

COURSE CODE – HVSC 0502

ADVANCE PRODUCTION TECHNOLOGY OF ELEPHANT FOOT YAM



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Elephant Foot Yam

Scientific name: *Amorphophallus campanulatus* (Roxburg) Blume
(*Amorphophallus paeoniifolius*)

Common name: Suran, Zamikand, whitespot gaint aurm.

Family: Araceae

Chromosome number: $2n=2x=28$

Centre of origin: India and south east Asia

Mode of pollination: cross pollinated crop

Progenitor: *Amorphophallus paeoniifolius*

Edible part: corms (modified stem)

Edible species found in india: *A.companulatus*, *A.oncophyllus* (coco island, Andaman), *A. variabilis* (voodoo lily, Indonesia), *A.rievieri* (konjac/ konnyaku potato/devil's tongue, East South Asia)



Introduction

- Elephant foot yam is a profitable stem tuber crop and the name its self-derived from its huge, heavy solitary tubers that look like elephant foot.
- It is gaining its popularity as a cooked vegetable due to its shade tolerance, easiness in cultivation, high productivity, less incidence of pest and diseases, steady demand and reasonably good price.
- It is commercially grown as vegetable in India, Sri Lanka, China, Malaysia, Thailand, Indonesia, Philippines and in tropical parts of Africa.
- In India, it is cultivated throughout plains as well as its commercially cultivated in Bihar, West Bengal, Andhra Pradesh, Uttar Pradesh and Gujarat.

Nutritive value and medicinal uses:

- Its corms are mainly used for preparation of curries, Gulab jamuns, pickles and baked to uses in different ways.
- The petioles also used after boiling as like asparagus.
- Its tubers are cheapest source of carbohydrates (24% starch-18.4g), 1-5% protein(1.2g), 0.1g fat and rich in minerals and vitamins A 434 IU & B complex. leaves contains 2-3% protein 3% carbohydrates and 4-7% crude fibre.

- The starch can be extracted and made into soupy noodles.
- At higher molecular weight non ionic glucomannan also made from its flour.
- Glucomannan is a health product widely used in Asian countries and the USA for its unique functional peculiarity.
- Besides this it has variety of medicinal uses and widely prescribed by ayurvedic physicians.
- But Both tubers and leaves are quite acrid due to high content of oxalates.
- This acidity is normally removed by boiling for longer duration.
- Amorphophallus corms are good source of phytoestrogens and are excellent alternative to conventional hormonal replacement therapy for symptoms associated with menopause and chronic digestive diseases of women.
- It is also recommended for piles, dysentery, asthma, swelling of lungs, vomiting, abdominal pain and as a blood purifier. The paste made from corms are applied externally to minimize pain in arthritis.

Botany

- It is an annual or perennial herb with no persistent stem above the ground and have under ground storage organ known as corms.
- Plants are grown upto a height of about 1.0-1.25 m.
- Roots: it is a shallow and fibrous rooted crop.
- Leaves: large dissected tripartite leaves constitute the luxuriant outspreading crown-like foliage, borne on a fairly thick single upright “stem”.
- The aerial “pseudo stem” which is round with characteristic irregular blotches is botanically a leaf petiole.





Climatic requirements

- EFY is a warm season vegetable crop grown in both sub-tropical and tropical climate.
- It prefers humid and warm weather during vegetative growth with temperate of 25-35°C.
- Moderate temperature with humid weather promotes the corm development and dry climate favors tuber bulking.
- It develops best with an evenly distributed rainfall of 1000-1500 mm during the growing period.
- The difference between the maximum and minimum temperatures should not be wide during growth period.
- The crop can be successfully grown at a temperature range of 20-35 °C with optimum soil temperature of 22- 30°C.
- A minimum temperature of 22°C during day time and 19°C during night is optimum.
- The plant growth is reduced when temperature falls below 20°C.
- Partial shade of about 50-60% is known to promote tuber production

Soil requirements

- It requires well drained, friable, fertile, sandy loam soils.
- Heavy soils are not suited for its cultivation.
- The crop can also be grown in other type of soils including laterite to sandy clay loam soils by reclaiming the pits filled with well decomposed FYM and good sandy loam soils.
- The pH of soil should be near neutral (6.5-7.5).
- Soil should be rich in organic matter and micro nutrients.
- In heavy and waterlogged soils, the roots start rotting.
- Such soils can be amended by incorporating organic matter or compost.



Varieties

First genetically improved variety in the world: Sree Athira

Non-acrid varieties: Gajendra, Santhragachi, Kovuur

Acrid varieties: Sree Padma, Bidhan Kusum.

