PHYTOCHEMICAL AND ANTIMICROBIAL SCREENING OF TURMERIC (*Curcuma longa* L.)

Suneet Kumar Sahni
Department of Chemistry
Government (P.G.) College, Bisalpur, Pilibhit

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.

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

Introduction

India has great opportunity for drug discovery research due to its rich culture, tradition and natural biodiversity. 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

Recently Swadhini et al., (2011) isolated six phytochemicals (Alkaloids, Cardiac Glycosides, Flavonoids, Tannin, Saponins, and phenol) from aqueous extract of Turmeric. Saxena and Rajeshwari in 2012 reported ten phytochemicals 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

Preparation of Turmeric Extract

Turmeric rhizomes were collected from local market and were washed under tap water and distilled water. 10 g of turmeric powder was used for solvent extraction via Soxhlet apparatus with methanol. The extract was evaporated at room temperature.

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.

1. Test for Saponins (Foam test)

To test presence of saponins 200 mg of sample powder was mixed with 5 ml of distilled water and was shaken vigorously for a stable persistent broth. Foam formation confirmed the presence of saponins in turmeric.

2. Test for Tannins (Ferric chloride test)

Few drops of 0.1% ferric chloride solution was added in turmeric extract. Formation of blue black colour indicated the presence of tannins in extract.

3. Test for Alkaloids (Wagner's test)

2-3 drops of Wagner's reagent was added in 0.5ml turmeric extract. Formation of reddish brown precipitate indicated the presence of alkaloids.

4. Test for Flavonoids (Alkaline reagent test)

Few drops of sodium hydroxide were added in the extract solution. First formation of an intense yellow color and then turning in to colourless solution on addition of few drops of dilute acetic acid indicate the presence of flavanoids in extract.

5. Test for Sterols and Triterpenoids (Salkolwski's test)

After treating with chloroform, few drops of concentrated H_2SO_4 was added in extract, the test tube will be shaken well and allowed to stand for some time. The appearance of red colour in upper layer confirmed the presence of sterol and formation of yellow colour at the lower layer confirmed the presence of triterpenoids in turmeric extract.

6. Test for Cardiac Glycosides (Keller Killani test)

After drying with chloroform, 0.4 ml of glacial acetic acid containing a trace amount of ferric chloride solution was added in extract. 0.5 ml of concentrated H_2SO_4 was added along the sides of the test tube. Blue color formation in acetic acid layer indicated the presence of cardiac glycosides in turmeric extract.

7. Screening of Phenol

1ml of the extract was treated with 3ml 10% lead acetate solution. A bulky white precipitate indicates the presence of phenolics in extract.

8. Screening for Proteins

5ml of turmeric extract was treated with 10% NaOH solution. After addition of few drops of copper sulphate, formation of reddish violet color confirmed the presence of proteins in extract.

9. Screening for Carbohydrate test

1ml of extract was treated with 1ml of Benedict's reagent. The mixture was heated on a boiling water bath for 2 minutes solution. Appearance of green color showed the presence of reducing sugar in extract.

Bacterial Cultures

1. *Escherichia coli* (NCIM-2064)
2. *Pseudomonas aeruginosa* (NCIM-5210)
3. Staphylococcus aureus (NCIM-2079)

Agar Well Diffusion Method

Anti-bacterial potential of Turmeric extract was tested by Agar well diffusion method. Nutrient agar was autoclaved and poured in the Petri plates under laminar air flow. After solidification of media the bacterial suspension (24 hrs old) was spread over the media. The wells were prepared using cork borer. Extract was dissolved in DMSO (Di Methyl Sulfoxide) in different concentrations such as 25, 50, 100 µg/ml. 40 µl test sample from each concentration was loaded to the wells and incubated for 24 hrs at 37ºC. DMSO was used as a negative control whereas amoxicillin antibiotic disc (10µg) was 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.

REFERENCES

1. Jachak, S. and Saklani, A. 2007. Challenges and oppurtunities in drug discovery from plants. Curr. Sci, 92(9): 1251-1257.

