

Turmeric

Turmeric is the dried rhizome of *Curcuma longa*, a herbaceous perennial plant with a thick underground rhizome giving rise to primary and secondary rhizomes called **fingers**, native to tropical South East Asia. The rhizome has 1.8 to 5.4 per cent **curcumin**, the pigment and 2.5 to 7.2 per cent of essential oil. It is used as an important condiment and as a dye with varied application in drug and cosmetic industries.

Botany and taxonomy

Family: Zingiberaceae

Genus: *Curcuma*

Species: *longa*

Botanical Name: ***Curcuma longa* Lin.**

Ch. No. $2n=3x=63$

Origin: South East Asia or India

Botanical Features

Habit: Plant is herbaceous perennial with a thick under ground rhizome.

Root

It is herbaceous perennial but being grown as annual crop with a thick under ground rhizome giving rise to primary and secondary rhizomes called fingers.

Stem Modified under ground stem i.e. rhizomatous.

Leaf Leaves are borne in a tuft and are about 60 cm long, broadly lanceolate, acceminate with a long leaf stalk.

Inflorescence Flowers scanty, borne on a separate peduncle arising directly from the rhizome.

Flower Flowers white with pinkish splash on the apex, zygomorphic, bisexual, bracteates and epigynous nature.

Fruit Capsule

Seed Arillate.

Varieties

CO1 (X-ray induced mutant from Erode Local), BSR 1 (X-ray induced mutant from Erode Local), BSR 2, Suguna, Suvarna, Sudharshana, Krishna, Sugandham, Roma, Suroma, Rajendra Sonia, Ranga, Rashmi, Allepy finger turmeric (AFT), IISR Prabha, IISR Prathiba, IISR Alleppey Supreme and IISR Kedaram.

Soil and climate

Turmeric is grown under diverse tropical conditions from sea level to 1500 m in the hills, at a temperature range of 20-30°C with a rainfall of 1500 to 2250 mm per annum. It is grown in different type of soils from light black, sandy loam and red soils to clay loams, but thrives in best a well drained sandy loam soil rich in humus content. It can be grown It is also grown as an irrigated crop.

Preparation of land

The land is ploughed four times deeply. Weeds, stubbles, roots etc. are removed. Immediately after the receipt of pre-monsoon showers, beds of 1 to 1.5m width, 15cm height and of convenient length are prepared. Planting is also done by forming ridges and furrows.

Spacing

40 to 50cm x 25cm.

Planting time (Season)

May-June is suitable. Since turmeric is a shade loving plant, castor or *Sesbania grandiflora* may raised along with the border lines in the field.

Propagation

Mother rhizome & finger rhizomes are used for planting. 25-30 g weight rhizomes are to be dibbled at a depth of 4 cm. Seed rate of finger rhizome – 2500 kg/ha.

Seed Treatment

- Seed rhizomes treated with 0.3% Copper oxychloride for 30 min or
- Seed treatment with *P. fluorescens* 10 g/kg and *T. viride* as 4 g/Kg.

Manures and manuring

Basal: FYM - 25 t /ha, neem or groundnut cake - 200 kg/ha, 25:60:60 kg of NPK per ha; 30 kg of FeSO₄ and 15 kg of ZnSO₄, 10 kg in each of Azospirillum and Phosphobacteria per ha to be applied at the time of planting.

Top dressing: 25: 60 kg of N and K/ha applied on 30, 60, 90 and 120 days after planting. Beds are earthed up each time after top dressing.

Mulching

The crop is mulched immediately after planting with green leaves or banana pseudostem or sugarcane trash at the rate of 12 to 15 tonnes per hectare.

After cultivation and growing as intercrop

Weeding may be done thrice at 60, 120 and 150 days after planting depending upon weed density. It can be grown as an intercrop in coconut and arecanut plantations. It can also be raised as a mixed crop with chillies, colocasia, onion, brinjal and cereals like maize, ragi etc. in some places, double inter cropping viz., Fenugreek + Onion in turmeric field is followed. Depending on soil types, irrigated crops require 15 to 20 irrigations in heavy soils and 35 to 40 in light soils.

Harvesting

Depending upon the variety, the crop becomes ready for harvest in seven to nine months. Usually, it extends from January-March. The plants will start lodging, yellowing and drying on crop maturity. The rhizomes are dug with spade or digging forks.

Yield

Fresh rhizomes : 25-30 t/ha

Cured rhizomes : 5-6 t/ha

Storage of seed rhizomes

Seed rhizomes can be stored after heaping under the shade of a tree or in well ventilated shed and covered with turmeric leaves.

