



Turmeric



INDIAN INSTITUTE of SPICES RESEARCH

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Turmeric (Extension Pamphlet)

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Turmeric (*Curcuma longa*) (Family: Zingiberaceae) is used as condiment, dye, drug and cosmetic in addition to its use in religious ceremonies. India is a leading producer and exporter of turmeric in the world. The major turmeric producing states in India are Andhra Pradesh, Tamil Nadu and Orissa. During 2001-2002, the country produced 5, 52,300 tonnes of turmeric from an area of 1, 62,950 ha.

Climate and soil

Turmeric can be grown in diverse tropical conditions from sea level to 1500 m above sea level, at a temperature range of 20-30°C with an annual rainfall of 1500 mm or more, under rainfed or irrigated conditions. Though it can be grown on different types of soils, it thrives best in well-drained sandy or clay loam soils.

Varieties

A number of cultivars are available in the country and are known mostly by the name of locality where they are cultivated. Some of the popular cultivars are Duggirala, Tekkurpet, Sugandham, Amalapuram, Erode local, Alleppey, Moovattupuzha, and Lakadong. The improved varieties of turmeric and their salient features are given in Table 1.

Cultivation

Preparation of land

The land is prepared with the receipt of early monsoon showers. The soil is brought to a fine tilth by giving about four deep ploughings. Hydrated lime @ 400 kg/ha has to be applied for laterite soils and thoroughly ploughed. Immediately with the receipt of pre-monsoon showers, beds of 1.0-1.5 m width, 15 cm height and of convenient length are prepared with spacing of 50 cm between beds. Planting is also done by forming ridges and furrows.

Planting

In Kerala and other West Coast areas where the rainfall begins early, the crop can be planted during April-May with the receipt of pre-monsoon showers.

Table 1. Characteristics of improved turmeric varieties

Sl. No.	Variety	Mean yield (fresh) (t/ha)	Crop duration (days)	Dry recovery (%)	Curcumin (%)	Oleoresin (%)	Essential oil (%)
1.	Suvarna	17.4	200	20.0	4.3	13.5	7.0
2.	Suguna	29.3	190	12.0	7.3	13.5	6.0
3.	Sudarsana	28.8	190	12.0	5.3	15.0	7.0
4.	IISR Prabha	37.5	195	19.5	6.5	15.0	6.5
5.	IISR Prathibha	39.1	188	18.5	6.2	16.2	6.2
6.	Co-1	30.0	285	19.5	3.2	6.7	3.2
7.	BSR-1	30.7	285	20.5	4.2	4.0	3.7
8.	Krishna	9.2	240	16.4	2.8	3.8	2.0
9.	Sugandham	15.0	210	23.3	3.1	11.0	2.7
10.	Roma	20.7	250	31.0	9.3	13.2	4.2
11.	Suroma	20.0	255	26.0	9.3	13.1	4.4
12.	Ranga	29.0	250	24.8	6.3	13.5	4.4
13.	Rasmi	31.3	240	23.0	6.4	13.4	4.4
14.	Rajendra Sonia	42.0	225	18.0	8.4	-	5.0
15.	IISR Alleppey Supreme	35.4	210	19.3	6.0	16.0	-
16.	IISR Kedaram	34.5	210	18.9	5.5	13.6	-

Source of planting material

Sl. nos. 1, 2, 3, 4, 5, 15 & 16 : IISR Experimental Farm, Peruvannmuzhi - 673 528, Kozhikode District, Kerala.

Sl. nos. 6 and 7 : Department of Spices and Plantation Crops, Faculty of Horticulture, Tamil Nadu Agricultural University, Coimbatore-641 003, Tamil Nadu.

Sl. no. 8 : Maharashtra Agricultural University, Kasba Digraj -416 305, Maharashtra.

Sl. no. 9 : Spices Research Station, Gujarat Agricultural University, Jagudan-382 701, Gujarat.

Sl. nos. 10, 11, 12 & 13 : High Altitude Research Station, Orissa University of Agriculture and Technology, Pottangi - 764 039, Orissa.

Sl. no. 14 : Department of Horticulture, Tirhut College of Agriculture, Rajendra Agricultural University, Dholi-843 121, Bihar.

