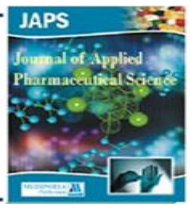
Journal of Applied Pharmaceutical Science
Available online at www.japsonline.com



ISSN: 2231-3354
Received on: 19-04-2012
Revised on: 19-05-2012
Accepted on: 06-06-2012
DOI: 10.7324/JAPS.2012.2624

Anti-microbial Activity of Turmeric Natural Dye against Different Bacterial Strains

R. Mari selvam, A.J.A. Ranjit Singh and K. Kalirajan

R. Mari selvam, K. Kalirajan
PG & Research Department of Chemistry, Sri Paramakalyani College, Alwarkurichi, Tamilnadu, India.

A.J.A. Ranjit Singh
Sri Paramakalyani College, Alwarkurichi, Tamilnadu, India.

For Correspondence
R. Mari selvam
PG & Research Department of Chemistry, Sri Paramakalyani College, Alwarkurichi, Tamilnadu, India.

ABSTRACT

Curcumin, a yellow pigment present in the Indian spice turmeric (associated with curry powder), has been linked with suppression of inflammation; angiogenesis; tumorigenesis; diabetes; diseases of the cardiovascular, pulmonary, and neurological systems, of skin, and of liver; loss of bone and muscle; depression; chronic fatigue; and neuropathic pain. The utility of curcumin is limited by its color, lack of water solubility, and relatively low *in vivo* bioavailability. Because of the multiple therapeutic activities attributed to curcumin, there is an intense search for the ''super curcumin''. In the present study anti microbial activity of turmeric natural dye against different bacterial strains. In the present study *in vitro*, test confirmed the antimicrobial activity of turmeric extract against ten different bacterial strains. The antibacterial activity was measured by agar well diffusion method. The natural dye showed antibacterial activity against all the test bacterial isolates. Turmeric natural dye showed good inhibitory activity against *E.coli and Vibrio cholera* with a zone of inhibition 7mm to 15mm and 10mm to 15mm respectively. As turmeric powders are used to color natural fibers from which consumer products are manufactured. The incorporation of turmeric dye with natural fiber will help to produce value added handicrafts.

Keywords: Anti-microbial Activity, Turmeric, Natural Dye.

INTRODUCTION

Turmeric is a spice that comes from the root *Curcuma longa*, a member of the ginger family, Zingaberaceae (Pierce, 1999). It is bright yellow and has been used as a coloring agent in food in the United States. In India, it has been used for centuries as a spice and a food preservative, and also for its various medicinal properties. In Ayurveda (Indian traditional medicine), turmeric has been used for various purposes and through different routes of administration. It has been used topically on the skin for wounds, blistering diseases such as pemphigus and herpes zoster, for parasitic skin infections, and for acne. It has been used via oral administration for the common cold, liver diseases, urinary tract diseases, and as a blood purifier. For chronic rhinitis and coryza, it has been used via inhalation (Eigner and Scholz, 1999; Majeed *et al.*, 1996)

In the last few decades there has been considerable interest in the active compounds in turmeric called curcuminoids. The major curcuminoid is called curcumin (diferuloyl methane), which makes up approximately 90% of the curcuminoid content in turmeric, followed by demethoxycurcumin and bisdemethoxycurcmin. (Ruby *et al*., 1995). Hundreds of *in vitro* and animal studies have been published describing the antioxidant, anti-inflammatory, antiviral, and antifungal (Apisariyakul *et al*., 1995; Roth et al., 1998) properties of curcuminoids (Ammon *et al*., 1993; Bisset, 1994; Miller and Murray, 1998; White and Foster, 2000; Young-Joon, 1999). The curcuminoids give turmeric its bright yellow color. The antibacterial activity of curcumin bioconjugates has been tested particularly for β-lactamase producing microorganisms (Kumar *et al*, 2001).

Turmeric oil was also tested for antibacterial activity against *Bacillus cereus, Bacillus coagulans, Bacillus subtilis, Staphylococcus aureus, Escherichia coli* and *Pseudomonas aeruginosa*. Turmeric oil was tested for its antifungal activity against *Aspergillus flavus, Aspergillus parasiticus, Fusarium moniliforme* and *Penicillium digitatum*(Jayaprakasha, and Negi, 2001). When combined with amphotericin B or fluconazole, curcumin provided a greater fungicidal effect in the treatment of systemic fungal infections such as candidiasis and candidemia. 13 Curcumin was found to be an antiparasitic agent of natural sources being cytotoxic against African trypanosoma *in vitro*. It was also observed that curcumin possesses nematocidal activity against visceral *Larva migrans* (Kiuchi *et al*,1992) and against the second-stage larvae of dog roundworm, *Toxocara canis*(Kiuchi *et al*, 1993).

