Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2017; 6(3): 171-173
Received: 05-03-2017
Accepted: 06-04-2017

Md. Golam Azam
PhD, Assistant Professor
Department of Pharmaceutical Sciences, North South University, Dhaka, Bangladesh

Md. Shibly Noman
Department of Pharmaceutical Sciences, North South University, Dhaka, Bangladesh

Md. Adit Muktadir Pavel
Department of Pharmaceutical Sciences, North South University, Dhaka, Bangladesh

Correspondence
Md. Golam Azam
PhD, Assistant Professor
Department of Pharmaceutical Sciences, North South University, Dhaka, Bangladesh

Evaluation of anti-diarrhoeal activity of *Curcuma zedoaria* rhizome

Md. Golam Azam, Md. Shibly Noman and Md. Adit Muktadir Pavel

Abstract
Curcuma zedoaria (family: Zingiberaceae) is broadly used as a folk medicine in dyspepsia, cough, dermatosis, inflammations, diarrhoea and other diseases. In the present study, ethanol extracts of *Curcuma zedoaria* rhizomes was evaluated for phytochemical screening and antidiarrhoeal activity. The results showed that *Curcuma zedoaria* extract dose-dependently reduced the severity & frequency of diarrhoea in mice compared with the standard antimotility drug loperamide. Preliminary phytochemical screening of ethanol extract showed the presence of tannins, flavonoids, saponins, alkaloids, terpinoids, carbohydrates and steroids as major constituents, some of which possess antidiarrhoeal activity and justify the traditional use of the plant extract in the treatment of diarrhea.

Keywords: *Curcuma zedoaria*, phytochemical screening, antidiarrhoeal

1. Introduction
Curcuma zedoaria or white Turmeric is a herbaceous and rhizomatous perennial plant belonging to the family Zingiberaceae. Some common names of the plant are kachur (Hindi), karchur (Sanskrit), shatkachuro (Gujarati), Meitei Yaingang (Manipuri) and shoti (Bangla) [1]. The plant is native to Bangladesh, India, Sri Lanka and Indonesia and cultivated in Brazil, China, Japan, Nepal, Malaysia, and Thailand [2]. The perennial herb has a woody, warm-spicy and camphoraceous cineolic odor and bears shiny yellow flowers, with green and red bracts. The ovate leaves are 1 to 2 feet long, narrowing at the base and possess purple-colored spots. Fruits are triangular and ovate in shape. Seeds are spear or oval shaped.
The rhizome of *C. zedoaria* is reported to possess anti-allergic [3], hepatoprotective [4], antimicrobial [5, 6], anti-zedoaronediol [7], analgesic [8], antipyretic [9], cytotoxic [10], antioxidant [11] and anti-hyperlipidemic [12] activities. The major active constituents of the plant are terpenoids, specially sesquiterpenoids like furanodienone and furanodiene, sesquiterpenes like procurcumenol and epiprocurcumenol [13], zederone, curzerenone, curzeone, germacrone, 13-hydroxygermacrone, dehydrocurdione, zedoaronediol [7], curcumenone, curcumanolide A, curcumanolide B [14], isocurcumenol, beta-turmerone and ar-turmerone [15].
The rhizome of *C. zedoaria* has been used traditionally for the treatment of menstrual disorders, dyspepsia, cough, vomiting [16], inflammations, hepatitis and diarrhoea [17]. However, no scientific work has been reported yet in support of the anti-diarrhoeal activity of *C. zedoaria*. Henceforth, the current study was carried out to investigate the anti-diarrhoeal activity of *C. zedoaria.*

Materials and Methods
Plant material
We collected the plant *Carcuma zedoaria* from Savar, Bangladesh. Experts of Bangladesh National Herbarium (BNH) Mirpur, Dhaka identified the plant (accession number 36098) and preserved the specimen.

Preparation of plant extract
The rhizomes of the collected plant were washed with water and separated from unwanted materials. They were partially air dried by the use of a fan. Afterward, we heated the rhizomes in the oven at below 40ºc for two days. The dried rhizomes were then grinded to make powder with a grinder. The powder was stored in a zipper bag in the refrigerator at +4ºc. About 500 gm of powdered material was taken in a clean, flat-bottomed glass container and soaked in 1500 ml of 80% ethanol. The container with the contents was sealed and kept for seven days and was subjected to occasional shaking and stirring. The entire mixture went through a coarse iltration by a piece of clean cotton cloth. Then we filtered the mixture through a cotton plug followed by Whatman filter paper number 1.

At the end, we concentrated the extract with a rotary evaporator at low temperature and reduced pressure and preserved that at +4ºc until further investigation.

Phytochemical screening

10% (w/v) solution of ethanolic extract of *Carcuma zedoaria* was subjected to preliminary phytochemical screening to detect the presence of various classes of phytoconstituents using the following reagents and chemicals: tannins with ferric chloride, flavonoids and terpinoids with concentrated HCl, saponins with ability to produce stable foam, alkaloids with Wagner's reagent, gums with Molisch reagent and sulphuric acid, reducing sugar by ring test and steroids by acetic anhydride and sulphuric acid. We followed standard procedures were to identify the phytoconstituents by characteristic color changes [18].