2. Singh, R. Chandra, R. Boss, M. and Luthra, P.M. 2002. Antibacterial activity of Curcuma longa Rhizome extract on pathogenic bacteria. Curr. Sci, 83(6).
3. Swadhini, S.P., Santosh, R., Uma, C., Mythili, S. and Sathiavelu, A. 2011. "Phytochemical Screening and Antimicrobial activity of five medicinal plants against Myrothecium SP." International Journal of Pharma and Biosciences, 2(1): 272-279.
4. Saxena, J. and Rajeshwari, S. 2012. Evaluation of Phytochemical constituents in Conventional and Non-conventional species of Curcuma." International Research Journal of Pharmacy, 3(8):203-204.
5. Rajesh, H., Rao. S.N., Megha, Rani, N., Prathima, K., Shetty, Rajesh, E.P., Chandrashekhar, R. (2013). Phytochemical Analysis of Methanolic extract of Curcuma longa Linn. International Journal of Universal Pharmacy and Bio Sciences, 2(2): 39-45.
6. Tilak, J. C., Meenal, B., Hari, M., Devasagayam, T. P. A. 2004. Antioxidant availability of turmeric in relation to its medicinal and culinary uses. Phytother Res.,18: 798–804.
7. Kumar, G.S., Harish, N., Shyaja, M.D., Salimath, P.V. 2006. Fress and bound phenolic anti-oxidant in amla (*Emblica officinalis*) and turmer (*Curcuma longa*). J Food Compos Anal., 19: 446–452.
8. Sandur, S. K., Manoj, K.P., Bokyung, S., Kwang, S. A., Akira, M., Gautam, S., Pornngarm, K., Vladimir, B., Bharar, B. A. 2007. Curcumin, demethoxycurcumin, bisdemethoxycurcumin, tetrahydrocurcumin and turmerones differentially regulate anti-inflammatory and anti-proliferative responses through a ROS-independent mechanism. Carcinogen, 28:1765–1773.
9. Aggarwal, B.B., Harikumar, K.B. 2009. Potential therapeutic effects of curcumin, the anti-inflammatory agent, against neurodegerative, cardiovascular, pulmonary, metabolic, autoimmune and neoplastic diseases. Int J Biochem Cell Biol.,41: 40–59.
10. Maheshwari, R.K., Anoop, K.S., Java, G., Rikhab, C.S. 2006. Multiple biological activities of curcumin: a short review. Life Sci., 78:2081–2087.
11. Kim, K. J., Yu, H. H., Cha, J.D., Seo, S.J., Choi, N.Y., You, Y. O. 2005 Antibacterial activity of *Curcuma longa* L. against methicillin-resistant *Staphylococcus aureus*. Phytother Res., 9:599–604.
12. Gupta, S., Sadhana, R. 2005. A comparison of the antimicrobial activity of garlic, ginger, carrot, and turmeric pastes against *Escherichia coli* O157:H7 in laboratory buffer and ground beef. Foodborne Pathog Dis., 2:330–340.
13. Naz, S., Safia, J., Saiqa, I., Farkhanda, M., Farah, A., Aamer, A. 2010. Antibacterial activity of curcuma longa varieties against different strains of bacteria." Pak J Bot.,42: 455–462.
14. Kaur, S. Fatima, N and Yadav, S. 2017. Antibacterial Activity of Different Extracts of Black Pepper." Int. J. Adv. Eng. Sci., 2(1): 172- 173.
15. Yadav, S. Gupta, P. and Rastogi, D. 2018. Antibacterial Activity of Aegle Marmelos Leaf Extracts. Int. J. Cre. Res. Tho., 6(2): 879-881.
16. Yadav, S. 2018. Antibacterial Activity of Garlic. Int. J. Bas. Adv. Res., 4(5): 156-159.
17. Chandrana, H., Baluja, S., Chanda, S.V.2005. Comparison of antibacterial activities of selected species of Zingiberaceae family and some synthetic compounds. Turk J Biol., 29(29):83–97.
18. Irshad, S., Mahmood, M., Parveen, F. 2012. Invitro antibacterial activities of three medicinal plants using agar well diffusion method. Res J Biol., 2: 1–8.

Table 1: Phytochemical analysis of Plant extract (in methanol)

Name of the Phytochemical Constituents	Methanolic Extract of Turmeric
ALKALOIDS	+ve
CARBOHYDRATES	+ve
FALAVONOIDS	+ve
GLYCOSIDES	-ve
PROTEINS	-ve
PHENOLS	+ve
SAPONIN	-ve
STEROID	+ve
TANNINS	-ve
TERPENOIDS	+ve

+ve: Indicates the presence and -ve: Indicates the absence of phytochemical

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.