International Journal of Chemical Science
www.chemicaljournals.com
Online ISSN: 2523-2843, Print ISSN: 2523-6075
Received: 10-11-2023, Accepted: 26-11-2023, Published: 11-12-2023
Volume 7, Issue 2, 2023, Page No. 24-28

Evaluation of functional properties, phytochemical components, antiseptic nature, and cosmetic application of turmeric powder

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Abstract
Turmeric, a well-known Zingiberaceae family member and renowned medicinal herb in India, is widely used. Indian turmeric is preferred from other nations because it contains a higher proportion of curcumin. Spices and condiments are essential to Indian cooking and are a storehouse of phytochemical and medicinal qualities. With a small molecular weight, curcumin is a lipophilic polyphenolic compound. Turmeric is the result of extracting the active component from curcuma longa. Curcumin exhibits several medicinal properties, such as its anti-inflammatory, antioxidant, antibacterial, and anti-cancer properties. Due to environmental factors and metabolic differences, it has been observed that the chemical makeup of most plants varies with geographic location. Phytochemistry, antibacterial activity, metal content, antifungal activity, antioxidant activity, functional characteristics, and total carbohydrates, total proteins are the main objectives of the current study.

Keywords: Phytochemical components, antiseptic nature, cosmetic application

Introduction
Every kitchen in an Indian nation has a spice called "haldi," without which no meal would be complete. Turmeric is the common name for this "haldi." Turmeric is not just utilized in food; it is also a common medical ingredient in Indian Ayurvedic, Unani, and Siddha remedies. Turmeric is widely regarded as a medicinal purpose, with India being both its primary producer and consumer. Turmeric's appeal as a flavoring, colorant, and food preservative is widespread. The Food and Agriculture Organization of the United Nations reports that more than 2400 metric tons of turmeric are imported into the United States each year for consumer use.

Materials and Methods
Various Techniques were used to analyze the turmeric samples. Colorimeter was used to determine composition of Iron, Flame emission spectrophotometer was used to determine the composition of Sodium & Potassium, Calcium was used determined by using UV-Visible spectrophotometer and finally Cu & Zn and Heavy metals (Cd, Pb & Hg) were determined by using Atomic Absorption Spectrophotometer (Table-2).
Colour of the sample was by viewing, amount of Organic carbon by wet oxidation and available nitrogen by Alkaline permanganate, estimation of total carbohydrates by Anthrone method (Table-3) and estimation of total proteins by biuret method (Table-4).

Qualitative analysis of Phytochemical Components
For qualitative analysis of phytochemical components based on standard procedures were used to test the existence of alkaloids, cardiac glycosides, flavonoids, phenols, saponins, tannins, terpenoids, quinones and proteins (Table-1).

Antimicrobial activity
In addition to the above activities, the Anti-bacterial and Anti- fungal activities of turmeric were tested against *Staphylococcus aureus* and *Pseudomonas aeurignosa*. Antifungal activities were tested against *Aspergillus* and *Rhizopus* species. The activities were determined using both the well and disc diffusion methods (Table-6 &7).

Skin pigmentation effect
In lieu of its natural properties curcumin is very effective as a skin coloring and skin pigmentation agent. Curcumin can reduce melanin production and provide a good texture to the skin. When different percentages of extracts of curcumin were applied there were permanent, visible, and statistically significant changes. The results obtained for emulsion with 30 % of turmeric showed statistically significant changes, colour space parameters. There was also a remarkable change in the skin color and brightness after and before the application of turmeric powder, which indicated that preparation with 30 % of turmeric did not cause permanent changes in the skin brightness.

Antioxidant activity
Using the 1, 1-diphenyl-2-picrylhydrazyl (DPPH) assay, the fractions' capacity to scavenge free radicals was assessed in vitro. A solution of 0.3 mM DPPH was made with 100% ethanol, and 1 ml of this mixture was combined with 1 ml of methanol and 1 ml of sample turmeric solution, that ranged in concentration from 20 to 100 µg/ml. Sample turmeric solution was not used in the control reaction. After shaking the mixture and letting it stand for 30 minutes at room temperature, a spectrophotometer was used to measure the absorbance at 517 nm. The percentage of scavenging inhibition was calculated and contrasted with the standard, gallic acid (Table-8).