Seed material

Whole or split mother rhizomes are used for planting and well developed healthy and disease free rhizomes are to be selected. Small pits are made with a hand hoe in the beds in rows with a spacing of 25 cm x 30 cm and covered with soil or dry powdered cattle manure. The optimum spacing in furrows and ridges is between 45-60 cm between the rows and 25 cm between the plants. A seed rate of 2,500 kg of rhizomes is required for planting one hectare of turmeric.

Manuring and fertilizer application

Farm yard manure (FYM) or compost @ 40 tonnes/ha is applied by broadcasting and ploughing at the time of preparation of land or as basal dressing by spreading over the beds to cover the seed after planting. Fertilizers @ 60 kg N, 50 kg P_2O_5 and 120 kg K_2O per hectare are to be applied in split doses as given in Table 2. Zinc @ 5 kg/ha may also be applied at the time of planting and organic manures like oil cakes can also be applied @ 2 tonnes/ha. In such case, the dosage of FYM can be reduced.

Table 2. Fertilizer schedule for turmeric (per ha)

Schedule	N	P_2O_5	K_2O	Compost/cowdung
Basal application	-	50 kg	60 kg	40 tonnes
After 40 days	30 kg	-	-	-
After 90 days	30 kg	-	60 kg	-

Mulching

The crop is to be mulched immediately after planting with green leaves @ 12-15 tonnes/ha. Mulching may be repeated for a second time after 45 days with the same quantity of green leaves after weeding and application of fertilizers.

Weeding and irrigation

Weeding has to be done thrice at 60, 120 and 150 days after planting depending upon weed intensity. In the case of irrigated crop, depending upon the weather and the soil conditions, about

15 to 23 irrigations are to be given in clayey soils and 40 irrigations in sandy loams.

Mixed cropping

Turmeric 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.

Plant protection

Diseases

Leaf blotch

Leaf blotch is caused by *Taphrina maculans* and appears as small, oval, rectangular or irregular brown spots on either side of the leaves which soon become dirty yellow or dark brown. The leaves also turn yellow. In severe cases the plants present a scorched appearance and the rhizome yield is reduced. The disease can be controlled by spraying mancozeb 0.2%.

Leaf spot

Leaf spot is caused by *Colletotrichum capsici* and appears as brown spots of various sizes on the upper surface of the young leaves. The spots are irregular in shape and white or grey in the centre. Later, two or more spots may coalesce and form an irregular patch covering almost the whole leaf. The affected leaves eventually dry up. The rhizomes do not develop well. The disease can be controlled by spraying zineb 0.3% or Bordeaux mixture 1%.

Rhizome rot

The disease is caused by *Pythium graminicolum*. The collar region of the pseudo stem becomes soft and water soaked, resulting in collapse of the plant and decay of rhizomes. Treating the seed rhizomes with mancozeb 0.3% for 30 minutes prior to storage and at the time of sowing prevents the disease. When the disease is noticed in the field, the beds should be drenched with mancozeb 0.3%.

Nematode pests

Root knot nematodes (*Meloidogyne* spp.) and burrowing nematode (*Radopholus similis*) are the two important nematodes causing damage to turmeric. Root lesion nematodes (*Pratylenchus* spp.) are of common occurrence in Andhra Pradesh. Wherever nematode problems are common, use only healthy, nematode-free planting material. Increasing the organic content of the soil also checks the multiplication of nematodes.

Insect pests

Shoot borer

The shoot borer (*Conogethes punctiferalis*) is the most serious pest of turmeric. The larvae bore into pseudo stems and feed on internal tissues. The presence of a bore-hole on the pseudo stem through which frass is extruded and the withered central shoot is a characteristic symptom of pest infestation. The adult is a medium sized moth with a wingspan of about 20 mm; the wings are orange-yellow with minute black spots. Fully-grown larvae are light brown with sparse hairs. Spraying malathion 0.1% or monocrotophos 0.075% at 21 day intervals during July to October is effective in controlling the pest infestation. The spraying has to be initiated when the first symptom of pest attack is seen on the inner most leaf.

Rhizome scale

The rhizome scale (*Aspidiella harti*) infests rhizomes in the field (at later stages of the crop) and in storage. Adult (female) scales are circular (about 1mm diameter) and light brown to grey and appear as encrustations on the rhizomes. They feed on sap and when the rhizomes are severely infested, they become shrivelled and desiccated affecting its germination. Treat seed material with quinalphos 0.075% (for 20-30 minutes) before storage and also before sowing in case the infestation persists. Discard and do not store severely infested rhizomes.

