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Phytochemical and Antimicrobial Screening of Turmeric (*Curcuma longa* L.)

Abstract

As microbial pathogens developing tolerance against current drug formulation so there is always a continuous need to isolate a new drug from plant sources. Keeping this in mind the present work was designed to identify antimicrobial potential of photochemical isolated from turmeric. In present study the phytochemical screening of turmeric for alkaloids, carbohydrates, flavonoids, glycosides, proteins, phenols, saponin, steroid, tannin and terpenoids was performed. The phytochemical analysis of the methanolic extract showed the presence of alkaloids, carbohydrates, flavonoids, phenols, steroids and terpenoids. The antimicrobial analysis of turmeric extract showed highest activity by methanol extract against *Staphylococcus aureus* (13mm). *Escherichia coli* showed no sensitivity against all extracts.

Suneet Kumar Sahni
Assistant Professor,
Deptt. of Chemistry,
Government (P.G.) College,
Bisalpur, Pilibhit

Keywords: Phytochemicals, Alkaloids, *Staphylococcus Aureus*, Flavonoids.

Introduction

India has rich culture, tradition and natural biodiversity and it provides opportunity for drug discovery research. According to Jachas, 2007 and Singh, 2002 number of traditional natural products have been increased and much work has been done on selected ethno medicinal plants for antibacterial activity against pathogenic strains of Gram negative and Gram positive bacteria. They provide best alternatives to chemically synthetic drugs to which many infectious microorganisms have become resistant. Further, natural products as an alternative to conventional treatment in healing and treatment of various diseases have been on the rise in the last few decades. Turmeric (*Curcuma longa* L.) is a medicinal plant extensively used in Ayurveda, Unani and Siddha medicine as home remedy for various diseases. Turmeric is well known member of family Zingiberaceae. It shows anti-inflammatory, anti-tumor, anti-rheumatic and anti phlegmatic property.

Review of Literature

Saxena Jyoti et.al (2012) isolated ten phytochemicals (Carbohydrate, Proteins, Starch, Amino acids, Steroid, Glycoside, Flavonoid, Alkaloid, Tannin and Saponin) from Methanolic extracts of rhizomes of Curcuma longa. Rajesh et.al (2013) has reported ten phytochemicals from Methanolic extract of curcuma longa. Swadhini S.P. et.al (2011) determined six phytochemicals viz Alkaloids, Flavonoids, Tannin, Saponins, Cardiac Glycosides and phenol from aqueous extract of Turmeric. Saxena Jyoti et.al (2012) isolated ten phytochemicals (Carbohydrate, Proteins, Starch, Amino acids, Steroid, Glycoside, Flavonoid, Alkaloid, Tannin and Saponin) from Methanolic extracts of rhizomes of Curcuma longa. Rajesh et.al (2013) has reported ten phytochemicals from Methanolic extract of curcuma longa. Swadhini S.P. et.al (2011) determined six phytochemicals viz Alkaloids, Flavonoids, Tannin, Saponins, Cardiac Glycosides and phenol from aqueous extract of Turmeric. Saxena Jyoti et.al (2012) isolated ten phytochemicals (Carbohydrate, Proteins, Starch, Amino acids, Steroid, Glycoside, Flavonoid, Alkaloid, Tannin and Saponin) from Methanolic extracts of rhizomes of Curcuma longa. Rajesh et.al (2013) has reported ten phytochemicals from Methanolic extract of curcuma longa. Swadhini S.P. et.al (2011) determined six phytochemicals viz Alkaloids, Flavonoids, Tannin, Saponins, Cardiac Glycosides and phenol from aqueous extract of Turmeric. Saxena Jyoti et.al (2012) isolated ten phytochemicals (Carbohydrate, Proteins, Starch, Amino acids, Steroid, Glycoside,

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Recently Swadhini et al., (2011) isolated six phytochemicals (Alkaloids, Cardiac Glycosides, Flavonoids, Tannin, Saponins, and phenol) from aqueous extract of Turmeric. Saxena and Rajeshwari (2012) reported ten phytochemicals (Carbohydrate, Proteins, Starch, Amino acids, Steroid, Glycoside, Flavonoid, Alkaloid, Tannin and Saponin) from Methanolic extracts of turmeric. Rajesh et al., (2013) has reported ten phytochemicals from Methanolic extract of *Curcuma longa. C. longa*, attributing a wide array of biological activities (Tilak et al., 2004; Kumar et al., 2006) anti-inflammatory (Sandur et al,. 2007; Aggarwal and Harikumar 2009) wound healing (Maheshwari et al., 2006), anticancer (Kim et al., 2012) and antibacterial activity (Gupta and Sadhana 2005; Naz et al., 2010). Kaur et al., 2017, Yadav et al., 2018 and Yadav, 2018 tested the antimicrobial activity of plants and showed that plants are a potential source of innovative antibiotic prototype.

Objective of the study

The present investigation was performed for phytochemical and antimicrobial analysis of turmeric.

Methodology

Collection of plant material

Plant materials were collected from local market and were stored in laboratory for future use.