The goal of this systematic review of the literature was to summarize the literature on the safety and anti- bacterial activity of curcumin that can be used as natural dye to evalue traditional craft products. The incorporation of curcumin dye with natural fibers that are used to make handicraft products, will add value to the traditional crafts and help to store perishable materials in baskets made of natural fibers.

MATERIAL AND METHODS

Preparation of natural dye from Turmeric

1. Turmeric roots were collected from agricultural field at Alwarkurichi region.
2. The roots were dried and powdered. Also the undried turmeric roots were sliced in to ¼ inch slivers.
3. Hundred grams of slivers and hundred grams of powder of turmeric root were boiled in a vessel with 2 liters of water.
4. Water was poured into the pot with the roots and brought to a low boil. This was simmered for 45 minutes an hour while the water extracts the color. As it was simmering the turmeric emitted a strong smell and the water turned a dark orange color.
5. Banana fibres used to prepare traditional craft products were rinsed well with tap water and wiped well.
6. The simmering dye was removed from its heat source.
7. The natural fibres were put in the pot of turmeric dye and it got submerged in the pot for half an hour. Occasionally the pot was rotated with the tongs to ensure an even development of color.
8. The fibres were removed and rinse thoroughly with cold water. The fibres were hang to dry.
9. The dried fibres were cut into small pieces and powdered. This powder was used for further testing.

Vibrio harveyi, E.coli, Entrococcus faecolis, Plesiomonas shigelloides, Salmonella paratyphi, Vibrio alginolyticus, Vibrio mimicus, Vibrio cholera, Staphylococcus lutea and Pseudomonas aeruginosa. Were selected for the antibacterial screening studies.

Agar well diffusion method

The antibacterial activity of turmeric dye with powdered fibers was tested against ten bacterial isolates using agar well diffusion method (Ahmad and Beg, 2001). The culture plates were inoculated with 100µl of standardized inoculums (1.5x108 CFU/ml) of each bacterium (in triplicates) and spread with sterile swabs. Wells are 6 mm sizes were made with sterile borer into agar plates containing the bacterial inoculums and the lower portion was sealed with a little molten agar medium. The dye with fiber was dissolved in water 100mg in 500ml of DMSO. From this stock solution 25µl, 50µl and 100µl volume was poured into the wells of the culture plates. Standard antibiotic disc was used as a negative control. The plates thus prepared were left at room temperature for ten minutes allowing the diffusion of the extract into the agar. After incubation for 24 hrs at 37oC, the plates were observed. If antibacterial activity was present on the plates, it was indicated by an inhibition zone surrounding the well containing the natural dye. The zone of inhibition was measured and expressed in millimeters. Antibacterial activity was recorded if the zone of inhibition was greater than 6 mm. The antibacterial activity results were expressed in term of the diameter of zone of inhibition and <9mm zone was considered as inactive; 9-12mm as partially active; while13-18mm as active and >18mm as very active (Junior and Zanil, 2000). The mean and standard deviation of the diameter of inhibition zones were calculated.

RESULT AND DISCUSSION

There has been an increasing consumer demand for natural dye coated traditional products like mat, Coconut shell products, Palmyra leaf products and toys etc, because synthetic dyes coated material could be toxic to humans. Concomitantly, consumers have also demand for wholesome and safe products with long shelf life. These requirements are often contradictory and have put pressure on the traditional industry for progressive removal of chemical dyes and adoption of natural alternatives to obtain its goals concerning safe products with long shelf life.

The turmeric natural dye possessed activity against eight different bacterial strains (table 1). The natural dye powder was active against *E. coli* and *vibrio cholera*. Chandrana, *et al*., (2005) who studied antimicrobial activity of turmeric reported that it was effective against *E. coli, B. subtilis* and *S. aureus* and suggested

that the activity is due to the presence of curcuminoid, a phenolic compound. The antimicrobial property of turmeric has been attributed to the presence of essential oil, an alkaloid, curcumin and other curcuminoids, turmeric oil, turmerol and veleric acid (Cikrikci, *et al*., 2008).

