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RESEARCH ARTICLE

Comparative study on spectrophotometric analysis and antibacterial activity of homely prepared turmeric powder and commercially available turmeric powder

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Abstract

The study was conducted t o determine and compare the amounts of curcumin that are present in three different brands of turmeric powder as well as homemade powder (*Curcuma longa, Curcuma aromatica, Curcuma amada, Curcuma caesia* and *Curcuma angustifolia*) using spectrophotometric analysis and antibacterial activity also done with four different bacterial species. The results showed that the absorbance of the acetone extracts of the three turmeric powder samples was read at 420 nm in spectrophotometer. The absorbance of pure curcumin was noted in 1.12 at 420 nm, brand A showed 1.76 brand B showed 1.32 and brand C showed 1.66. The concentration of the curcumin was found to be different for each sample. Antibacterial results showed that brand A,B,C were sensitive to *Klebsiella, Proteus* and *Bacillus* species , but in the case of *E.coli* species A,B are sensitive and C was not sensitive.

Key words: Antibacterial, Spectrophotometer, Curcuma, turmeric power

Introduction

Spices occupy a vital component of agriculture products that are used as spice or condiment and for medical reasons. They are well recognised to contain considerable amounts of bioactive substances and natural antioxidants. (1). The *Zingerberaceae* family includes the tropical perennial monocotyledonous herbaceous plant known as turmeric (*Curcuma longa*) (2). Although it comes originally from South and South-East Asia, the majority of it is cultivated in Bangladesh, China, Thailand, Malaysia, Cambodia, Philippines, Indonesia and Nigeria, which are all tropical regions (3). The rhizome, often known as the root, has a bitter and bright orange color that is covered in a rough brown skin. In traditional medicine, turmeric's rhizomes have been used to treat inflammations, signs of cancer, diabetes, stomachaches, high cholesterol as a natural remedy (4). Ikpeama *et al.* looked at the nutritional profile of turmeric and it was said to contain 67.38% carbohydrates, 2.85% ash, 6.85% fat, 9.40% crude protein, and 8.92% moisture(5) . Additionally, according to Gopinathan *et al.,* the granulated rhizome contains 70–76% curcumin (6). The biological effects of turmeric are due to curcumin, a yellow-colored active compound that is a powerful antioxidant (7). Vital components including vitamin C, betacarotene, polyphenol, fatty acids, and essential oil are also included in curcumin (5). Curcumin has been shown to have promise as a preventative and therapeutic agent for a number of malignancies, including those of the gastrointestinal tract, breast, lungs, head and neck, nervous system, and sarcoma (8, 9, 10,11). *Curcuma longa* comprises 2-9% curcuminoids, which are made up of the demethoxycurcumin, diarylheptanoids curcumin as well as bisdemethoxycurcumin (12, 13). The present research was focused on the comparative study of homely prepared turmeric with commercially available turmeric powder.

Materials and Method

Collection of samples

Curcuma longa, Curcuma aromatica, Curcuma casiea, Curcuma amada, Curcuma angustifolia were taken from Peermade, Idukki district it was then cleaned, rinsed with deionized water, scraped off, sliced, and dried for a week in the sun shade. For the current investigation, dried rhizomes were broken down into tiny pieces and powdered. Turmeric powder of the commercial brands A, B, and C was obtained from Konni.

Sample extraction

In 100ml of solvents such as acetone, butanol, and petroleum ether, 50g of the powder of home

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made dried rhizomes *of C.longa, C.aromatica, C.amada, C.caesia* and *C.angustifolia* and brand A, B and C were taken for 3 days with periodic shaking. A filter was used to separate the solvent from the whole extract and the remaining solvent was then allowed to evaporate before being concentrated. The extracts were kept chilled in capped conical flasks until use. Extracts were then utilized to quantitatively analysis of curcuminoids using a spectrophotometer and to check the antibacterial activity.

Spectrophotometric analysis of curcumin

The five *Curcuma* samples's absorbance were measured on a spectrophotometer at 420 nm in comparison to the blank solvents, and the amount of curcumin obtained using this approach was calculated and represented as a percentage.

UV-Visible spectra of curcuminoids

By refluxing the substance in acetone, curcumin was extracted quantitatively from the samples and measured spectrophotometrically using a spectrophotometer in the 200–700nm wavelength. At around 425 nm, curcumin displays a prominent, wide maximum absorption. As a result, the spectrophotometric estimation of curcumin concentration for all turmeric samples was in the range of around 425nm.

Antibacterial activity

The disc diffusion technique was used to evaluate the anti-microbial activity of the extracts. For the antibacterial test, nutritional broth was inoculated with overnight cultures of *E. coli, Proteus, Bacillus sp.,* and *Klebsiella sp.* Each of the petri plates contained around 20ml of nutritional agar, which was added and let to set. After making wells in the agar, the bacterial cultures were swabbed onto the plates. Each well received a single drop of extract from five different species in a specific solvent. The petri dishes were incubated for 48 hours at 37^0C. All five of the samples underwent the test. The diameter of the clear inhibitory zone around the well was measured to assess its antibacterial activity. Additionally, pictures were taken to document the effects of curcuminoid extracts on cultures.

