International Journal of Botany Studies
www.botanyjournals.com
ISSN: 2455-541X
Received: 01-03-2022, Accepted: 16-03-2022, Published: 30-03-2022
Volume 7, Issue 3, 2022, Page No. 240-244

Phytochemical analysis and antibacterial activities of *Curcuma longa*

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Abstract
Using the grinding method, dry turmeric was collected and ground into a fine powder. Carbohydrate, alkaloids, and tannin are all found in the phytochemical data. Turmeric's biological functions could be explained by the presence of these phytochemicals, which were also examined for antibacterial activity and found to be more effective against Bacillus subtilis and Escherichia coli.

Keywords: turmeric; phytochemical; antibacterial activity

Introduction

Curcuma longa, a member of the ginger family Zingiberaceae, has underground rhizomes. It is a rhizomatous herbaceous perennial herb that reaches three to five feet tall and is widely farmed in Asia, India, China, and in many other countries. Turmeric is a globally important spice with a long history of use, notably among Eastern peoples [1]. Because of its medicinal characteristics, it is utilised as traditional medicine in Asian nations such as India, Bangladesh, and Pakistan, in addition to being used as a spice [2]. It's utilised for flavouring as well as therapeutic purposes [3]. Its powder is used in traditional medicine to treat gastrointestinal ailments, particularly biliary and hepatic disorders, diabetic wounds, rheumatism, inflammation, sinusitis, anorexia, coryza, and cough [4]. Curcumin is the colouring agent of the turmeric and is the vital element of the turmeric [4]. Turmeric has been proven to be anticancer, antidiabetic, antioxidant, hypolipidemic, anti-inflammatory, antibacterial, anti-fertility, anti-venom, hepatoprotective, nephroprotective, anticoagulant, and other health benefits in recent studies. The turmeric has also been demonstrated to have activity against HIV and in the fight against AIDS. Turmeric's medical characteristics have led to its classification as a spice having multifunctional therapeutic properties. Turmeric is a plant that has been used in traditional medicine for over 3000 years. [5]. In Asia, turmeric is utilised not only as a spice in the food nut also used for religious purposes. Turmeric is often referred to as "Indian saffron" because of its vivid yellow colour. About 3000 studies on turmeric have been published in the previous 25 years, suggesting that contemporary medicine has recognised its importance. This review delves deeper into the uses and usage of turmeric, beginning with in vitro investigations, then animal studies, and ultimately human trials. Called a natural defence mechanism against illness and infection, higher plants produce tens of thousands of these chemicals as secondary metabolites. Many of these natural chemicals have pharmacological or biological features that could be utilised in pharmaceutical development. In many ancient and current civilizations, plant-based remedies have long been an important aspect of health care. Plant-based remedies or formulations are used in Ayurveda, an ancient Indian holistic medical system, to treat a variety of ailments, including cancer. Natural components were used in the majority (61%) of the 800 small-molecule medications launched in the world between 1981to 2001. [6]. Plant-based medications are better suited for human usage, at least in biochemical terms, than manufactured ones. Despite this, contemporary medicine has not examined or endorsed the use of natural substances for medical purposes.

Fig 1: structure of fresh turmeric

Hcomposition of Turmeric

Turmeric has about 100 components that have been identified. Turmeric has a volatile oil that contains turmerone, as well as other colouring compounds called curcuminoids. Curcuminoids are natural antioxidants that include curcumin demethoxycurcumin, 5'-methoxycurcumin, and dihydrocurcumin [7, 8]. Turmeric contains moisture (>9%), curcumin (5–6.6%), extraneous matter (0.5 percent by weight), mould (3%), and volatile oils (3.5 percent) in its normal form. D-phellandrene, d-sabinene, cinol, borneol, zingiberene, and sesquiterpenes are all volatile oils [9]. Many sesquiterpenes exist, including germacrone, turmerone, ar-(+)-, -, and -turmerones; -bisabolene; -curcumene; zingiberene; - sesquiphellanderene; bisacurone; curcumenone; dehydrocurdione; procurcumadiol; bis-acumol; curcumenol; isoprocurcumeno. Turmeric's scent is created by the compounds turmerone, arturmerone, and zingiberene. In addition to stigmasterole, -sitosterole, cholesterol, and 2-hydroxymethyl anthraquinone [10], the rhizomes are said to include four novel polysaccharides: ukonans [11]. 100 grammes of turmeric contain 390 calories, 10 grammes of total fat, 3 grammes of saturated fat, 0 mg of cholesterol, 0.2 mg of calcium, 0.26 mg of phosphorous, 10 mg of sodium, 2500 mg of potassium, 47.5 mg of iron, 0.9 mg of thiamine, 0.19 mg of riboflavin, 4.8 mg of niacin, 50 mg of [12]. Turmeric is also high in the fatty acids -3 and -linolenic acid (2.5) [13].

Metrials and Method

Experimental section

Preparation of turmeric powder

Turmeric rhizomes are dried and powdered using grinding method.

Fig 2: Powder of Turmeric Phytochemical Components

Standard techniques were used to screen Turmeric extract for phytochemicals, with minor changes in some areas. (16-19).

Phytochemical Test

Test for Alkaloids

Dragendroff's reagent was used to verify this, and Wagner's reagent was used to confirm it..

Wagner's Test

Wagner's reagent was combined with 1ml of the filtrate. The presence of alkaloids was revealed by the formation of a brownish precipitate.

Test for phenol

Ferric Chloride Test

Test extract were treated with 4 drops of Alcoholic FeCl3 solution. Formation of bluish black colour indicate the presence of Phenol.