Table. 1: Anti microbial activity of turmeric natural dye against different bacterial strains.

Tested bacterial strains	Turmeric powdered			Erythromycin 5mcg/disc
	25µl	50µl	100µl	
Salmonella paratyphi	-	-	-	-
Pseudomonas aeruginosa	10	11	13	17
Vibrio harveyi	7	9	12	7
E.coli	7	9	15	10
Entrococcus faecolis	10	11	14	-
Plesiomonas shigelloides	-	-	-	9
Staphylococcus lutea	9	10	13	-
Vibrio alginolyticus	11	11	14	8
Vibrio mimicus	-	-	-	9
Vibrio cholera	10	12	15	-

In the present study it was observed that the banana fiber coated with turmeric extract posses a good antibacterial activity against pathogenic microbes. At a dose level of 100µl the turmeric extract was able to inhibit the growth of all the bacteria tested. This indicates that the traditional craft products can be colored with turmeric at the time of making. This turmeric dye coated fiber products can add antimicrobial activity and will protect the products so as to the consumable food materials.

ACKNOWLEDGEMENT

The author is grateful to DST for providing funds and the Principal, Sri Paramakalyani College, Alwarkurichi, Tamilnadu, India, for providing research facilities.

REFERANCE

A.Junior and C. Zanil. Biological screening of Brazilian meditional plants. Braz. *J. Sci*. 2000;95: 367-373.

Ammon H, Safayhi H, Mack T, Sabieraj. Mechanism of antiinflammatory actions of curcumin and boswellic acids. *J Ethnopharmacol*. 1993; 38:113.

Apisariyakul A, Vanittanakorn N, Buddhasukh D. Antifungal activity of tumeric oil extracted from *Curcuma longa* (Zingiberaceae). *J Ethnopharmacol*. 1995; 49:163–169.

Bisset NG, ed. Herbal Drugs and Phytopharmaceuticals. Boca Raton, FL. CRC Press. (1994).

Eigner D, Scholz D. *Ferula asa-foetida* and *Curcuma longa* in traditional medical treatment and diet in Nepal. *J Ethnopharmacol*. 1999; 67:1–6.

F. Kiuchi, S. Nishizawa, A. Uchitani, H. Ohshima, K. Kondo and Y. Tsuda. *Chem. Pharm. Bull*. 1992; 40: 3234

F. Kiuchi, Y. Goto, N. Sugimoto, N. Akao and Y. Tsuda. *Chem. Pharm. Bull*. 1993; 41: 1640-1643.

H. Chandrana, S. Baluja and S. V. Chanda. Comparison of antibacterial activities of selected species of Zingiberaceae family and some synthetic compounds. Turk. *J. Biol*. 2005; 29 83-97.

Jayaprakasha, G.K.; Negi, P.S.. Anandharamkrishnan, C. and Sakariah, K.K.; *J. Biosci*. 2001; 56: 40-44.

Kumar, S; Narian, U.; Tripathi, S. and Misra, K.; *Bioconjugate Chem*. 2001; 12: 464-469.

Majeed M, Badmaev V, Shivakumar U, Rajendran R.. Curcuminoids. Antioxidant Phytonutrients. Nutriscience Publishers, Inc. (1995).

Miller L, Murray WJ. Herbal Medicinals. A Clinician's Guide. Binghamton, NY. Pharmaceutical Products Press. (1998).

Peirce A. The American Pharmaceutical Association Practical Guide to Natural Medicines. New York, NY. The Stonesong Press. (1999).

Roth G, Chandra A, Nair M. Novel bioactivities of *Curcuma longa* constituents J Nat Prod. 1998; 61:542–545.

Ruby J, Kuttan G , Babu KD, Rajashekharan KN, Kuttan R. Antitumor and oxidant activity of natural curcumnoids. *Cancer Lett*. 1995; 94:79–83.

S. Cikricki, E. Mozioglu and H. Yýlmaz,. Biological activity of curcuminoids isolated from *Curcuma longa*. Rec. Nat. Prod. 2008; 2; 19-24.

V., Ahmed, F. T. Baqai and R. Ahmed. A tigogenin pentasaccharide from Cestrum diurnum. Phytochem. 1993; 34 511-515.

White LB, Foster S. The Herbal Drugstore. Emaus, PA: Rodale Inc (2000).

Young-Joon S. Molecular mechanisms of chemopreventive effects of selected dietary and medicinal phenolic substances. Mutat Res. 1999; 428:305–327.