Preparation of extract

10 g of powdered rhizome were used for solvent extraction via Soxhlet apparatus following standard protocol (Nag et al., 2012). After the complete process, the collected extracts were subjected for evaporation at room temperature. The dried extracts were stored at 4˚C for future analysis.

Phytochemical screening

Phytochemical screening was carried out to determine the presence of saponins, tannins, flavonoids, glycosides, terpenoids, phytosterols and cardiac glycosides, proteins, carbohydrates and phenols.

Phytochemical Test	Procedure	Observation	Result
Saponins (Foam test)	200 mg of powdered sample was mixed with 5 ml of distilled water and shaken vigorously	Formation of foam	Saponins Present
Tannins (Ferric chloride test)	200 mg of extract was treated with few drops of 0.1% ferric chloride	Blue or black colouration	Tannins present
Alkaloids (Wagner's test)	0.5ml of extract solution was treated with 2-3 drops of Wagner's reagent (solution of Iodine in potassium iodide)	Reddish brown precipitate	Alkaloids present
Flavonoids (Alkaline reagent test)	To the extract solution, few drops of sodium hydroxide was added, formation of an intense yellow colour and then added few drops of acetic acid	Colourless	Flavonoids present
Sterols and Triterpenoids (Salkolwski's test)	Extract was treated with chloroform, few drops of concentrated H_2SO_4 was added, the test tube will be shaken well and allowed to stand for some time.	The appearance of red colour / formation of yellow colour at the lower layer	Red colour indicated presence of sterols and yellow colour indicates presence of triterpenoids
Cardiac Glycosides (Keller Killani test)	The extract was treated with 0.4 ml of glacial acetic acid containing a trace amount of ferric chloride solution was added. The mixture will be	The appearance of blue color in acetic acid layer	Cardiac glycosides present

	transferred to small test tube. 0.5 ml of concentrated H_2SO_4 will be added along the sides of the test tube		
Proteins	5ml of extract was mixed with 10% NaOH solution and added few drops of copper sulphate	Reddish violet colour	Protein present
Carbohydrate	To 1ml of extract, 1ml of Benedict's reagent was added. The mixture is heated on a boiling water bath for 2 minutes	appeared green	Reducing sugars present

Bacterial Cultures

Pseudomonas aeruginosa (NCIM-5210), Staphylococcus aureus (NCIM-2079) and *Escherichia coli* (NCIM-2064).

Solvents and Media

Methanol, Nutrient Agar

Agar Well Diffusion Method

Extracts were tested for the anti-bacterial potential by Agar well diffusion method (Irshad et al, 2012). Initially, autoclaved nutrient media were poured in the Petri plates under laminar air flow and after solidification of media the bacterial suspension (24 hrs old) swab over the media. The wells were prepared using cork borer. Test sample was dissolved in DMSO in different concentrations such as 25, 50, 100 µg/ml and 40 µl dissolved test sample from each concentration was loaded to the wells and incubated for 24 hrs at 37ºC. DMSO (Di Methyl Sulfoxide) was used as a negative control whereas antibiotic amoxicillin disc (10µg) used as positive control.

Discussion and Results

Turmeric extract showed presence of alkaloids, carbohydrates, flavonoids, phenols, steroids and terpenoids (Table-1). In table -2 antimicrobial activity of turmeric extract was studied. Results showed that staphylococcus aureus was highly sensitive to methanolic extract of turmeric (13mm). Antimicrobial activity of extract increases as the concentration increases (Figure-1). *Escherichia coli* showed no sensitivity against extract. Chandrana et al. (2005) and Kim et al. (2005) reported that turmeric extract was effective against *Escherichia colii, Bacillus subtilis* and *Staphylococcus aureus* which may be due to the presence of curcuminoid, a phenolic compound. The data supports the hypothesis that *turmeric rhizome* has an inhibitory effect on the growth of certain pathogens due to presence of phytochemicals like alkaloids, flavonoids, phenols, steroids and terpenoids. In vitro studies are the first step in using plants as pharmaceutical and food additives. Then, further *in vivo* studies will certify their physiologic role.

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Table 1: Phytochemical Analysis of Plant Extract (in methanol)

S.No.	Phytochemicals	Turmeric
1	Alkaloids	+ve
2	Carbohydrates	+ve
3	Falavonoids	+ve
4	Glycosides	-ve
5	Proteins	-ve
6	Phenols	+ve
7	Saponin	-ve
8	Steroid	+ve
9	Tannins	-ve
10	Terpenoids	+ve

Table 2: Effect of turmeric extract on growth of bacteria *in vitro*.

Bacteria	Methanol extract(µg/ml)			DMSO (Negative control)	Amoxycillin (Positive control)
	25	50	100		
Pseudomonas aeruginosa	-	7	9	-	18
Staphylococcus aureus	-	9	13	-	20
Escherichia coli	-	-	-	-	16

Figure 1: Inhibition Zone Photograph of *S. Aureus* For Methanol Extract Of Turmeric.