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Short Communication

Antagonistic profiling and phytochemical analysis of roots of *Curculigo orchioides* and *Curcuma angustifolia* against UTI bacterial isolates

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Abstract

The present study was performed with an aim of determining the phytochemical constituents and antagonistic effect of roots of Curculigo orchioides (family Amaryllidaceae) and *Curcuma angustifolia (family Zingiberaceae). Antagonistic effect was evaluated against four UTI causing bacterial isolates by well diffusion method. The results of the study showed, in comparison with Curcuma angustifolia, the root extracts of Curculigo orchioides exhibited higher antagonistic activity against the tested isolates. Also the phytochemical investigation of Curculigo orchioides indicated the presence of phenols, amino acids, glycosides, alkaloids, tannins, terpenoids and coumarins. This study derives in a conclusion that root extracts of Curculigo orchioides can be used to develop antagonistic agents against bacterial isolates causing UTI.*

Keywords: Antagonistic effect, *Curculigo orchioides*, *Curcuma angustifolia*, roots, phytochemical analysis.

Introduction

Urinary tract infections (UTI) are infections that affect millions of people worldwide[1]. Gram negative bacteria are the major causative agents of about 90% of urinary tract infections while rest of the cases includes Gram positive bacteria[2,3]. The effectiveness of drugs was declined gradually due to the emergence of multidrug resistant pathogens resulted from over use of antimicrobial medicines[4,5]. Although many pharmaceutical companies developed numerous antibacterial drugs, the multidrug resistance still exists, becoming a global problem of concern[6]. However, attempts are continuing to assess the capability of medicinal plants to compete MDR strains of pathogenic agents[7]. Numerous plants have been investigated to treat the infections caused by bacteria pathogens including UTI[8].

Curculigo orchioides belongs to the family Amaryllidaceae is a small herbaceous plant widely identified as black musali in India and also widely distributed in Japan, Sri Lanka, Australia and Malaysia. It has elongated tuberous rootstock and lateral roots, linear to lanceolate leaves crowded on the short stem with sheathing leaf bases and yellow flowers flowering throughout the year[9-12]. In India, Pakistan and China, the rhizome of the plant has been extensively used to treat jaundice, diarrhea, asthma, cancer and wounds[9]. The juice of the rhizome has been used as an aphrodisiac to overcome impotency[13]. In folkloric medicines, it is used to treat neurasthenia, urinary retention, chronic nephritis, chronic arthritis and rheumatic arthritis. In Ayurvedic system, it is used to treat blood related disorders, piles, sprue, and also as rejuvenator[14].

Curcuma angustifolia popularly known as arrowroot belongs to the family *Zingiberaceae* is distributed throughout India[15,16]. It is known as Araukizhangu in Tamil and kuva kizhanna in Malayalam[17,18]. *C. angustifolia* is a herb that grows about 90-180 cm in height. The rhizome is cylindrical and fleshy, that can grow up to 1.5 m in length. The rhizome of this plant is well known for its nutritive and medicinal properties[19,20]. It has potential antioxidant, anti-cancerous activity[21] and also the essential oil extracted from this species possess antibacterial[19] and antimycotic activities[22]. It is used for treating indigestion, typhoid fever, cough, bronchitis, diarrhea, dysentery, skin diseases, ulceration of bowels, bladder and in painful micturition[23].

At this context, this study was designed to evaluate the antagonistic activities and ascertain the phytochemical compounds in roots of *Curculigo orchioides* and *Curcuma angustifolia* against UTI causing pathogenic bacteria.

Methodology

Test Organisms used: *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* isolated from infected urine samples.

Plant Material used: Fresh, healthy roots of *Curculigo orchioides* and *Curcuma angustifolia*.

Solvent Extraction: Powdered roots were extracted using solvents such as acetone, distilled water, ethanol, hexane and methanol at room temperature.

Antagonistic Activity Assay: The root extracts of *Curculigo orchioides* and *Curcuma angustifolia* were evaluated for its antagonistic activity by well diffusion method against the four bacterial isolates[24].

Phytochemical Analysis of Root extracts: For detecting the presence of phytochemicals, the root extracts of *Curculigo orchioides* and *Curcuma angustifolia* were screened qualitatively by standard methods[25-28].

Glycosides: To the extract, added glacial acetic acid, drop of 2% ferric chloride and sulphuric acid to form bluish green colour.

Amino acids: To the extract, Ninhydrin solution was added to observe the purple colour.

Phenols: The extract was mixed with ferric chloride solution to form bluish black colour.

Alkaloids: The extract was added with drops of Dragendroff's reagent to produce orange precipitation.

Flavonoids: To the extract added drops of lead acetate solution to form yellow precipitation.

Saponins: Distilled water was added to the extracts. Shake vigorously to observe persistent foam.

Steroids: To the extract, concentrated sulphuric acid was added side wise and observed for green colour.