Steroid

In a test tube, 1 mL of extract was mixed with 10 mL chloroform. Without agitating the mixture, concentrated H2SO4 acid was gently poured through the tube walls. In the H2SO4 acid layer, the appearance of a red interface and yellow-greenish fluorescence indicated the presence of steroid.

Test for Tannins

Lead Test

In a test tube, 20mg of turmeric was dissolved in 1ml of distilled water, followed by 1-3 drops of ferric chloride. The combination was then examined to see if it was blue or green in colour.

Test for Saponins

Foam Test

40 mg turmeric was diluted in 5ml distilled water and briskly agitated until a stable, persistent froth formed. The froth was combined with three drops of olive oil and rapidly agitated before being examined for emulsion.

Determination of antibacterial activity

The antibacterial activity was performed by disc diffusion method using Escherichia coli, Pseudomonas aeruginosa.

Preparation of plant powder solutions for the experiment

The powdered turmeric was weighed (10 mg/ml) and diluted in sterile distilled water to make adequate dilutions of around 25 µl (25 µg), 50 µl (50 µg), 75 µl (75 µg), and 100 µl (100 µg). Unless they were utilised in the experiment, they were kept in the refrigerator. The test solution was compared to a standard solution containing Gentamicin for bacteria and fungi. Unless they were utilised in the experiment, they were kept in the refrigerator.

Preparation of dried filter paper disc

Whatmann filter paper (no. 1) was used to make 6mm-diameter discs that were sterilised with hot air. The discs were sterilised before being loaded with various quantities of Curcuma Longa plant extract solution and maintained in the refrigerator for another 24 hours.

Microorganism

Bacteria causing infectious diseases both in animals and human were used in the current research. They were gram positive bacteria and gram-negative bacteria like Bacillus Subtillis and E. coli were used.

Table 1: Qualitative Analysis of *CURCUMA Longa*

Phytochemical	water	ethanol
Alkaloids Wager's test	+	+
Phenol		
Ferric chloride test	+	+
Steroid	-	-
Tannis	+	+
Saponnis	+	+

Fig 3: Qualitative analysis of *curcuma longa*

In Vitro Antibacterial Activity

The antimicrobial activities of powder of Curcuma Longa were studied against the pathogenic bacterial strains Bacillus Subtilis and Escherichia coli. The powder's antibacterial activity was measured in terms of bacterial and fungal growth inhibition zones. The antibacterial outcome has sparked interest in developing new antimicrobial medications that are free of adverse effects for the treatment of infectious disorders. The consequences of such colonisation in vital human organs as the lungs, urinary tract, and kidneys might be lethal. (20). Turmeric extract of *Curcuma Longa* also shows high activity against Bacillus Subtilis with zone of inhibition 1mm and E. coli

with zone of inhibition of 16 mm by the method of disc diffusion. *Curcuma longa has* better antibacterial activity against gram positive bacteria B.subtilis in 11 mm at 100µg\ml and gram-negative E. coli in 16 mm at 100µg\ml. So, *curcuma longa* shows better antibacterial activity when concentration increases antibacterial activity also increased.

Table 2: Zone of inhibition of the synthesized Curcuma Long

S. No	Positive and Negative Pathoge n	Zone of inhibition (diameter in mm)				Standard (Gentamicin)
		25 µg/mL	50 µg/m L	75 µg/mL	100 µg/mL	
1	Bacillus Subtilis	7	9	10	11	12
2	Escheric hia coli	9	11	14	16	17
3	Control (DMSO)	NI	NI	NI	NI	NI

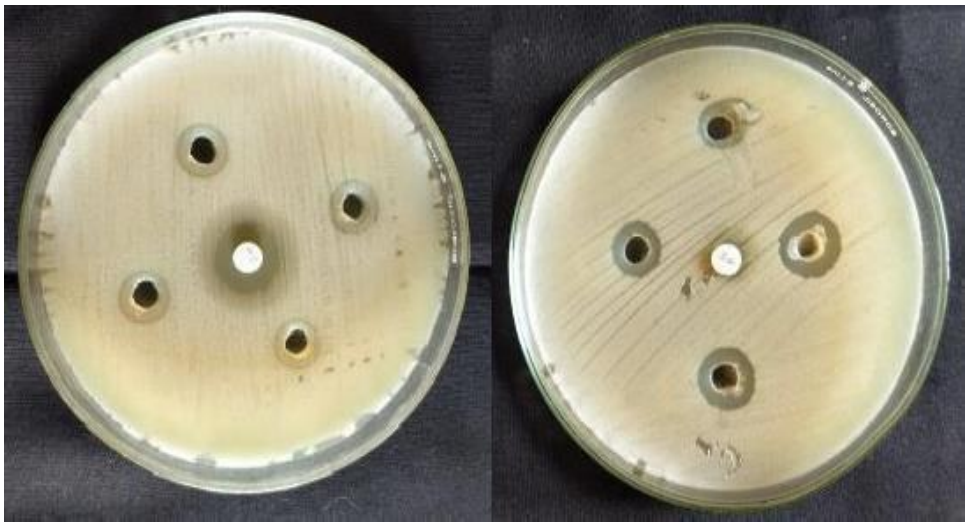

Fig 4: Zone of inhibition of the Curcuma Longa

Conclusion

Phytochemical screening showed the presence of biologically active phytochemical Flavonoids, Tannin, Glycosides, Triterpinoids, Steroids. Antibacterial activity of powder of *Curcuma Longa* was evaluated using disc diffusion and method. The antibacterial and of powder of *Curcuma Longa* was tested against Bacillus Subtilis and Escherichia coli. When concentration increases antibacterial activity. The result showed that Curcuma Longa was found to be more effective against bacteria. On the basis of the results obtained in the presents study, it concluded that powder of Curcuma Longa has potent antibacterial activities.

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