Results and Discussion

The collected samples were analyzed for major phytochemical components, metal composition, functional properties, antimicrobial activity, anti-oxidant activity and finally cosmetic application.

Table 1: Phytochemical components of turmeric

Phytochemical components	Sample 1	Sample 2	Sample 3
Flavonoids	+	+	+
Phenol	-	-	-
Tannins	-	-	-
Saponins	+	+	+
Phlobatannins	-	-	-
Alkaloids	+	+	+
Steroids	+	+	+
Terpenoids	+	+	+
Glycosides	+	+	+
Anthraquinones	-	-	-

Table 2: Metal composition of turmeric

Name of the metal (ppm)	Sample 1	Sample 2	Sample 3
Na	12	11	4
K	77	70	20
Ca	1.54	8.56	10.48
Cu	0.625	5.025	3.567
Zn	2.3777	8.259	10.5
Fe	7.191	7.392	3.544
Cd	ND	ND	ND
Pb	ND	ND	ND
Hg	ND	ND	ND

Table 3: Amount of Carbohydrates of turmeric

Sample	Amount of Carbohydrate (ppm)
1	5.36
2	11.47
3	12.06

Table 4: Amount of proteins of turmeric

Sample	Amount of protein (ppm)
1	1.08
2	2.39
3	0.64

Table 5: Turmeric as an indicator

Sample	Acid	Base
1	No change	The paper turns to red color
2	No change	The paper turns to dark red color
3	No change	The paper turns to slightly red color

Table 6(a): Anti-bacterial activity of Turmeric (well diffusion method)

Bacteria	*Staphylococcus aureus*				*Pseudomonas aeurignosa*			
Con.	Sample				Sample			
		1	2	3		1	2	3
	C	100 µl	100 µl	100 µl	C	100 µl	100 µl	100 µl
Methanol extraction	18 mm	22 mm	22 mm	26 mm	18 mm	18 mm	20 mm	20 mm
Aqueous extraction	19 mm	16 mm	23 mm	22 mm	18 mm	21 mm	22 mm	24 mm

Table 6(b): Anti-bacterial activity of Turmeric (Disc diffusion method)

Bacteria	*Staphylococcus aureus*				*Pseudomonas aeurignosa*			
Con.	Sample				Sample			
		1	2	3		1	2	3
	C	100 µl	100 µl	100 µl	C	100 µl	100 µl	100 µl
Methanol extraction	20 mm	10 mm	10 mm	11 mm	18 mm	10 mm	11 mm	11 mm
Aqueous extraction	19 mm	11 mm	13 mm	10 mm	18 mm	11 mm	11 mm	12 mm

Table 7: Anti-Fungal activity of Turmeric

Extraction	Zone of Inhibition							
	Rhizopus				*Penicillium*			
	Well diffusion				Well diffusion			
Con.	Sample				Sample			
		1	2	3		1	2	3
	C	100 µl	100 µl	100 µl	C	10 µl	50 µl	100 µl
Methanol extraction	21 mm	10 mm	10 mm	10 mm	0 mm	10 mm	10 mm	17 mm
Aqueous extraction	24 mm	10 mm	10 mm	12 mm	11mm	10 mm	10 mm	16 mm

Table 8: % Antioxidant activity by DPPH radical scavenging method

Sample	Extract concentration (µg/ml)	Inhibition (%)	Gallic acid concentration (µg/ml)	Inhibition (%)
1	100	96.04	100	97.11
2	100	90.15	100	87.58
3	100	86.54	100	90.34

Table 9: Functional properties of turmeric

Functional property	Sample 1	Sample 2	Sample 3
Water absorption capacity (%)	850	932	1050
Oil absorption capacity (%)	795	879	854
Water Solubility Index (%)	20.4	18.5	16.5
Foaming capacity (%)	2.5	3.4	2.8
Foaming stability (%)	22.8	25.9	26.7
Wettability (S)	87.6	75.6	67.8
Hydrated density (g/ml)	1.71	0.64	1.23

