



Study On Curcumin Content In Turmeric Powders Available In Local Markets Of Kerala

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Abstract

Asian communities consume 1.5 g turmeric daily per person. Turmeric use in the field of medicine was described in Asia thousands of years ago. Curcumin has the potential to prevent or treat various physiological processes, including cardiovascular disease, carcinogenesis, wound healing and inflammation. The curcumin content in collected from local markets as well as from different geographical regions varied from 1.94 to 3.10%. The geographical variation of farmed turmeric showed that comparatively higher content of curcumin was obtained from the sample collected from Kalady (Ernakulam district), followed by Kalpatta (Wyanad district) and Cherthala (Alappuzha district). Among the turmeric powder available in local market, comparatively higher concentrations were observed in Treesa and Eastern, and no wide variations observed between rests of them. The common adulterants found in turmeric powder were absent in the analysed samples. Even though curcumin contents in turmeric powders were slightly lower compared to farmed, all were free off toxic chemicals.

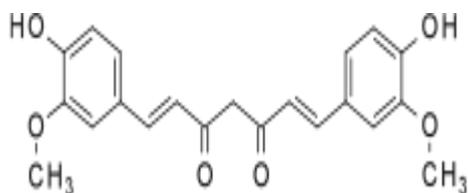
Key words - Turmeric, curcumin, adulterants.

1. Introduction

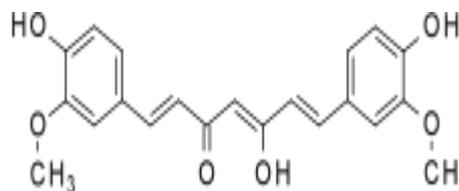
Turmeric is a rhizomatous plant (*Curcuma longa*) and a member of the Ginger family consisting of approximately 3% curcumin (Sharma et al., 2001). Asian communities consume 1.5 g turmeric daily per person. Turmeric use in the field of medicine was described in Asia thousands of years ago (Aggarwal et al., 2007). Evidence suggests curcumin has the potential to prevent or treat various physiological processes, including cardiovascular disease, carcinogenesis, wound healing and inflammation. Asian populations experience approximately half the incidence of inflammatory bowel diseases (Loftus, 2004) and an eighth of the incidence of bowel cancer than that of Western populations (WHO, 2008). Diet is likely to be a major contributory factor. Curcumin exists as a bright yellow powder that provides the pigmentation to turmeric, and is used in the dye industry.

Curcumin exists as a bright yellow powder that provides the pigmentation to turmeric, and is used in the food industry. It carries food additive number E100 (Rahman et al., 2006). Most of the interests to medical research lies within the ability of curcumin to counter act the generation and subsequent effects of reactive oxygen species and nitrogen free radicals, typically manifesting from damaged cells. Curcuminoids can avidly donate hydrogen ions and undergo nucleophilic addition. They possess several moieties with the potential to undergo biochemical modification (Priyadarsini et al., 2003) and impart the important reduction oxidation, anti-oxidant and proton donating properties that can compact cell damage. The mechanisms which enable curcumin to scavenge and trap radicals are

numerous and complex (Weber et al., 2005). One of the key attributes of curcuminoids likely to evoke this benefit is the chain-breaking anti-oxidant activity from hydrogen atoms, most probably donated from the phenol (OH) groups (Barclay et al., 2000). Curcumin is unstable under alkaline conditions and degrades in less than 30 min (Lin et al., 2000). Under acidic conditions, the rate of decomposition is significantly reduced with less than 20% of total curcumin degraded in one hour (Wang et al., 1997). This may explain why curcumin seems to be stable within the gastrointestinal tract where the pH range is 1–6.



keto form



enol form

The major curcuminoids, curcumin, demethoxycurcumin, and bisdemethoxycurcumin, occur naturally in these curcuma species. Curcumin has been shown to have several biological effects, exhibiting anti-inflammatory (Holt et al., 2005, Chainani, 2003), antioxidant (Iqbal et al., 2003, Ramirez Tortosa et al.1999), and hypolipidemic (Soni et al.,1992, Babu et al.,1997) activities. Curcumin has also been studied extensively as a chemo preventive agent in several cancers (Duvoix et al., 2005, Leu et al., 2002). Additionally, it has been suggested that curcumin may contribute in part to the lower rate of colorectal cancer in Asian countries compared to rates in other countries (Garcea et al., 2004). Curcumin exhibits relatively low oral bioavailability in humans and rats and may undergo extensive intestinal metabolism (Sharma et al., 2005, Ireson et al., 2001). Traditionally turmeric is used in various cuisines for flavor as well as a coloring agent for foods such as rice, yogurt and chicken. Turmeric may also be used by itself or in combination with other mixed spices. Curcumin content is reported to vary from one batch of turmeric powder to another. Even though it is highly important and valuable material, if it is contaminated its value in the open market decreases. In this sense, the presence of common adulterants in turmeric powder will affects the curcumin purity. The objective of the study is to find out the purity of turmeric (curcumin content), which is available in local markets. Along with a geographical variation of farmed turmeric also carried out. Nowadays adulterants become a non ignorable material in food additives. The common adulterants present in turmeric powders are also carried out qualitatively.