Carbohydrates: 1ml of the extract along with Benedict's solution forms brick red colour precipitation on boiling.

Terpenoids: To the extract, chloroform and concentrated sulphuric acid was added to form reddish brown colour at the interface.

Tannins: The extract was mixed with ferric chloride to observe greenish or black colour precipitation.

Quinones: 5ml of HCl was added to the extract to produce yellow color precipitate.

Reducing Sugars: Fehling's A and B solutions along with the extract on heating produce orange red precipitate.

Catachins: Few drops of Echrilich reagent and concentrated HCl were added to the extract to form pink color.

Coumarins: The extract was treated with 10% sodium hydroxide to produce yellow color.

Results and discussion

The root extracts of *Curculigo orchioides* and *Curcuma angustifolia* were assessed for its antagonistic activity against *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* by agar well diffusion method. All the extracts except water and hexane extracts showed different range of antagonistic activities against the tested bacterial isolates and the results were shown in Table-1.

The ethanol extracts of *Curculigo orchioides* possess greater inhibitory potential with greatest zone of inhibition (20mm) against *Klebsiella pneumoniae* and minimum inhibition against *Pseudomonas aeruginosa*. In case of methanolic extracts of *C. orchioides* maximum zone of inhibition (14mm) was showed against *Klebsiella pneumoniae*. Though *Staphylococcus aureus* and *Pseudomonas aeruginosa* were highly resistant to acetone extracts, *E. coli* was found highly sensitive producing an inhibitory zone of 21mm. While all the extracts of *Curcuma angustifolia* possess antagonistic activity against *Klebsiella pneumoniae* while Pseudomonas aeruginosa was highly resistant to *C. angustifolia* extracts.

Table- 1: Antagonistic Activity of leaf extracts by well diffusion method

Test Organisms	*Curculigo orchioides*			*Curcuma angustifolia*		
	A mm	E mm	M mm	A mm	E mm	M mm
Escherichia coli	21	13	11	8	13	-
Klebsiella pneumoniae	17	20	14	10	11	14
Pseudomonas aeruginosa	-	10	10	-	-	-
Staphylococcus aureus	-	14	12	-	8	10

A-Acetone; E-Ethanol; M-Methanol.

The phytochemical investigation of ethanol, acetone and methanol extracts of *Curculigo orchioides* and *Curcuma angustifolia* were performed qualitatively by standard phytochemical tests and the results reported on Table-2.

C. angustifolia showed the presence of phytochemicals viz., alkaloids, carbohydrates and phenols in all the three extracts. On the other hand, *C. orchioides* possess alkaloids, amino acids, glycosides, terpenoids, tannins, coumarins, etc. in all the three extracts. Amino acids are found absent in acetone extracts of *C. orchioides*.

Conclusion

Based on the results obtained, this study suggests that *Curculigo orchioides* have strong antagonistic activity when compared to *Curcuma angustifolia* which may be due to the presence of numerous phytochemicals in them. Though both the plants possess some sort of activity, *C. orchioides* may be more beneficial in drug research and development against UTI causing bacteria.

Table-2: Phytochemical constituents in various extracts.

Phytochemicals	*Curculigo orchioides*			*Curcuma angustifolia*		
	A	E	M	A	E	M
Glycosides	+	+	+	-	-	-
Amino acids	-	+	+	-	-	-
Phenols	+	+	+	+	+	+
Alkaloids	+	+	+	+	+	+
Flavonoids	-	-	-	-	-	-
Saponins	+	-	+	-	-	-
Steroids	-	-	-	-	-	-
Carbohydrates	-	-	-	+	+	+
Terpenoids	+	+	+	-	-	-
Tannins	+	+	+	-	-	-
Quinones	-	-	+	-	-	-
Reducing sugars	-	-	+	-	-	-
Catachins	-	-	-	-	-	-
Coumarins	+	+	+	-	-	-

A-Acetone; E-Ethanol; M-Methanol

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References

1. Stamm, W.E. and Norrby, S.R. (2001). Urinary tract infections: disease panorama and challenges. *The Journal of Infectious Diseases*, 183, 1-4.

2. Nicolle, L.E. (2008). Uncomplicated urinary tract infection in adults including uncomplicated pyelonephritis. *Urol. Clin. North Am.*, 35, 1-12.

3. Lane, D.R. and Takhar, S.S. (2011). Diagnosis and management of urinary tract infection and pyelonephritis. *Emergency medicine clinics of North America*, 29, 539-552.

4. Hancock, R.E.W. (2005). Mechanisms of action of newer antibiotics for Gram-positive pathogens. *Lancet. Infect. Dis*., 5(4), 209-218.

5. Noumedem, J.A.K., Mihasan, M., Lacmata, S.T., Stefan, M., Kuiateand, J.R. and Kuete, V. (2013). Antibacterial activities of the methanol extracts of ten Cameroonian vegetables against Gram-negative multidrug-resistant bacteria. *BMC Complement. Altern. Med*., 13(1), 26.