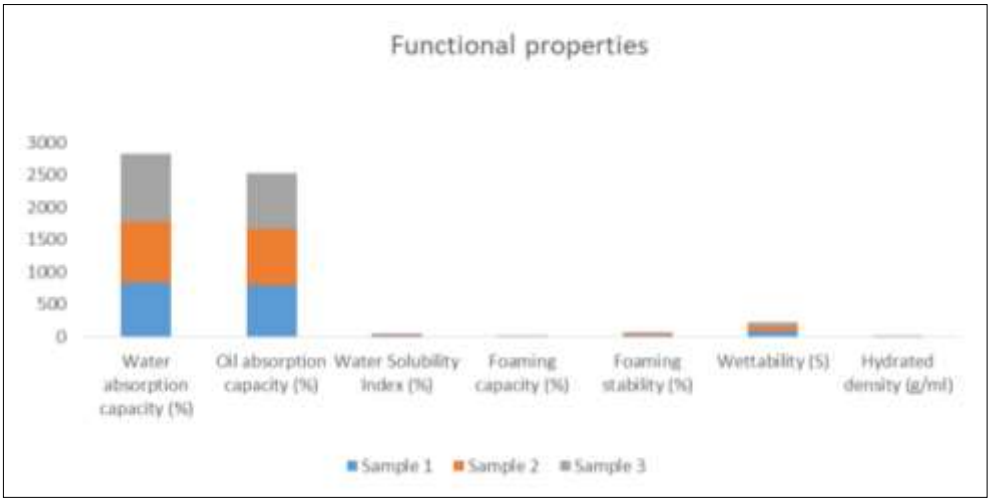

Fig 1: Functional properties

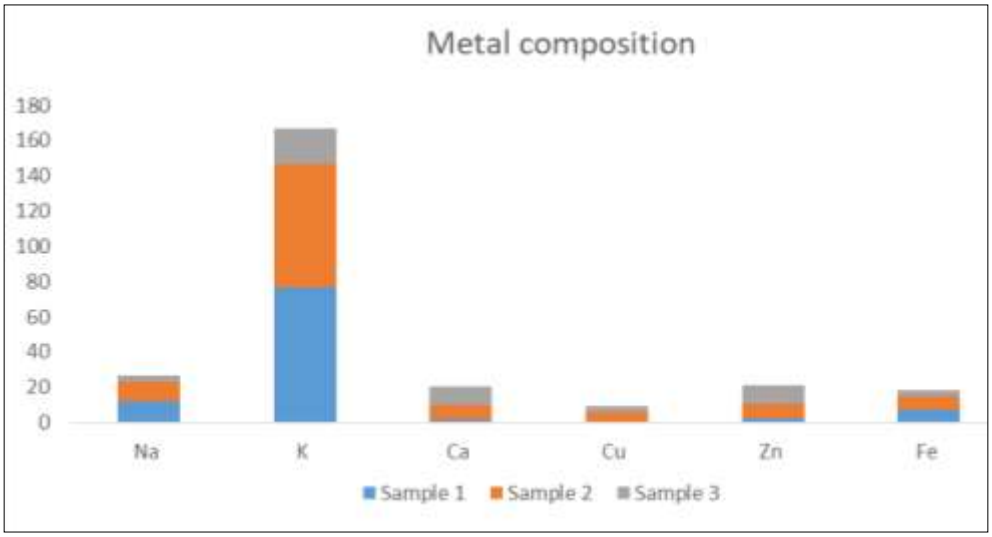

Fig 2: Metal composition

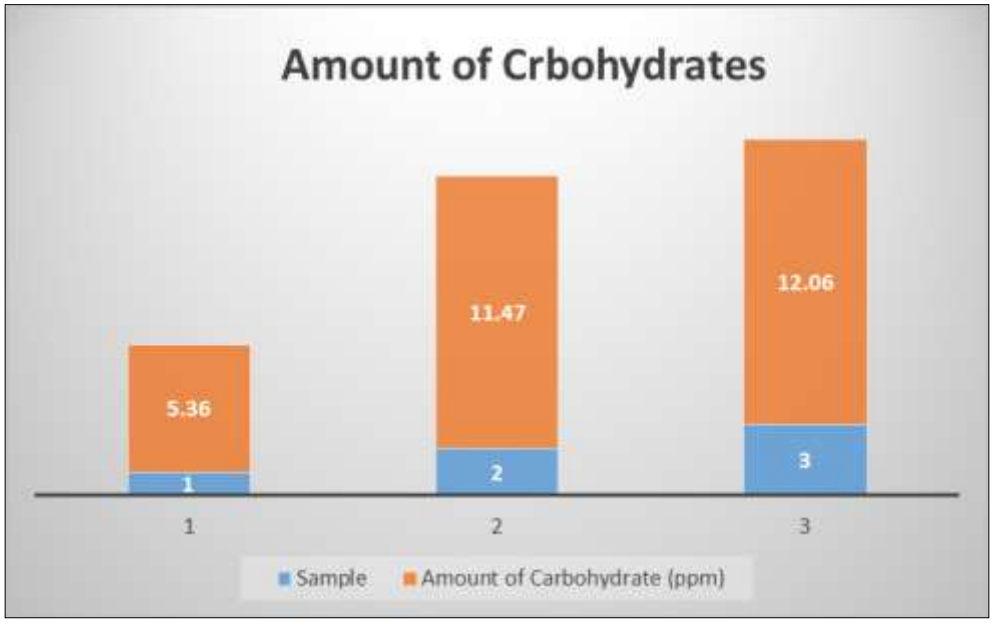

Fig 3: Amount of carbohydrates

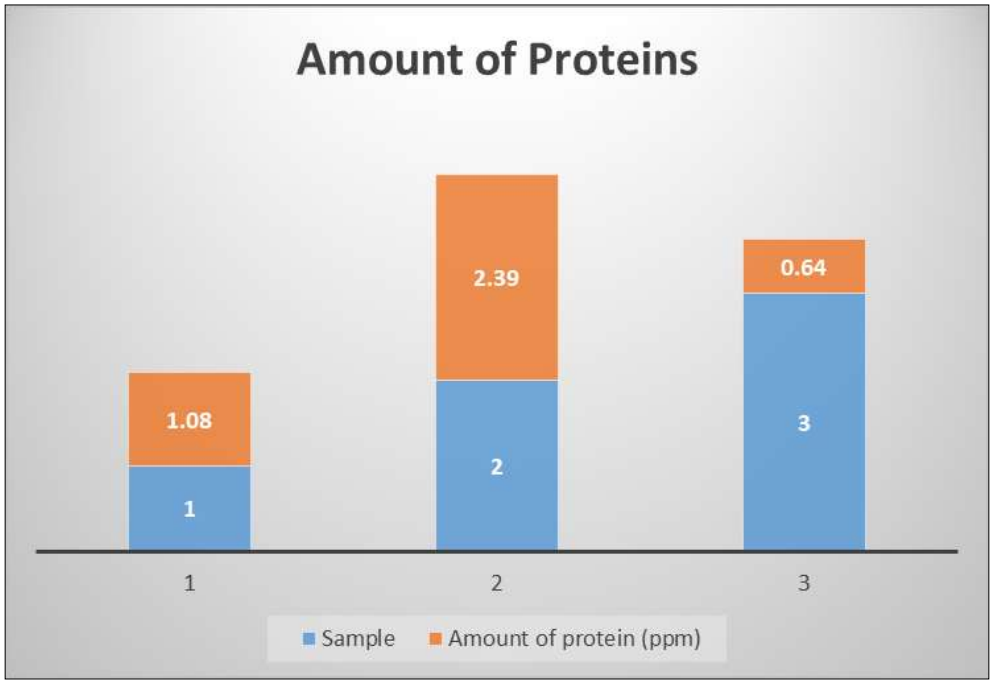

Fig 4: Amount of Proteins

Conclusion

Turmeric's color, quality, medicinal value, and consequently its price are all determined by its curcumin level. Thus, turmeric's curcumin component is crucial for both medicinal and commercial purposes. The pharmaceutical and ayurveda sectors would find this data helpful in determining the source and availability of turmeric. Turmeric extract is used to treat various diseases, most of which are gastric diseases. Even though the use of turmeric in medicines, it is very potential to be developed as an antibacterial, antioxidant, anti-inflammatory.

Acknowledgements

Authors thank to University of Technology and Applied sciences, Muscat, Sultanate of Oman, for providing research facilities to the research scholar.

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