Anti-diarrheal test

The anti-diarrheal activity was performed by the reported method [19]. Male albino mice (average weight: 20 - 25g) were kept in well cross ventilated room. We provided them commercial rodent pellet diet and water ad libitum. 20 animals were divided into four groups of five animals in each group. Group I (control) received distilled water and Groups II (positive control) received standard drug, loperamide at the dose of 2 mg/kg body weight. Groups III, IV and V (test groups**)** were treated with suspension of *Carcuma zedoaria* extract at the oral doses of 250, 500 and 750 mg /kg, respectively. After one hour treatment with distilled water, standard drug or plant extract, 1 ml of castor oil was orally given to all the overnight-fasted animals to induce diarrhoea. Each mouse was housed separately and observed for diarrheal episode for 4 hours. During this time, number and weight of diarrheal feces were taken and noted after every thirty minutes. We calculated the mean diarrheal episodes and percent protection of diarrhoea in mice.

Statistical analysis

The data of stool weight was expressed as mean ± standard error of mean (SEM). We performed one-way ANOVA test followed by Dunnet's multiple comparisons. We compared the results with the control group. P values <0.05 were considered to be statistically significant.

Results and discussion

Phytochemical screening

Phytochemical studies showed the presence of tannins, flavonoids, saponins, alkaloids, terpinoids, carbohydrates and steroids in the ethanolic extract of *Curcuma zedoaria* rhizomes (Table 1).

Table 1: Phytochemical constituents of *Curcuma zedoaria* rhizomes.

Plant Extract	Tannins	Flavonoids	Saponins	Alkaloids	Terpiniods	Gums carbohydrates	Reducing sugars	Steroids
Ethanol	+++	++	+++	+++	+++	+++	+++	+++

Symbol (+++) indicates presence in high concentration, symbol (++) indicates presence in moderate concentration and symbol (+) indicates presence in trace concentration of the respective phytochemicals.

Antidiarrhoeal activity

Diarrhoea was induced by castor oil in about one hour in the mice. The onset of diarrhoea was significantly prolonged by administration of ethanol extract of leaves of *Curcuma zedoaria* at in dose-dependent manner (Table 2). During three hours` study, the total number of feces was significantly reduced by the plant extract in comparison to control animals. The amount of stool (g) was also significantly decreased by ethanolic extract of *Curcuma zedoaria* compared to control animals. The plant extract protected 52.84 %, 71.55 % and 78.39 % diarrhoea at the dose of 250, 500 and 750 mg/kg respectively, in comparison to 90.12% protection of diarrhoea in animals treated with loperamide (2 mg/kg). So this study reveals that alcohol extracts of *Curcuma zedoaria* have significant antidiarrhoeal activity.

Table 2: Antidiarrhoeal activity of *Curcuma zedoaria*

Treatments	Onset of diarrhea (min.)	Total no. of feces in 3 hr	Weight of stools (g)
Control (Water 10 ml/kg)	69.0 ± 2.966	26.2±1.15	1.1846±0.029
Standard (Loperamide 2 mg/kg)	164.4 ± 6.256**	3.19±0.69***	0.117±0.0642***
C. Zedoaria (250 mg/kg)	98.4 ± 2.638*	19.7±0.67*	0.5586±0.0962*
C. Zedoaria (500 mg/kg)	116.4 ± 3.501*	16.04±1.17*	0.337±0.022**
C. Zedoaria (750 mg/kg)	123.4 ± 9.03**	11.08±0.88**	0.267±0.039**

All values are expressed as mean ± Standard Error of Mean (SEM), n = number of mice = 5. *$P < 0.05$, ** $P < 0.01$, *** $P < 0.001$ as compared with control group.

The remarkable anti-diarrheal effect (% protection) of *Curcuma zedoaria* rhizome extracts against castor oil-induced diarrhea model suggests that it is effective in an extensive range of diarrheal conditions. It is well known that castor oil produces diarrhoea due to its most active constituent recinoleic acid which causes irritation and inflammation of the intestinal mucosa. This leads to release of prostaglandins resulting in stimulation of secretion [20]. Since the ethanol extract of *Curcuma zedoaria* inhibited castor oil- induced diarrhoea in the test groups of the experiment, the extract might have showed its antidiarrhoeal effect through antisecretory mechanism. The antidiarrhoeal activity of the plant may be due to its content of tannins [21] and/or flavonoids [22]

Conclusions

In the present study, we can draw a conclusion that the ethanol extracts of *Curcuma zedoara* have significant anti-diarrheal effects, which support the traditional use of this plant in diarrhoea. Further studies will be conducted to identify the major component(s) of the plant responsible for the antidiarrhoeal effect.