2. Materials and Methods

2.1. Materials

A total of nine turmeric samples, out of which six from the local markets and the rest of them were, farmed turmeric of different regions. For the analysis, farmed turmeric were collected almost in the same period from north (Kalpatta), mid (Ernakulam) and South (Alappuzha) parts of Kerala The details of turmeric powder collected for study were given in the below Table 1 and 2. The curcumin standard was purchased from Sigma Aldrich (India). The stock concentration of curcumin standard was 500 µg/ml and working standard concentration was 20 µg/ml. From this a series of 2, 4, 6, 8, 10 and 12 µg/ml solutions were prepared for the calibration.



Table 1. Details of turmeric powder from local markets

Product details	Quantity in g	Mfg date	Exp. Date	Batch no:
Treesa	100	8/12	7/13	18B08
Marias	100	11/12	10/13	850
Quality	100	1/13	12/14	7
Swami's	100	12/12	11/13	F4
Eastern	100	6/12	5/13	MCL2F002
Grandmass	100	2/13	1/14	502507

Table 2. Details of Farmed Turmeric Powder

Region	Quantity in g	Prepared on
Kalppatta	100	25/01/2013
Ernakulam	100	20/01/2013
Alapuzha	100	22/01/2013

2.2 Methods

2.2.1. Determination of purity of turmeric powder

A known quantity of the substance is dissolved in acetone and read the absorbance at 420 nm using a digital spectrophotometer (Spectronic 20D) (ASTA, 1997).

2.2.2. Determination of adulterants in turmeric powder

Take a small quantity of turmeric powder in a test tube containing small quantity of water. Add a few drops of conc. HCl (effervescence, will indicate the presence of chalk or yellow soap stone powder). Lead Chromate ($PbCrO_3$) appears to be bright in colour which leaves colour immediately in water. Filter the sample and using the filtrate tests for lead and chromate were done. Take a teaspoon full of turmeric powder in a test tube, add a few drops of conc. HCl (an instant appearance of pink colour which disappears on dilution with water shows the presence of turmeric, if the colour persists metanil yellow (an artificial colour) a not permitted coal tar colour is present (Pruthi, 1998).

3. Results and Discussion

3.1 Curcumin content in turmeric powder

The curcumin content in farmed turmeric powder varied from 2.32 (Cherthala) to 3.10% (Kalady) where as in local market varied from 1.94 (Swami's) to 2.46% (Treesa). The results were given in Table 4. The sample named Eastern had a content of 2.32% and rest of the samples was almost same. The turmeric powder from Cherthala and Eastern's results showed that the curcumin content was almost same.

Table 3 Curcumin concentration to optical density

SI. No.	Concentration in $\mu\text{g/ml}$	Optical density
1	2	0.066
2	4	0.133
3	6	0.194
4	8	0.256
5	10	0.319
6	12	0.384

Figure 1: Calibration graph of curcumin standard

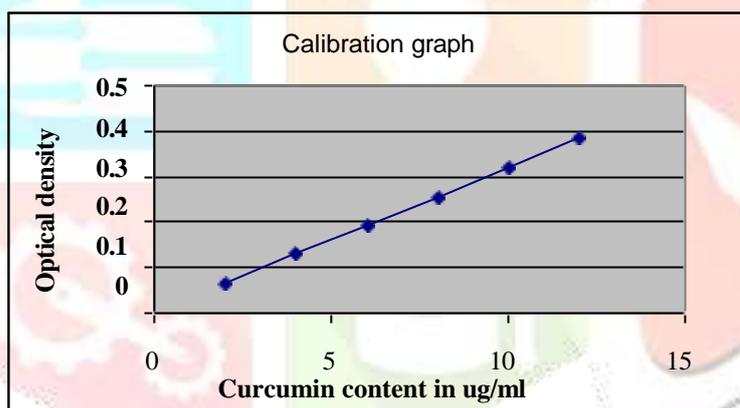
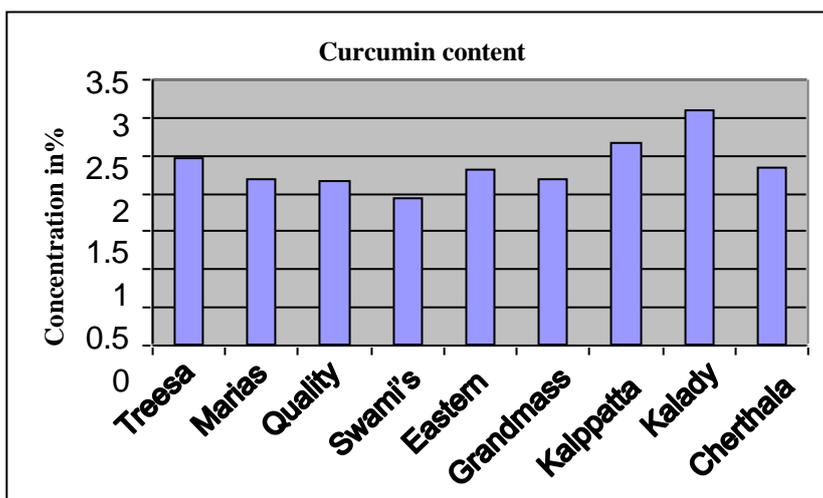


Table 4. Curcumin contents in turmeric powder in g/100g (%).

