

Advance Production Technology of Turmeric (*Curcuma longa* L.)

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Turmeric (*Curcuma longa* L.) is one of the most widely cultivated spice since from times of immemorial its uses dates back to 4000 years to Vedic culture in India where it is used as condiments in culinary. Turmeric is also known as the “golden spice” as well as the “spice of life”. It is still used as a symbol of well-being and widely used in ceremonies and religious functions. Turmeric is valued for its deep yellow colour (0.2-8% curcumin) pungency (2.2- 4.2% termerol) and aromatic flavor of volatile oil (1.5-5%). During Vedic period turmeric referred as “earthy herb of the Sun” with the orange-yellow rhizome it was regarded as the “scared spice”.

Medicinal and Therapeutic Uses

Turmeric has anti-inflammatory, hepatoprotective, antitumor, antiviral, wound-healing, and anti-cancerous characteristics that are the main reasons for its usage in Ayurvedic medicine. It also helps with respiratory and gastrointestinal issues. One of the most promising substances for treating Alzheimer's disease is curcumin and curcuminoids (6%). With its antioxidant capabilities, it has several beneficial qualities and can help with ulcers, inflammation, cancer, diabetes, allergies, and arthritis, among other illnesses. Additionally, it is used to treat digestive diseases, including distension and abdominal pain, as well as to lessen colic, jaundice, flatus, and menstruation troubles. Uses in cooking include oleoresin (a medication and dietary supplement) and powder and pastes (spice: as a standalone or in curry powder and pastes, food coloring).

Species

- *Curcuma longa*: Longa kinds are the cultivated variety.
- *Curcuma aromaticum*: Because of the volatile oil, the rhizomes have a nice, distinct aroma. commonly referred to as Kasthuri kinds.
- *Curcuma amada*: Also known as mango ginger, the rhizome has a smell similar to that of raw mangoes. Used to make pickles.

- *Curcuma zedoaria*: Camphor-scented, musk-like smell, sharply bitter taste.
- *Curcuma angustifolia*: Strach taken from rhizomes, known as Indian arrow root.

Soil

Many types of soils are appropriate, including alluvial, clay, and sandy loams. The best loamy soils are those that drain well. Alkalinity or water stagnation cannot be tolerated by turmeric.

Climate

Tropical crops need an environment that is warm and humid. range of 21°C to 28°C to 35°C. Growth stops when the temperature drops below 20°C. It grows best in areas with 225 cm of annual rainfall. It may be grown up to 1,200 meters above sea level.

Propagation

The primary obstacles to planting turmeric using the traditional approach are its high cost and limited availability of high-quality planting material. Rhizome development and sprouting take approximately five to six months.

Seed material

Mother rhizome or finger rhizome seed utilized for propagation.

Seed selection

Rhizomes from both mother and finger are employed. Each of the 4-5 cm long, 1-2 bud segments that make up the fingers are cut. Mother rhizomes can be planted whole or divided into two, with one sound bud on each. The usage of a mother rhizome weighing between 50 and 60 grams produced the highest biometric.

Protray techniques in turmeric

When choosing turmeric rhizomes to seed, choose robust ones. The chosen rhizomes should be treated for 30 minutes with mancozeb (0.3%) and quinalphos (0.075%), then stored in a location with good ventilation.

Cut the seed rhizomes into single buds one month prior to planting, using small pieces of rhizomes weighing five to seven grams.

Give the single bud sprouts (mancozeb 0.3%) a 30-minute treatment before planting.

Add PGPR/Trichoderma 10g/kg of combination to the nursery medium in the pro-trays (98 well), which contains partially decomposed coir pith and vermicompost (75:25).

Arrange the pro-trays with the turmeric bud sprouts. Uphold the pro-trays beneath the 50% shade net home. Use appropriate sprinklers or a rose can for need-based irrigation.

Within 30 to 35 days, seedlings will be prepared for transplantation.