- **Sree Padma** - Non-acrid tubers, generally have one mother corm and a few cormels. Variety has developed at CTCRI, Trivandrum. It has a yield potential of 40 tonnes per hectare.
- **Sree Athira** - First genetically improved variety with very good cooking quality.
- **Bidhan Kusum** - This variety was developed by Vidhan ChandraKrishi Viswavidyalaya, West Bengal.
- **Palam Zimikand-1** -Released from C.S.K.H.P.K.V., Palampur.
- At the **Central Tuber Crops Research Institute (CTCRI)**, Trivandrum, there are 45 genetic stock of *Amorphophallus* and Am-6, Am-7, Am-8 and Am-16 were found promising.



Propagation

- Elephant foot yam is commercially propagated vegetatively by using either whole tuber(corm) or cut tubers.
- Whole tubers should be preferred over cut tubers to minimize rotting.
- Daughter corm or cormels adhere to mother corm can also be used as planting material but it is less profitable owing to lower yield.
- Corms of bigger size (2-3kg) are vertically cut into pieces in such a way that each piece contains a portion of central bud.
- **Whole tubers having 500-1000g weight used for cultivation to get higher yield.**
- **Corms weighing 400-500g are found to be optimum planting material for commercial crop.**
- However, corms or cormels weighing 250-300g are also used for planting at closer planting distance.
- The cut corms may fail to sprout due to dehydration at high temperature prevail during the planting and rotting occurs due to fungal and bacterial infections.
- These hazards can be avoided by planting whole seed corms, which may not only sprouts early but also produce higher corm yield as compared to cut seed corms of same weight.
- The top of the corm produce better sprout than the corms obtained from the basal portion.
- **Before planting whole corm/corm pieces are treated in thick slurry comprising of 0.2%mancozeb, 0.05% monochrotophos, Trichoderma formulation and cow dung.**
- **These treated corms are dried in shade for 4-6 hours before planting.**

Planting time, seed rate and method of planting

- The time of planting depends upon climate and soil.
- In most parts of India generally planted in March and April under irrigation facility.
- In south India, it can be planted any time between February –April.
- Corms planted in March –April sprouts faster and attains better plant vigor before June to allow a longer period for maximum bulking and higher corm production.
- Corms bulking is most rapid between June and August; high temperature coupled with high humidity is favourable for bulking.
- The seed rate varies from 5-7 tonnes/ha depending upon spacing and variety.
- Corms weighing 500g and planted at a distance of 90cm x 90cm, thus thereby require the seed corms of about 6t/ha;
- Corm weighing 250-300g and planted at 60cm x 60cm distance will requires the seed corms of about 7t/ha.

- The distance of pits depends on the size of planting material and variety used.
- Corms weighing 500g, 600g, 750g and 1kg should be planted in pits of 50cm x50cm, 60 cm x60 cm, 75cm x75cm and 90cm x90cm, respectively.
- Most growth parameters (LAI, CGR, NAR, dry matter accumulation and total dry matter production.) increase by planting corms at higher plant density (50-60cm spacing).
- Depth of the planting 10-12cm.
- Manure and fertilizer requirement:
- In general EFY requires a high doses of N and K. the absorption of nutrients usually high at 3rd month for N and 6th month for K and P.
- While K uptake is steady through out the crop growth.
- recommended dose 25 t FYM, 100-150 kg N, 75 kg P and 80-100kg K.
- Application times basal, 30 and 60-70 DAP(both N and K).

Irrigation and Interculture

- *Amorphophallus* is mainly grown as a rainfed crop. During periods of late receipt of monsoon, a light irrigation is given during early stages of crop.
- Mulching immediately after planting is the most important operation in *Amorphophallus*.
- When the crop approaches maturity, irrigation should be light.
- Generally, the crop requires 2-3 weeding before the onset of monsoon.
- Preplanting application of **Fluchloralin** @ 2.0 L per hectare can replace hand weeding.

Intercropping

- During the initial period of 2-3 months after planting, crops like leafy vegetables, green gram, black gram, cowpea, cucumber, etc; can be grown as an inter-crop.
- Intercropping of elephant foot yam in banana, coconut and other newly planted orchards gives additional income to farmers.