Result

According to reports, the amount of curcumin in each kind of turmeric powder varies. In the current research, the spectrophometric analysis and antibacterial activities of commercially available turmeric powders are contrasted with those of naturally occurring turmeric powder that is made at home.

Three different kinds of turmeric powder were purchased from Konni for the comparative study, and the powders were then extracted in acetone, butanol, and petroleum ether. Using a spectrophotometer, 1ml of the sample was taken to measure absorbance at 420 nm in order to determine the quantity of coloured substance (curcumin) in the sample.Antibacterial activities were also investigated by placing a drop of extract into the wells made on the agar plates swabbed by strains of bacteria including *Bacillus sp, E.coli, Proteus sp* and *Klebsiella.*

Spectrophotometric analysis

The absorbance of the acetone extracts of the three turmeric powder samples was read at 420nm in spectrophotometer. The concentration of the curcumin was found to be different for each sample (Table.1).

Table 1.Spectrophotometric analysis

SI No.	Turmeric powder	OD at 420nm
1	A	1.76
2	B	1.32
3	C	1.67

Antibacterial activity

The antibacterial activity of selected brands of turmeric powder with homemade was carried out andtabulated.

Table .2

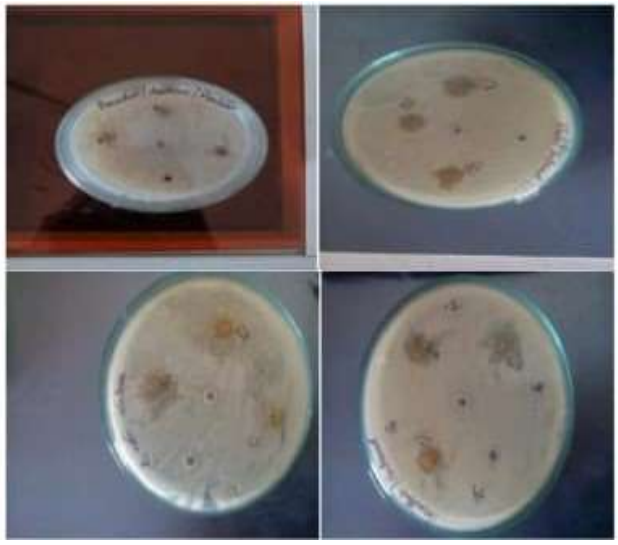
Sl. No.	Name of bacteria	Home made turmeric powder					Brand code of turmeric powder		
		C.longa	***C.aromatica***	***C.amada***	***C. caesia***	***C.angustifolia***	A	B	C
1	*Klebsiella*	+	+	-	-	-	+	+	+
2	*Proteus*	+	-	-	-	-	+	+	+
3	*Bacillus*	+	+	+	+	-	+	+	+
4	*E.coli*	-	-	-	-	-	+	+	-

\+ Sensitive
\- Not Sensitive

The diameter of the zone of inhibition was used to assess the antibacterial activity. Observable results were obtained when the antibacterial potential was tested against several bacterial strains. This experiment employed commercial brands A, B, and C of turmeric powder and the results revealed that *Klebsiella sp.* was sensitive to those brands (Plate.2). In the case of *E,coli* , it was sensitive to Brand A and B, not sensitive to brand C. The homemade powder result showed that *C.longa* was sensitive to *Klebsiella, Proteus* and *Bacillus* whereas E.coli was not sensitive. *C.aromatica* was sensitive to *Klebsiella* and *bacillus* ; not sensitive to *Proteus* and *E.coli. C.amada* and *C.caesia* was sensitive to *Bacillus* only and not sensitive to remaining species. *C.angustifolia* was not sensitive to all species like *Klebsiella, Proteus, Bacillus and E.coli* (Plate.1, Table.2).

Plate.1 Showing antibacterial activity of homemade turmeric powder

Plate.2 Showing antibacterial activity of commercial turmeric powder A,B,C



Discussion

Along with the three brands of turmeric powder obtained from the market, the antibacterial and Spectrophotometric analyses of the five chosen species were also studied. Thus, it is shown that turmeric, a common dietary item, may help to protect humans against some of nature's enemies like germs. In the three various brands of turmeric powder that are commercially available, a comparative study was carried out to determine how much curcumin was present. The results showed that colouring agents were present. Brand A displayed an absorbance of 1.76, Brand B displayed 1.32, and Brand C displayed 1.66 whereas pure curcumin had an absorbance of 1.12 at 420nm. It is evident that the samples include colouring agents since the spectrophotometer detects the coloured component in the sample. By measuring the diameter of the zone of inhibition, antibacterial activity was determined. Observable results were obtained when the antibacterial was tested against several bacterial strains. When tested against specific bacterial strains such *Klebsiella sp, Bacillus sp, E.coli,* and *Proteus sp.,* the extract from each species shown clear antibacterial activity.

Conclusion

The pigment curcumin, which is derived from five distinct *Curcuma* species, including *Curcuma longa, Curcuma aromatica, Curcuma amada, Curcuma caesia* and *Curcuma angustifolia* has been investigated thoroughly using a spectrophotometer. The antibacterial activity was also observed for the five species chosen as well as the three brands of turmeric powder owned from the market. Thus, it clearly showed that turmeric, a natural food component, may provide some kind of defence against our natural adversaries like germs.

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