibre, energy, protein, Vitamin A, Fe, Mn, Zn and Ca in its fresh weight basis. No acidity has been found (10.53 mg / 100 g Ca-oxalate) while consumption after cooking. It is field resistant to collar rot and has a very little incidence of Phytophthora blight. Corm shape is elliptical with brown epidermis. Flesh of corm is light orange in colour. Farmers of Gujarat appreciated this variety due to much higher productivity and very low disease incidence. Corm flesh

without acidity with attractive colour, smooth texture, good flavour, taste and softness make it more preferable.

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Potato: MP/09-45 has been identified for cultivation in the Northern, Central and Eastern plains of India. The clone has white cream ovoid tubers with shallow eyes and creamy flesh. The average yield of the clone is 35 t/ha and tuber dry-matter of 21%. The clone is medium maturing (90-100 days). It is suitable for processing into chips.

HT/11-3 is heat-tolerant variety with white cream peel, creamy pulp, oval and shallow eyes on tubers. The tuber productivity of the clone is 35 t/ha which was 18% higher than the present heat-tolerant variety Kufri Surya and 12% higher than Kufri Kiran. The clone is early medium to medium (85-90 days) maturing. It possesses 19% tuber dry-matter and has tolerance to mite and hopper burn, which are the primary insect-pests during early-season crops. It has been identified for Uttar Pradesh, Haryana, Punjab, Uttarakhand (early crop planting) Chhattisgarh, Gujarat, Rajasthan and Odisha (main crop planting). Therefore, this variety is recommended for potato production as the early crop in northern plains of India and as the main crop in central blainsh and plateau regions.

WS/07-113 has been identified as a climate resilient variety with field tolerance to less soil moisture stress and recommended for cultivation in Central and Eastern plains of India. It has white cream ovoid tubers with cream flesh. The productivity of this variety is 32 t/ha under water stress conditions. The clone is medium maturing (90-100 days).



Source: ICAR-Annual Report 2022-23