INTERNATIONAL JOURNAL OF APPLIED BIOLOGY AND PHARMACEUTICAL TECHNOLOGY

www.ijabpt.com Volume-4, Issue-4, Oct-Dec-2013 Coden : IJABPT Copyrights@2013

ISSN : 0976-4550

Received: 30th July-2013 *Revised: 05th August-2013* *Accepted: 18th August-2013*

Research article

IN VITRO ANTIMICROBIAL ACTIVITY OF *ACALYPHA CHENGALPATTENSIS*. (NARASIMHAN) –A NEW SPECIES.

R. Jeyachandran[1]*and M. Bastin[1]

[1*]Head, Deparment of Botany, St. Joseph's College (Autonomous), Tiruchirappalli – 620 002.
[1] Research Scholar, Deparment of Botany, St. Joseph's College (Autonomous), Tiruchirappalli – 620 002.
E-mail:robertjeyachandran@gmail.com, Fax: +91 0431 2701501; Tel: +91- 9443112371
Corresponding author: R. Jeyachandran.

ABSTRACT: The present study was designed to evaluate comparatively the antimicrobial potentiality of acetone, alcohol, chloroform, and ethyl acetate extract of stem and leaf of *Acalypha chengalpattensis.* (Narasimhan) using the agar diffusion method against five strains of bacterial species, namely, *Bacillus substilis, Pseudomonas aeruginaosa, Vibrio cholerae, Shigella sinogei, Proteus vulgaricus, Salmonella typhi, Klebsiella pneumonia.* Among the various extracts studied, the acetone stem extract showed highest antibacterial activity against *B. Subtillis* (2.75 ± 0.95 mm): following by methanol extract (2.5 ± 0.57 mm). The greatest inhibition zone was observed for acetone extract of *Acalypha chengalpattensis* leaf against *Shigella sinogei* (2.8 ± 0.83 mm). The alcohol stem extract showed significant antimicrobial activity against *Pseudomonas aeruginosa*. The chloroform stem extract of *A. Chengalpattensis* showed moderate activity against four pathogens. However, the stem extract exhibited higher inhibitory effect than the leaf extracts. This research suggests that these findings provide a support for the public to use the plant in traditional medicine for the society.

Key words: Antimicrobial potentiality, *Acalypha chengalpattensis*, plant extracts, agar diffusion method.

INTRODUCTION

In general, plants something that treats or prevents or alleviates the symptoms of diseases. Bacterial diseases are a type of infectious diseases caused by pathogenic bacteria. Once bacteria enter into the body, the immune system of the body recognizes the bacteria as foreign intruder and tries to kill or stop them from multiplying. (Renu Solanki., 2010). Many plants and plant products are seemed to have antibacterial activities due to various components present in various plant parts. (Kabir *et al*., 2005). Traditionally the plant was used as a laxative, anthelmintic, cathartic and the juice is used as a speedy emetic for children and expectorant. (Balakrishnan *et al*., 2009) As per the World Health Organization (WHO) report, 80% of the world population presently use herbal medicine for some aspect of primary health care. Since the last decade, the rise in the failure of chemotherapeutic and antibiotic resistance exhibited by pathogenic microbial infectious agents has led to the screening of several of medicinal plants for their potential antimicrobial activity. India is the largest producer of medicinal herbs and traditional practitioners of this country use more than 6,000 medicinal plants in primary health care (Shariff *et al*. 2006). *Acalypha chengalpattensis* is an herbaceous annual plant, 0.3 – 0.7m tall, monoecious: flowering branches 9-30 long, 2 – 3.5 mm diameter. Indumentums sparsely hairy, denser on young parts, with simple straight hairs and caspitate trichomes. The leaves are coppery green with red splashes of color. This gives them a mottled appearance. The leaves are large and broad with teeth around the edge. They can be 10–20 cm long and 15 cm wide. The leaves are finely hairy. They can be flat or crinkled. This species is very similar to *Acalypha indica.* There has been a lot of interest in the investigation of natural materials as sources of new antibacterial agents. (Devi, *et al*., 2010) Many of the herbal remedies have been incorporated into orthodox medicinal plant practice. Diseases that have been managed traditionally using medicinal plant include malaria, epilepsy, infantile convulsion, diarrhea, dysentery, fungal and bacterial infections (Sofowora, 1996). Although synthetic and semi synthetic antimicrobial drugs abound in various markets today, there is a need for continuous search for new ones to cope with the increased evolution of multiple antimicrobial resistant strains of organisms (Hart and Kariuki, 1998). The objectives were to investigate the antimicrobial activity of the plant extracts against seven bacterial strains and five fungal pathogens.

MATERIALS AND METHODS

Collection of Plant Materials

The fresh plants of *Acalypha chengalpattensis* were collected from the Thanjavur district near poondi village in kollidam river banks by September'11. These were identified and authenticated by Botanical survey of India (BSI), Coimbatore. The voucher plant material was deposited in the herbarium of the Botanical survey of India (BSI) Coimbatore. The fresh stem and leaf plant were thoroughly washed with ordinary tap water and then washed with distilled water. The plant was then completely shade dried into powder using to 40 mesh size sieve.