Seed rate

Varies according to type of planting material, spacing and weight of rhizomes. Mother rhizomes: 2000-2500 kg/ha. Finger rhizomes: 1500-2000 kg/ha. As an intercrop in fruit garden: 400-500kg/ha.

Seed treatment

Mancozeb and Bavistin (1.5 and 2 g/lit) are applied to rhizomes by soaking them for 15 to 20 minutes in order to avoid illnesses and early rhizome flies.

Planting

Effect of planting techniques and spacing on turmeric development and yield when producing turmeric under the combined influence of a 60 x 20 cm ridge bed method.

Season of Planting

May to July is the best season of planting depending on tract. In Maharashtra, May is the best time of planting rhizomes. Karnataka and Tamil Nadu April-May sowing done.

Manures and fertilizers

For optimal growth and productivity, turmeric is an intensive crop that needs high soil fertility and applied nutrients. A nutrient dosage of 150: 60: 108 kg NPK per hectare has been suggested in Tamil Nadu. It has been suggested that split application of nutrients particularly nitrogen and potassium will increase quality and yield.

Irrigation

7-10 day interval of irrigation is given, depending on the moisture content of the soil. Over the course of the crop's life, a total of 20-25 irrigations are provided.

Harvesting and yield

The leaves begin to turn yellow and eventually the stem dries out, turmeric is collected. begins in February and lasts until April. After planting, rhizomes can be harvested in seven to nine months. Rhizome clusters underground are dug up using a pick axe or digging fork during the harvesting process. Mother rhizomes are split off from fingers.

Yield

250-300 q/ha for fresh rhizomes. In Maharashtra the average yield is 225 q/ha. and cured produce 20-25 % of fresh rhizome.

Plant protection

Diseases Rhizome rot and root rot (*Pythium aphanidermatum*) and Leaf blotch (*Taphrina maculans*)

Copper oxychloride (97.36%), Chlorothalonil (76.16%) and Mancozeb (70.62%) were the fungicides that considerably reduced mycelial growth, hence reducing *Pythium aphanidermatum* infestation which can result in yield losses of up to 30-89%.

Insect pest

Shoot borer (*Conogethes puctiferalis*) Rhizome scale (*Aspidiotus hartii*) and Nematodes (*Meloidogyne* spp)

Treatment T6- Neem cake + *Paecilomyces lilacinus*(3.75g/3kg soil) performed better.

Processing

Cleaning and Drying

Extrinsic quality could not be attained by traditional processing, but intrinsic quality could be preserved to some extent. The solar tunnel drying technique is a good substitute for open-air drying, which requires less drying time but retains a higher percentage of volatile oil (4.74%) and oleoresin (12.4%) than curcumin (5.83%). The quantitative research revealed that whereas solar biomass drying took only 1.5 days and generated higher-quality output, traditional drying, or open sun drying, had taken 11 days to dry the rhizomes.

Curing

Fresh rhizomes must be cleaned, boiled in water, and then dried in the sun. The turmeric was boiled for 40, 60, and 90 minutes, and it took 11 days for it to completely dry. The rhizomes that were boiled for 40 minutes yielded the highest percentage of curcumin (5.91%) and essential oil (3.6%). The drying process for turmeric rhizomes that were steam-cooked for 30, 45, and 60 minutes required 24, 23, and 12 days.

Polishing

The outer surface of dried rhizomes is polished and smoothed by hand or machine rubbing. There is use of polishing drum rotations.

Colouring

Turmeric powder is applied to half-polished, boiled rhizomes to give them a nice appearance. Carbonate of sodium (0.05–0.1%) Lime and 20 grams of sodium bisulphite are used to intensify the color.

Grading

Fingers

The average finger length is 2.5 to 7.5 cm, with a possible diameter of more than 1 cm.

Bulbs

Oval in shape, wider in diameter than fingers, and shorter in length than fingers, these are the core "mother" rhizomes.

Splits

To aid in curing and subsequent drying, splits are bulbs that have been divided into halves or quarters.

Turmeric powder

Including Madras, Lakhdong, and Allepy varieties.

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