6. Middleton, J.R., Fales, W.H. and Luby, C.D. (2005). Surveillance of *Staphylococcus aureus* in veterinary teaching hospitals. *J. Clin. Microbiol*., 43(6), 2916-2919.

7. Mahmood, A.M., Doughari, J.H. and Ladan, N. (2008). Antimicrobial screening of stem bark extracts of *Vitellaria paradoxa* against some enteric pathogenic microorganisms. *Afr. J. Pharm. Pharmacol*., 2(5), 089-094.

8. Eisenberg, D.M., Kessler, R.C., Foster, C., Norlock, F.E., Calkins, D.R. and Delbanco, T.L. (1993). Unconventional medicine in the United States. *N. Engl. J. Med*., 328(4), 246-252.

9. Dhar, M.L., Dhar, B.N., Dhawan, D.N. and Mehrota, C.R. (1968). Screening of Indian plants for biological activity part 1. *Indian J. Expt. Biol.*, 6(6), 232-249.

10. Raghunathan, S. and Mitra, R. (1982). Pharmacognosy of Indigenous drugs. Vol.I, New Delhi.

11. Dhenuka, S., Balakrishna, P. and Anand, A. (1999). Indirect organogenesis from the leaf explants of medicinally important plant *Curculigo orchioides* Gaertn. *J Plant Biochem Biotech*, 8, 113- 115.

12. Joy, P.P., Thomas, J., Samuel, M. and Skaria, B.P. (2004). *Curculigo orchioides*: A plant for health care. *Indian J. Areca nut, Spices & Med Plants*, 6(4), 131-134.

13. Chopra, R.N., Nayar, S.L. and Chopra, I.C. (1956). Glossary of medicinal plants. CSIR, New Delhi, pp 84.

14. Santapou, H. and Henery, A.N. (1976). A dictionary of the flowering plants in India. New Delhi, CSIR.

15. Srivastava, A.K., Srivastava, S.K. and Syamsundar, K.V. (2006). Volatile composition of *Curcuma angustifolia* Roxb. rhizome from central and southern India. *Flavour and Fragrance Journal*, 21, 423-426.

16. Sharma, A. (2012). Traditional processing of Shotti (*Curcuma augustifolia* Roxb.)–a rhizome based ethnic weaning food. *Indian Journal of Traditional Knowledge*, 11(1), 154-155.

17. Nadkarni, A.K. (1976). Indian Materia Medica. 3rd edn, Popular Prakashan Pvt. Ltd, I, pp 413.

18. Bapalal, G. (1985). Nighantu Adarsha. Chaukhambha Bharati Academy, Varanasi, pp 579.

19. Doble, B., Dwivedi, S., Dubey, K. and Joshi, H. (2011). Pharmacognostical and antimicrobial activity of leaf of *Curcuma angustifolia* Roxb. *International Journal of Drug Discovery and Herbal Research*, 1(2), 46-49.

20. Elias, L., Pradeep, Harini, A. and Hegde, P.L. (2015). *Curcuma angustifolia* Roxb (Tavaksheeri): A Review. *Journal of Pharmacognosy and Phytochemistry*, 4(2), 241-243.

21. Nayak, S., Jena, A.K. and Sucharita, S. (2013). *In vitro* bioactivity studies of wild *Curcuma angustifolia* rhizome extract against (Hela) Human Cervical Carcinoma cells. *World Journal of Pharmacy and Pharmaceutical Sciences,* 2(6), 4972 - 4986.

22. Shukla, A.C., Pandey, K.P., Mishra, R.K., Dikshit, A. and Shukla, N. (2011). Broad spectrum antimycotic plant as a potential source of therapeutic agent. *Natural Product Journal*, 4, 42-50.

23. Quamar, M.F. and Bera, S.K. (2014). Ethno-medico-botanical studies of plant resources of Hoshangabad district, Madhya Pradesh, India: Retrospect and Prospects. *Journal of Plant Science & Research*, 1(1), 101.

24. Parez, C. (1990). An antibiotic assay by agar well diffusion method. *Acta Biol Med Exp*., 15, 113-115.

25. Yadav, M., Chatterji, S., Gupta, S.K. and Watal, G. (2014). Preliminary phytochemical screening of six medicinal plants used in traditional medicine. *Int. J. Pharm. Pharm. Sci*, 6, 539-542.

26. Dey, B. and Raman, S.M.V. (1957). Laboratory Manual of Organic Chemistry. S. Viswanathan publication, Madras.

27. Ashok, K.K., Narayani, Subanthini and Jayakumar, (2011). Antimicrobial Activity and Phytochemical Analysis of Citrus Fruit Peels -Utilization of Fruit Waste. *International Journal of Engineering Science and Technology,* 3, 5414-5421.

28. Dey, P.M. and Harborne, J. B. (1987). Methods in Plant Biochemistry. Academic Press; London.