Plant protection

Pre planting treatment

The seed rhizomes are dipped in Carbendazim 1 g/lit and Phosalone 35 EC 2 ml/lit for controlling rhizome rot and scales.

Pests

Thrips

Thrips can be controlled by spraying Dimethoate 30 EC or Methyl demeton 25 EC 2 ml/litre.

Rhizome scale

Rhizome scale can be controlled by applying well rotten sheep manure @ 10 t/ha in two splits (once basally and other at earthing up) or Poultry manure in 2 splits followed by drenching Dimethoate 30 EC 2 ml/lit or Phosalone 35 EC 2 ml/lit.

Nematode

Avoid planting turmeric after Banana or other solanaceous vegetables. Plant only after taking suitable control measures. Apply Carbofuran 4 kg a.i./ha twice on the third and fifth month after planting the rhizomes.

Diseases

Rhizome rot

- Treat the seed rhizomes with 0.3% Copper oxychloride for 30 min or Drench with Bordeaux mixture 1 % or Copper oxychloride 0.25 % or Ridomil 0.1 % or
- Seed treatment with *P. fluorescens* 10 g/kg and *T. viride* 4 g/ Kg and soil application of 2.5 Kg/ha each of *P. fluorescens* and *T. viride* in 50 kg of FYM as basal and top dressing on 150 Days after planting.

Leaf spot

Leaf spot can be controlled by spraying Carbendazim 500 g/ha or Mancozeb 1 kg/ha or Copper oxychloride 1.25 kg/ha.

Leaf blotch

Leaf spot controlled by spraying Carbendazim 500 g/ ha or Mancozeb 1kg/ha or Copper oxychloride 1.25 kg/ha. Mix sticker solution @ 5ml / 10 litre of spray solution.

Processing and curing:

Fresh rhizomes are not useful for marketing. Curing makes fresh rhizomes marketable. Curing involves boiling, drying and polishing.

A. Boiling: is done either by traditional or improved method.

I. Traditional method: Water is poured to cover rhizomes in the vessels of copper or galvanized iron or earthen material. Mother rhizomes and fingers should be boiled separately, since fingers take long time for boiling. Stop boiling when froth, fumes with typical odour comes. Rhizomes yield to finger pressure. Over cooking should be avoided as it spoils the colour, while under cooking renders the dried product brittle.

II. Improved method:

A. Boiling: 50 kg of cleaned rhizomes are taken in a perforated trough made of GI sheet. It is immersed in a pan. Alkaline solution 0.1% sodium carbonate/ sodium bicarbonate are poured in the trough. Boil till fingers become soft. Alkaline solution helps in imparting orange yellow colour to the core.

B. Drying: The boiled rhizomes are sun dried in 5.7 cm thick layers for 10 – 15 days. Rake

frequently for uniform drying. Dry until they become hard, brittle, break with a metallic sound. After drying they should possess only 8 – 10 % moisture.

C. Polishing: The dried rhizomes are smoothed by manual or mechanical rubbing.

Manually they rubbed on hard surface or trampled under feet. Mechanically they are polished by mechanically operated polishing drums.

D. Colouring: They are coloured to improve the appearance. Rhizomes are artificially coloured in two way *i.e.* dry and wet colouring. Half polished fingers are coloured. In dry process– turmeric powder is added in the last 10 min to polishing drum. In wet process– turmeric powder is suspended in water and mixed by sprinkling. For brighter colour– boiled, dried and half polished fingers are taken in baskets and shaken continuously with an emulsion of

2 kg turmeric powder,
0.04 kg alum,
0.14 kg castor seed oil,
30 g of sodium bisulphate and
30 ml HCl.

Coloured rhizomes are again sun dried before sending to market.

Ginger (*Zingiber officinale* L.)

Zingiberaceae

Ginger, an indigenous plant as is an important spice crop of the world. It is herbaceous perennial with underground rhizomes. It is valued in medicinal as a carminative and stimulant of the gastro-intestinal tract. Dry ginger is used for the manufacture of oil, oleoresin, soft drink, non-alcoholic beverage and vitaminised effervescent soft drinks.

Varieties

Rio de Janeiro, Maran Nadan, Suruchi, Suprabha, Surari (X-ray induced mutant of local cultivar), Himagiri, IISR Varada, IISR Mahima and IISR Rejatha Athira and Karthika are the popular varieties.