References

1. Mia MMK, Kadir, MF, Hossan MS, Rahmatullah M. Medicinal plants of the Garo tribe inhabiting the Madhupur forest region of Bangladesh. American Eurasian Journal of Sustain Agriculture. 2009; 3(2):165-171.

2. Saadiah MS, Halijah I. Proceedings of the national convention on herbal medicine. Kuala Lumpur: Forest Research Institute Malaysia. 1995, 205-207.
3. Stanly C, Bhatt A, Keng CL. A comparative study of Curcuma zedoaria and Zingiber zerumbet plantlet production using different micropropagation systems. African Journal of Biotechnology. 2010; 9(28):4326.
4. Rana AC, Avadhoot Y. Experimental evaluation of hepatoprotective activity of Gymnema sylvestre and Curcuma zedoaria. Fitoterapia. 1992; 63(1):60-62.
5. Bugno A, Nicoletti MA, Almodóvar AAB, Pereira TC, Auricchio MT. Antimicrobial efficacy of *Curcuma zedoaria* extract as assessed by linear regression compared with commercial mouthrinses. Brazilian Journal of Microbiology. 2007; 38:440-445.
6. Banisalam B, Sani W, Philip K, Imdadul H and Khorasani A. Comparison between in vitro and in vivo antibacterial activity of Curcuma zedoaria from Malaysia. African Journal of Biotechnology. 2011; 10(55):11676-11681.
7. Makabe H, Maru N, Kuwabara A. Anti-inflammatory sesquiterpenes from Curcuma zedoaria. Natural Product Research. 2006; 20(7):680-5.
8. Monache DF, Filho CV. Phytochemical analysis and analgesic properties of Curcuma zedoaria grown in Brazil. Phytomedicine. 2002; 9(5):427-32.
9. Azam MG, Noman MS, Al-Amin MM. Phytochemical Screening and Antipyretic Effect of *Curcuma zedoaria* Rosc. (Zingiberaceae) Rhizome. British Journal of Pharmaceutical Research. 2014; 4(5):569-575.
10. Syu WJ, Shen CC, Don MJ. Cytotoxicity of curcuminoids and some novel compounds from Curcuma zedoaria. Natural Product Research. 1998; 61(12):1531-4.
11. Chen IN, Chang CC, Ng CC, Wang CY, Shyu YT, Chang TL. Antioxidant and antimicrobial activity of Zingiberaceae plants in Taiwan. Plant Foods for Human Nutrition. 2008; 63:15-20.
12. Srividya AR, Dhanabal SP, Ajit Kumar Yadav, Sathish Kumar MN and Vishnuvarthan VJ. Phytopreventive anti-hyperlipidemic activity of Curcuma zedoaria. Bulletin of Pharmaceutical Research. 2012; 2(1):22-5.
13. Mi Kyung Jang, Dong Hwan Sohn and Jae-Ha Ryu. A Curcuminoid and Sesquiterpenes as Inhibitors of Macrophage TNF-α Release from Curcuma zedoaria., Planta Med. 2001; 67(6):550-552.
14. Navarro DF, de Souza FM, Neto, RA, Golin V, Niero R, Yunes RA *et al*. Curcumenol from Curcuma zedoaria: a second monoclinic modification. Acta Crystallographica Section E. 2010; 66(11):2844.
15. Hong CH, Kim Y, Lee SK. Sesquiterpenoids from the rhizome of Curcuma zedoaria. Archives of Pharmaceutical Research. 2001; 24(50):424-6.
16. Khare CK. Indian Medicinal Plants: An illustrated Dictionary, 1st Ed, Springer Pvt Ltd., New Delhi, 2007.
17. Saralamp P, Chuakual W, Temsirikul R. Medicinal Plants in Thailand. Amerin Printing and Publishing Public Co. Ltd., Bangkok, Thailand, 2000.
18. Ghani A. Medicinal Plants of Bangladesh: Chemical Constituents & Uses. 2nd ed, Asiatic Society of Bangladesh, Dhaka. 2003, 1-16.
19. Havagiray RC, Ramesh C, Sadhna K. Studies on anti-diarrheal activity of Calotropis gigantean R.BR. in experimental animals, Journal of Pharmacy and Pharmaceutical Science. 2004; 7(1):70-75.
20. Gaginella TS, Stewart JJ, Olsen WA, Bass P. Action of recinoleic acid and structurally related fatty acid on the gastrointestinal tract; Effect on water and electrolyte absorption in vitro. Journal of Pharmacology and Experimental Therapeutics. 1975; 195:355-356.
21. Farthing MJ. Diarrhoea: a significant worldwide problem, International Journal of Antimicrobial Agents. 2000; 14:65-69.
22. Rao VSN, Santos FA, Sobreika TT, Souza MF, Melo LL, Silveira ER. Investigations on the gastroprotective and antidiarrhoeal properties of ternatin, a tetramethoxyflavone from *Egletes viscose,* Planta Medica. 1997; 63:146-1497.