Elephant foot yam: A profitable crop for vegetable based multi-tier cropping system

Pointed gourd + Elephant foot yam + Cowpea/ bitter gourd

Selection of varieties:

Elephant foot yam:

Gajendra, Sree Padma, Kusum

Pointed gourd:

Rajendra Parwal-1, Rajendra Parwal-2

Bitter gourd:

Pusa Do Mausami, Pusa Vishesh

Cowpea:

Kashi Kanchan, Kashi Gauri, Arka Garima

Elephant foot yam based multi-layer vegetable cropping system



Sole crop of Elephant foot yam



Elephant foot yam + Bitter gourd



Elephant foot yam + Ridge gourd



Elephant foot yam + Bottle gourd

Harvesting

- The crop is harvested after 6-7 months from planting.
- Yellowing and drooping down of the leaves are the signs of maturity of the crop.
- The crop can be harvested earlier before full maturity for early market and higher price.
- The corms can be retained in the soil even after full maturity.
- It can be stored for several months in well-ventilated rooms without any damage.
- It is better to harvest the crop at right stage, as the rate of loss of moisture from the corms for the first 4 days is about 3-4% per day, the total extending to even 25% or more in the first month of storage.

Yield

The average corm yield ranges from 12 to 22 tonnes per hectare, depending on the weight of seed corm, soil type and nutrition applied.



Whole Seed Corm Production

- Inadequate supply of planting material is a major constraint in extending the cultivation of elephant foot yam.
- South Indian smooth type which is of good quality and commercially acceptable, does not produce daughter corms necessary for rapid multiplication (although plenty of daughter corms arise in local irritating type).
- The improved type is usually propagated by cutting large corms in small pieces for planting.
- The cut corms may fail to sprout due to dehydration at high temperature prevailing during the planting season and rotting caused by infection of fungus and bacteria.

Storage

- Harvested corms are cleaned and spread out under a shade cover for two days prior to storage, which helps in healing the injuries and bruises on the corm.
- The corms could be safely stored on racks in well-ventilated store house facilitating diffused light.
- If corms are to be stored for seed purpose, the cut corms should be immediately treated with Mancozeb (0.2%).
- If the storage is for planting purpose, the corms should be treated with Fenitrothion (0.05%)+ Mancozeb (0.2%).

Fungal Disease

Collar Rot/Foot Rot

- Causal organism - *Sclerotium rolfsii*
Rhizoctonia solani
- Symptoms - It appears when the plant is about 2-3 months old.
Collar region is attacked by the pathogen.
Water soaked lesions appear on the stem.
The whole plant soon turns yellow.
Stem shrinks and collapses due to rotting of the collar region.
- Causes - Heavy rains and high relative humidity
Heavy soils, high organic matter and poor drainage.
- Control- Crop rotation, removal of plant debris.
Improvement of drainage.
Apply biocontrol agents like *Trichoderma harzianum* @ 2.5 kg/ha mixed with 50kg of FYM.
Drenching soil with Captan (0.2%) or Brasicol (0.1%).



Viral disease

Mosaic

- Vector - Aphids (*Myzus persicae*, *Aphis gossypii*)

- Symptom - Mosaic mottling on the leaves.

Distortion of leaf lamina.

More proliferation of lateral buds.

Separation of buds from the mother corms.

Poor growth of roots.

Small corms are produced.



- Control - Since the crop is vegetatively propagated, corms from healthy plants should be used for seed purpose. Rouging of infected plants will help in minimising the secondary spread. Spraying of systemic insecticides to prevent secondary spread.

Insect-Pests

- Aphids
- Spider-mites
- Thrips
- Caterpillars
- Mealy bugs - Control - Use of pest-free seed corms. If mealy bug infestation is noted during storage of seed corms, dipping in 0.05% Monocrotophos should be done to check the pest in field.

CONCLUSION

Elephant foot yam is a profitable stem tuber crop and the name its self-derived from its huge, heavy solitary tubers that look like elephant foot.it is gaining its popularity as a cooked vegetable due to its shade tolerance, easiness in cultivation, high productivity, less incidence of pest and diseases, steady demand and reasonably good price.



REFERANCE

1. GOSWAMI S.B., SEN H., 1992- Growth and corm yield of elephant foot yam as affected by planting dates in West Bengal. – J. Root Crops, 18: 77-80.
2. IRAWATI, ARDITTI J., NYMAN L.P., 1986- In vitro propagation of the elephant yam, *Amorphophallus campanulatus* var. *hortensis* Backer (Araceae).- *Annales Botany*, 57(1): 11-17.
3. JAMES G.. NAIR G.M., 1993 Influence of spacing and seed corm size on yield and yield attributes of elephant foot yam.- J. Root Crops, 19: 57-59.
4. JAMES G.. NAIR G.M., SREEKUMARI M.T., 2004- Rapid multiplication of quality planting materials in tuber crops. CTCRI, Thiruvananthapuram, India. P. 36.
5. KABEERTHUMMA S., MOHANKUMAR B., NAIR P.G., 1987- Nutrient uptake and their utilization by yams aroids and coleus. –Central Tuber Crops Research Institute, Thiruvananthapuram. Kerala, India. Technical Bulletin No. 10.

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