Soil and climate

A friable well drained loamy soil rich in humus with warm and humid conditions with 150 cm of annual rainfall are preferable. This crop is cultivated in the tropics from sea level to an altitude of 1500 metres, both under rainfed and irrigated conditions. Dry weather with a temperature of 28 to 35°C for about a month before harvesting is necessary.

Preparation of land

Preparation of land starts with receipt of early summer showers. The land is to be ploughed 4 to 5 times deeply. Weeds, stubbles, roots etc. are removed. Beds of about one meter width, 15cm height and of any convenient length are prepared. Planting is also done by forming ridges and furrows.

Spacing

Irrigated crop- 40-50 x 20 cm in ridges and furrows. Rainfed crop – Raised beds of 20 x 20 cm or 25x 25 cm

Planting time (Season)

May - June is highly suitable for cultivation.

Propagation

Ginger is always propagated by portions of the rhizomes, known as **seed rhizomes**. Carefully preserved seed rhizomes are cut into small pieces of 2.5-5.0cm length weighing 20-25g, each having one or two good buds. The seed rate 1500 - 1800 kg of rhizome/ha is required.

Seed treatment:

Treat the seed rhizomes with Mancozeb or Copper oxychloride 3 g/lit or 200 ppm Streptocycline for 30 minute.

Manures and Manuring

Basal: FYM 25-30 t + 30 tonnes green leaves as mulch in three splits : 15 tonnes- immediately after planting, 7.5 tonnes – 60 days and 120 days after planting, 50: 25 kg of P and K per ha.

Top dressing: 37.5: 12.5 kg of N and K per ha applied on 45th and 90th day after planting

Aftercultivation

Weeding is done before fertilizer application and mulching. Two to three weeding are required depending on the intensity of weed growth. Mulching is done at the time of planting with green leaves. After each top dressing, earth up the plants.

Harvesting

Harvesting is done from 6th month onwards for marketing the produce as green ginger. For preparing the dry ginger, the crop can be harvested after 8 - 9 months (between 245 to 260 days) when leaves start yellowing and drying.

Yield

About 15 - 25 t/ha

Plant protection

Pests

Shoot borer

Shoot borer can be controlled by spraying Dimethoate 30 EC 2 ml/lit or Phosphamidon 86 WSC 1 ml/lit.

Leaf roller

Leaf roller can be controlled by spraying Carbaryl 50 WP 2 g/ha or Quinalphos 25 EC 2 ml/lit.

Rhizome scale

Rhizome scale can be controlled by applying well rotten sheep manure @ 10 t/ha in two splits (once basally and other at earthing up) or Poultry manure in 2 splits followed by drenching Dimethoate 30 EC 2 ml/lit or Phosalone 35 EC 2 ml/lit.

Diseases

Soft rot (*Pythium* sp.)

- Provide adequate drainage facilities
- Select healthy and disease-free seed rhizomes
- Treat the seed rhizomes with Mancozeb or Copper oxychloride 3 g/lit or 200 ppm Streptocycline for 30 minutes.
- In the field, drench the beds with 2.5 g/lit of Copper oxychloride or 1% Bordeaux mixture or Metalaxyl - mancozeb 4 g/lit.

Rhizome rot

Rhizome treatment with *Pseudomonas fluorescens* @ 20g/kg rhizome + soil application, @ 10kg/ha immediately after planting and 45 days after planting followed by pre monsoon drenching with Metalaxyl 0.1%.

Leaf spot

Leaf spot can be controlled by spraying 1 % Bordeaux mixture or Copper oxychloride 0.25%.

Processing and curing:

I. Dry Ginger: Preparation of commercial dry zinger involves a series of steps. Fully

developed rhizomes are harvested after 8 months of planting for preparation of Dry Ginger.

1. Soaking in water: The rhizomes are soaked overnight in cement tubs for easy removal of skin.
2. Trampling: The rhizomes are trampled under feet in the tub. Avoid damage to epidermal cells containing flavouring oil.
3. Peeling: The skin is peeled off, with sharp bamboo knives. Don't rupture epidermal cells. This step hastens drying process.

4. **Washing and Drying:** The peeled rhizomes are washed and sun dried for 3-4 days on cement floors.
 5. **Polishing:** After drying, the rhizomes are polished by rubbing with a coarse cloth to remove all bits of skin or dirt. These are called unbleached ginger. To get bleached Ginger, peeled rhizomes are soaked in 2% lime water for 6 hours, fumigated with sulphur for 12 hours. Yield of dry Ginger is 16 to 25% of the fresh Ginger.
- II. Preserved Ginger:** Ginger is harvested at 7 months after planted for preparing the preserved Ginger. It is preserved in syrup or brine.