Minor pests

Adults and larvae of leaf feeding beetles such as *Lema* spp. feed

on leaves especially during the monsoon season and form elongated parallel feeding marks on them. The spraying of malathion 0.1% undertaken for the management of shoot borer is sufficient to manage this pest.

The lacewing bug (*Stephanitis typicus*) infests the foliage causing them to turn pale and dry up. The pest infestation is more common during the post monsoon period especially in drier regions of the country. Spraying dimethoate (0.05%) is effective in managing the pest.

The turmeric thrips (*Panchaetothrips indicus*) infests the leaves causing them to roll, turn pale and gradually dry up. The pest infestation is more common during the post monsoon period especially in drier regions of the country. Spraying dimethoate 0.05%, is effective for the management of the pest.

Harvesting

Depending upon the variety, the crop becomes ready for harvest in 7-9 months after planting during January-March. Early varieties mature in 7-8 months, medium varieties in 8-9 months and late varieties after 9 months.

The land is ploughed and the rhizomes are gathered by hand picking or the clumps are carefully lifted with a spade. The harvested rhizomes are cleared of mud and other extraneous matter adhering to them.

Processing

Curing

Fresh turmeric is cured for obtaining dry turmeric. The fingers are separated from mother rhizomes. Mother rhizomes are usually kept as seed material. Curing involves boiling of fresh rhizomes in water and drying in the sun.

In the traditional method of curing, the cleaned rhizomes are boiled in water just enough to immerse them. Boiling is stopped when froth comes out and white fumes appear giving out a typical odour. The boiling should last for 45-60 minutes when the rhizomes

turn soft. The stage at which boiling is stopped largely influences the colour and aroma of the final product. Over cooking spoils the colour of the final product while under-cooking renders the dried product brittle.

In the improved scientific method of curing, the cleaned fingers (approximately 50 kg) are taken in a perforated trough of 0.9 m x 0.5 m x 0.4 m size made of GI or MS sheet with extended parallel handle. The perforated trough containing the fingers are then immersed in a pan; 100 litres of water is poured into the trough so as to immerse the turmeric fingers. The whole mass is boiled till the fingers become soft. The cooked fingers are taken out of the pan by lifting the trough and draining the water into the pan. The water used for boiling turmeric rhizomes can be used for curing fresh samples. The processing of turmeric is to be done 2 or 3 days after harvesting. If there is delay in processing, the rhizomes should be stored under shade or covered with sawdust or coir dust.

Drying

The cooked fingers are dried in the sun by spreading them in 5-7 cm thick layers on bamboo mats or drying floor. A thinner layer is not desirable, as the colour of the dried product may be adversely affected. During night time, the rhizomes should be heaped or covered with material which provides aeration. It may take 10-15 days for the rhizomes to become completely dry. Artificial drying, using cross-flow hot air at a maximum temperature of 60°C also gives a satisfactory product. In the case of sliced turmeric, artificial drying has clear advantages in giving a brighter coloured product than sun drying which tends to undergo surface bleaching. The yield of the dry product varies from 10-30% depending upon the variety and the location where the crop is grown.

Polishing

Dried turmeric has a poor appearance and a rough dull outer surface with scales and root bits. The appearance is improved by smoothening and polishing the outer surface by manual or mechanical rubbing.

Manual polishing consists of rubbing the dried turmeric fingers on a hard surface. The improved method is by using a hand operated barrel or drum mounted on a central axis, the sides of which are made of expanded metal mesh. When the drum filled with turmeric is rotated, polishing is effected by abrasion of the surface against the mesh as well as by mutual rubbing against each other as they roll inside the drum. Turmeric is also polished in power operated drums. The yield of polished turmeric from the raw material varies from 15-25%.

Colouring

The colour of the processed turmeric influences the price of the produce. For an attractive product, turmeric powder (mixed with little water) may be sprinkled during the last phase of polishing.

Preservation of seed rhizomes

Rhizomes for seed purpose are generally stored by heaping in well ventilated rooms and covered with turmeric leaves. The seed rhizomes can also be stored in pits with saw dust, sand, leaves of *Glycosmis pentaphylla* (panal), *Stychnos nux-vomica* (kanjiram) etc. The pits are to be covered with wooden planks with one or two openings for aeration. The rhizomes are to be dipped in quinalphos (0.075%) solution for 15 minutes if scale infestations are observed and in mancozeb (0.3%) to avoid storage losses due to fungi.



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