

Processing Methods for Turmeric (*Curcuma longa* L.) Under the Tamil Nadu Conditions

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SUMMARY

The rhizomes, when dried and ground provide a yellow and flavorful powder that has been used for centuries as a natural coloring agent in food, cosmetics, textiles, and flavoring compounds. It is also used as an insect repellent in Indian medicine. India is one of the leading countries in the production of raw turmeric, accounting for 76% of the world's production. However, there is a need to develop processing technology in order to obtain products of added value and good quality. Hence, precautions have to be taken from the harvesting through the primary processing, which includes boiling, drying, polishing, coloring, 400-grading, and packaging, in order to meet the standards. The improvements in postharvest processing, mechanization and value addition in turmeric are needed for good-quality produce that meets international standards.

INTRODUCTION

Turmeric (*Curcuma longa* L.) belongs to the family Zingiberaceae. It is used as a condiment, dye, drug, and cosmetic in addition to its use in religious ceremonies. India is the largest producer, exporter, and consumer of turmeric in the world, using more than 90% of the total production domestically and only exporting the rest (about 8% of total production). India is a leading state, such as Andhra Pradesh, Tamil Nadu, Orissa, Karnataka, West Bengal, Gujarat, Meghalaya, Maharashtra, and Assam, which are some of the important states that cultivate turmeric, of which Tamil Nadu alone occupies 24.14 percent of the area and 33.37 percent of the production (Anonymous, 2022). Major turmeric-growing districts are Erode, Coimbatore, Salem, and Dharmapuri. Erode turmeric is known for its high curcumin content, which is a natural food coloring agent as approved by the WHO. Erode turmeric has about 90 percent curcumin content, for which it is most sought after. It is also known for its high medicinal value. It is an important spice used for day-to-day cooking throughout the world. India is one of the leading countries in the production of raw turmeric and other subproducts related to turmeric. It is one kind of herb that has been widely regarded in modern and traditional medicine. Its appearance is dark yellow, and it has a unique smell. It is reported to possess numerous medicinal properties, including antioxidant, anti-protozoal, anti-tumor, anti-inflammatory, and antivenom activity (Kanjana *et al.*, 2016). The main component of turmeric used in the pharmaceutical industry is curcuminoids, consisting of curcumin, demethoxycurcumin, and bisdemethoxycurcumin (Wakte *et al.*, 2011). Turmeric is used as a condiment, dye, and drug in addition to its use in cosmetic preparations. Turmeric is the major spice for which the most products have been patented. Another factor that could influence the demand for turmeric is its increasing use as a food color, since synthetic colors are falling out of favor in many countries. A number of high-value products made from turmeric are now being traded on the international market. The various products are turmeric powder, turmeric oil, turmeric oleoresin, curcumin, and encapsulated flavor (Sasikumar, 2015). The fame of turmeric is due to its color and flavor. In its fresh state, the rootstock has an aromatic and spicy fragrance, which, by drying, gives way to a more medicinal aroma. Like many other spices, turmeric is a storehouse of phytochemicals, some of which have unique properties. Volatile oil and oleoresin are predominant in turmeric and are composed of chemically active principles (Sadasivam and Manickam 2008). Scientific post-harvest methods have paramount importance to retain the quality. Post-harvest operations generally start with harvesting itself. Cleaning, cooking, curing, polishing, coloring, and grading are the next steps under post-harvest technology.

Processing of turmeric

The following involves steps for three in Tamil Nadu

Processing of raw turmeric rhizomes is important to get an end product with good colour and appearance.

- Curing
- Polishing
- Colouring.

Curing

Fingers are separated from mother rhizomes and are usually kept as seed material. The fresh turmeric is cured before marketing. Curing involves boiling fresh rhizomes in water and drying them in the sun.



