Effect of storage of fresh turmeric rhizomes on oleoresin and curcumin contents*

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ABSTRACT

The turmeric varieties Suvarna (PCT-8), Suguna (PCT-13) and Sudarshana (PCT-14), were harvested and stored for a period of nine months. Samples were analysed for curcumin and oleoresin at monthly intervals. Curcumin and oleoresin levels were not affected by sotrage. The marginal increase in these constitutents after sprouting is only relative as the nutrients like carbohydrates get progressively depleted with the progress of sprouting and growth of the sprout. The distribution of curcumin in mother rhizomes and fingers are also discussed.

Key words: *Curcuma longa* L., curcumin, oleoresin, storage, turmeric.

Introduction

Turmeric, *Curcuma longa* L is a perennial herbaceous plant having thick and fleshy underground rhizomes and pseudostems made up of leaf sheaths. The underground rhizome is processed into the spice, turmeric. The rhizome consists of two distinct parts, the egg shaped main or mother rhizome and several long cylindrical branched primary and secondary rhizomes growing downward and sideways from the mother rhizome. Maturity of the crop is indicated by the drying up of the pseudostem and leaves. Depending on the variety this takes from 180-250 days from planting (Govindarajan 1980).

Turmeric of commerce is the processed and dried rhizome. Turmeric is valued for its content of curcumin which imparts the typical yellow colour. This is traded in the market as whole, powder or oleo-

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resin. The use of turmeric oleoresin is gaining importance in the processed food industry. Besides convenience in processing (such as mixing, uniformity for flavour, and economy in use) freedom from microbial contamination is very significant in processed foods such as frozen-stored, ready to eat, and other convenience foods and food adjuncts. Turmeric is essentially used for its colour in most of the ready-to-eat preparations. Turmeric is also a major ingredient in curry powders (Narayanan *et al* 1980). Most of the *Curcuma* species contain mainly the yellow curcumin along with minor yellow and brownish red compounds.

Curcumin or di-cinnamoyl methane is the major colouring principle in turmeric. It is an odourless yellow crystalline powder (mp, 184 to 186°C), soluble in methyl and ethyl alcohols, glacial acetic acid and propylene glycol. It has an absorption maxima at 425 nm. When protected against sunlight, the colour is quite stable and not affected by heat. FAO has recommended the necessary specifications of curcumin for using it as a food additive (Govindarajan 1980). Curcumin is extracted from the cured rhizomes of turmeric. Sometimes the fresh rhizomes may be stocked for long before curing due to various reasons. It is also not possible to process immediately the whole harvested rhizomes for extraction of curcumin and oleoresins. Therefore, an attempt has been made to study the effect of storage on the levels of curcumin and oleoresin.

Materials and methods

Three turmeric varieties were selected for the study. They are Suvarna (PCT-8), Suguna (PCT-13) and Sudarsana (PCT-14) which are the released varieties from National Research Centre for Spices. The harvested rhizomes are stored in pots lined with saw dust in shade in specially made cubicles to avoid heat and light. The clumps are taken at monthly intervals and processed for analysis. Turmeric samples harvested in December, 1990 were processed and analysed upto September, 1991 till the rhizomes started germinating and showed symptoms of decay.

The turmeric rhizomes after harvest is washed well to remove the adhering soil and cooked in boiling water for one hr under light alkaline conditions (Natarajan and Lewis 1980). The cooked material was sundried to a moisture level of 8% (Joseph Philip and Sethumadhavan 1980). The dried material was powdered to uniform mesh and used for extracting oleoresin and curcumin. Oleoresin was determined by cold percolation of turmeric powder with acetone and the percentage was computed gravimetrically (A.O.A.C. 1975). Curcumin was estimated by the ASTA procedure from the powdered and sieved sample (ASTA 1968). The analysis of oleoresin and curcumin were replicated 4 times and the mean was taken for discussion. The absorption maxima of curcumin was measured in a Shimadzu UV-160 spectrophotometer.

Results and discussion

The levels of oleoresin and curcumin at monthly intervals is given in Table 1 and 2. It is clear from the data that the levels of curcumin and oleoresin were maintained almost steadily though a slight increase was noticed by August. So under normal condition of storage the oleoresin and curcumin levels remain more or less constant. The curcumin content ranges from 6.8 to 8.9 in PCT-13, 6.9 to 10.5 in PCT-14 and 3.5 to 5.4% in PCT-8.

However, this is different from earlier reports with regard to PCT-8 (Ratnambal and Nair 1986). The oleoresin content ranges from 8.5 to 20% in PCT-8, 11.6 to 24% in PCT-13 and 11.4 to 24% in PCT-14. Increase in curcumin content and oleoresin from June-July onwards is related to the decrease in other rhizome constituents especially carbohydrates which are made use of in the process of germination. The rhizomes are planted in the field usually during May. With the onset of monsoon in June, stored rhizomes start sprouting, a process which gradually lead to the depletion of the primary metabolites. This leads to an increase in curcumin and oleoresin contents on estimation.

Table 1. Oleoresin levels in turmeric varieties on storage*

Period in months	Oleoresin % W/W		
	PCT-8	PCT-13	PCT-14
January	8.5	11.6	11.4
February	8.8	11.5	12.2
March	8.7	14.3	11.9
April	8.8	14.4	12.6
May	8.8	14.4	12.0
June	10.8	15.5	15.0
July	12.4	14.5	15.0
August	17.0	20.0	21.0
September	20.0	24.0	24.0
Mean ± SE	11.75 ± 4.7	15.5 ± 4.0	15.2 ± 5.0

* Mean of four replications.

Table 2. Curcumin levels in turmeric varieties on storage*.

Period in months	Curcumin % W/W		
	PCT-8	PCT-13	PCT-14
January	4.5	7.0	6.9
February	4.0	7.7	8.8
March	3.5	6.8	7.0
April	3.8	8.6	7.0
May	3.5	8.7	7.7
June	4.0	8.5	8.5
July	5.4	8.0	9.0
August	4.7	8.9	10.5
September	4.0	9.0	10.0
Mean ± SE	4.2 ± 0.61	8.2 ± 0.84	8.3 ± 1.1

* Mean of four replications

The distribution of curcumin in the mother rhizome and fingers of these varieties are given in Table 3. The data reveal that the curcumin in PCT-8 mother rhizome is lower than primary and secondary fingers. But in PCT-13 and 14 the mother rhizome has more curcumin than the primary and secondary fingers. This difference may be due to the difference in the pattern of synthesis and storage in these varieties.

Table 3. Distribution of curcumin in the mother and fingers of turmeric*.

	Curcumin %		
	PCT-8	PCT-13	PCT-14
Mother	4.3	10.9	11.7
Primary	6.9	9.8	9.5
Secondary	6.8	6.9	6.5

* Mean of cumulative analysis of several samples

The absorption maximum of curcumin is 425 nm (Narayanan *et al* 1980). The absorption maxima of the curcumin in the stored samples did not show any major change, there by indicating that the quality of the curcumin is unaffected during the storage.

The study establishes that once synthesized the curcumin as well as oleoresin remains more or less steady in the rhizome during storage.

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