SI No.	Product details	Curcumin content in %
1	Treesa	2.46
2	Marias	2.20
3	Quality	2.16
4	Swami's	1.94
5	Eastern	2.32
6	Grandmass	2.20
7	Kalppatta	2.66
8	Kalady	3.10
9	Cherthala	2.34

Figure 2: Purity of turmeric powder obtained from various regions and brands



3.2. Adulterants in turmeric powder

The common additives used in turmeric powder are chalk or yellow soap stone powder, lead chromate and metanil yellow (an artificial colour). The results obtained in turmeric powder were free off adulterants and given in Table 5.

Table5: Adulterants in turmeric powder

SI No.	Product details	Chalk/yellow soap stone	Metanil yellow	Lead Chromate
1	Treesa	-	-	-
2	Marias	-	-	-
3	Quality	-	-	-
4	Swami's	-	-	-
5	Eastern	-	-	-
6	Grandmass	-	-	-

Curcumin is naturally occurring polyphenolic phytochemical, which is the major yellow pigment extracted from turmeric, used as spice. This has been considered as scientific and public interest in the use of phytochemicals derived from the diet to reduce risk and progression of major chronic diseases (Sharma et al., 2005). It has been studied extensively as a chemo preventive agent in several cancers (Heath et al., 2003). In the present study, samples collected from the farmers of Cherthala, Kalpatta, Kalady and also curcumin powders available from the local market of Kerala. Also analyse the presence of common adulterants such as chalk powder, metanil yellow and lead chromate etc. According to Duraisankar et al., 2015, the average curcumin content was lie in between 1.06% to 5.70% and it varies from one batch of turmeric powder to another. In this study, it was found that the maximum curcumin content observed in samples collected from Kalady was 3.10% followed by sample from Kalpatta was 2.66% and the minimum appears in sample swami's was 1.94%. The rest of the samples appear in almost same ranges between 2.15% - 2.7%. The maximum curcumin content in Kalady and Kalpatta was due to climatic conditions such as temperature range is in between 20-30⁰C, elevation of the area from the sea level, very high rainfall etc (Ramkumar et al., 2020; Arya et al., 2016, Geethanjali et al., 2016; Jha and Deka, 2012).

The curcumin content of turmeric 17 accessions collected from the North East India ranged from 0.29-8.9%. The higher curcumin content observed in Lachin (8.9%) followed by Megha (8.3%) and Lakadong (7.7%) (Magar and Chowdhur, 2021) and it was lower than the present study. The solvent used for the extraction of curcumin was ethyl alcohol. The relatively lower concentrations of curcumin might be due to the differences in extracting solvent as acetone (Sahoo et al., 2017). Curcumin content in turmeric varieties grown in Maharashtra showed that highest observed from 3.584 to 7.730% in Pratibha followed by Salem 2.169 to 5.932%, Rajapuri 2.812 to 4.366% and Krishna 1.599 to 3.520%, respectively (Kamble et al., 2011). Arya et al., 2016, showed that curcumin concentration was varied from 1.51 to 3.26 % and it was in line with the present study. The curcumin content in turmeric samples from various states ranged from 0.68 to 2.35% (Geethanjali et al., 2016). The curcumin content in local variety of turmeric collected from Assam was found to be 3.00% (Choudhury, 2019). The study of curcumin adulterants present in different marketed brands of turmeric powder showed that all the samples contained Metanil yellow and Yellow lead while in the present study all those adulterants were absent (Mayuri et al., 2022). According to Sumita et al., 2009, curcumin content in branded samples ranged from 2.2 to 3.7 % while non-branded samples had 0.3 to 2.6%. Though none of the branded turmeric powders contained artificial colors, 17% of loose powders showed the presence of extraneous color metanil yellow, in the range of 1.0-8.5 mg g⁻¹ which may pose health threats. The curcumin content varied between 2.08 and 4.73% among these maximum concentration was recorded in var. Prathibha (4.73%) followed by var. Suroma (4.58%) and minimum was recorded in genotype CLI-327 (2.08 %) (Shashidhar et al., 2018).

Conclusion

The curcumin content in collected from local markets as well as from different geographical regions varied from 1.94 to 3.10%. The geographical variation of farmed turmeric showed that comparatively higher content of curcumin was obtained from the sample collected from Kalady (Ernakulam district), followed by Kalpatta (Wyanad district) and Cherthala (Alappuzha district). The high content of curcumin in farmed turmeric from Kalady might be due to its nature of soil texture and quality of turmeric taken for cultivation. Among the turmeric powder available in local market, comparatively higher concentrations were observed in Preesa and Eastern, and no wide variations observed between rests of them. The common adulterants found in turmeric powder were absent in the analysed samples.

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