Traditional method:

The cleaned rhizomes are boiled in copper, galvanized iron, or earthen vessels with just enough water to soak them. In certain places, cow dung slurry is used as a boiling medium. From a hygienic point of view, such rhizomes fetch a poor market value. Boiling is stopped when froth comes out and white fumes appear, giving off a typical odor. The boiling lasts for 45 to 60 minutes when the rhizomes are soft. Overcooking spoils the color of the final product. The dried product becomes brittle while cooking.



Boiling of rhizomes

Improved scientific method:

In this method of curing, the cleaned fingers (approximately 50 kg) are placed in a perforated trough of size 0.9×0.55×0.4 m, made of GI or MS sheet with an extended parallel handle. The perforated trough containing the fingers is then immersed in the pan. The alkaline solution (0.1% sodium carbonate or sodium bicarbonate) is poured into the trough so as to immerse the turmeric fingers. The wholesome is boiled until the fingers become soft. The cooked fingers are taken out of the pan by lifting the trough and draining the solution into the pan. The alkalinity of the boiling water helps impart an orange-yellow tinge to the core of turmeric. The drained solution in the pan can also be used for boiling another lot of turmeric along with the fresh solution prepared for the purpose.

The cooking of turmeric is to be done within two or three days after harvesting. The mother rhizomes and the fingers are generally cured separately.



Steam boiling of turmeric in TNAU designed boiler

Drying: The cooked fingers are dried in the sun by spreading 5 to 7 cm-thick layers on a bamboo mat or drying floor. A thinner layer is not desirable, as the color of the dried product may be adversely affected. During the night, the materials should be heaped or covered. It may take 10 to 15 days for the rhizomes to become completely dry. The yield of the dry product varies from 20 to 30 percent depending upon the location where the crop is grown.



Sun dried by spreading 5 to 7 cm-thick layers

Heaped or covered

Polishing

Dried turmeric has a poor appearance and a rough, dull outer surface with scales and root bits. The appearance is improved by smoothing and polishing the outer surface using two methods: manual and mechanical rubbing.

Manual polishing: It consists of rubbing the dried turmeric fingers on a hard surface or trampling them under feet, wrapped in gunny bags. There two methods of manual polishing.



Hand-operated polishing method



Paddle-operated polishing method

Improved method:

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 at 30 rpm, 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. The turmeric is also polished on power-operated drums. The yield of polished turmeric from the raw materials varies from 15 to 25 percent.



Hand-operated barrel or drum mounted

Coloring

It is done to give a good appearance and better finish to the product. This is done to half-polished rhizomes in two ways, known as dry and wet coloring.

Dry coloring: Turmeric powder is added to the polishing drum in the last 10 minutes of the dry process.

Wet coloring: In this process, turmeric powder is suspended in water and mixed by sprinkling inside the polishing basket. For a brighter color, the boiled, dried, and half-polished fingers are placed in baskets that are continuously shaken when an emulsion is poured in. When the fingers are uniformly coated with the emulsion, they may be dried in the sun. The composition of the emulsion required for coating, 100 kg of half-boiled turmeric, is as follows: Alum, 0.04 kg; Sodium bisulfate, 30 g; Turmeric powder, 2.00 kg; Conc. HCl, 30 ml; and Castor seed oil, 0.14 kg.



Dry coloring of rhizome



Wet coloring of rhizome

CONCLUSION

The removal of the peel from turmeric caused a mass loss of 30%. However, the product obtained by this process had a higher intensity of yellow and red when compared to rhizomes with peel. A precise understanding of effective dose, safety, and mechanism of action is required for the rational use of turmeric in the treatment of human diseases. Further clinical studies are warranted if turmeric is to be employed in meeting human needs and improving human welfare. Heat treatment of turmeric prior to dehydration reduced drying time and provided a powder with lower moisture content, higher levels of curcuminoid pigments, a good appearance and better finish to the product, as well as a higher intensity of yellow and red color. Cooking by immersion originated a product of superior quality compared to the one cooked in a retort with respect to curcuminoid pigments and luminosity.

Polyethylene bags were not a good barrier to water vapor, allowing absorption of moisture by the ground turmeric during storage.

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