Preparation of Plant Extracts

To obtain two different extracts of *Acalypha chengalpattensis* 400 gms of stem and leaf were powdered and it was successively extracted with acetone, alcohol, chloform, and ethyl acetate using soxhlet apparatus for 72 hours in each solvent. Each extract was maintained in refrigerator under 4°C in still works.

Collection of Strains

The test strains were collected from the Department of Botany, National College (Autonomous), Tiruchirappalli-620 001. The strains were maintained in nutrient agar slant culture at 4°C.

Preparation of Inocula

Each strain was tested and it was streaked onto a nutrient agar medium to capture pure colonies. After incubation at 35°C overnight, select 4 or 5 well-isolated colonies were selected with an inoculating needle or loop, and transferred on nutrient agar broth for growth.

Antimicrobial assay

Antimicrobial activities of stem and leaf extracts of acetone, alcohol, chloroform, and ethyl acetate were examined for their microbial potency by nutrient agar using this disc diffusion method. Nutrient broth and nutrient agar were used for sub-culturing the bacterial isolates, while diagnostic sensitivity test agar was used for sensitivity testing.

The test inoculum was swabbed uniformly to solidified 20ml nutrient agar medium and test inoculum was allowed to dry for 5 min. The Chloramphenicol (10 µg/disc), a standard antibiotic obtained from Hi-media, Mumbai, was used as positive controls. Thereafter, petri dishes were incubated at 37°C for 24 hrs. The antimicrobial activity was evaluated by measuring the zone of inhibition diameter in millimeters (mm) around the disc.

RESULTS AND DISCUSSION

The effect of four different extracts of leaf and stem on five different pathogens using paper disc method are presented in Tables: 1&2. The anti-bacterial activity of various extracts using acetone, methanol, ethanol, and ethyl acetate extracts of *A. Chengalpattensis* leaf and stem were tested against bacteria such as *Bacillus subtillis, Pseudomonas auriginosa, Vibrio cholerae, Shigella sinogei, Proteus vulgaricus*. The two test extracts were found to possess significant antibacterial activity against all the bacterial pathogens. Among the four, acetone extracts of stem and leaf extract has shown a broad spectrum of activity against *Shigella singe*. The leaf extract of acetone showed remarkable inhibition against *Proteus vulgaricus* and *Shigella sinogei* when compared with other extracts. The methanol extract of the leaf was found to be effective against *Proteus vulgaricus, Pseudomonas auriginosa, and Shigella sinogei*. The ethanol extract of leaf was found to be effective against *Shigella sinogei* when compared with other pathogens, following stem extract showed significant antibacterial activity against *Vibrio cholera*.

Table : 1 Showing zone of Inhibition (mm) of leaf extracts of *A. Chengalpattensis* against Bacterial pathogens.

S/No	*Bacterial Culture*	Acetone	Ethanol	Methanol	Ethyl acetate	Chloramphenicol
1	*Bacillus subtillis*	2.4 ± 0.54	0.94 ± 0.68	1.5 ± 0.57	0.8 ± 0.83	5.25 ± 0.95
2	*Pseudomonas auriginosa*	1.2 ± 0.73	0.8 ± 0.83	2.75 ± 0.5	0.75 ± 0.95	4.75 ± 0.95
3	*Vibrio cholerae*	0.4 ± 0.54	0.6 ± 0.89	1.2 ± 0.83	1.4 ± 0.89	7.00 ± 0.81
4	*Shigella sinogei*	2.8 ± 0.83	2.2 ± 0.5	2.5 ± 0.57	0.2 ± 0.44	5.50 ±0.57
5	*Proteus vulgaricus*	2.6 ± 0.54	1.16 ± 0.83	3 ± 0.81	0.18 ± 0.30	5.50 ±0.57

The ethyl acetate extract of leaf showed moderate activity against all the strains when compared with stem extracts. The acetone and methanol extracts of the leaf revealed a higher anti-bacterial activity as compared with stem extracts. In the mean time, both ethanol and ethyl acetate extracts of leaves showed moderate antibacterial activity when compared with stem extracts. The leaf extracts are found to exhibit a significant antibacterial activity as compared to stem extract.

Table : 2 Showing zone of Inhibition (mm) of stem extracts of *A. Chengalpattensis* against Bacterial pathogens.

S/No	*Bacterial Culture*	Acetone	Ethanol	Methanol	Ethyl acetate	Chloramphenicol
1	*Bacillus subtillis*	2.75 ± 0.95	0.44 ± 0.32	2.5 ± 0.57	0.04 ± 0.054	6.2 ± 0.83
2	*Pseudomonas auriginosa*	2.4 ± 0.89	0.34 ± 0.30	0.24 ± 0.32	1.8 ± 0.83	6.8 ± 0.83
3	*Vibrio cholerae*	2.4 ± 0.54	2.2 ± 0.83	1.6 ± 0.54	0.2 ± 0.33	6.6 ± 0.54
4	*Shigella sinogei*	1.2 ± 0.73	1.6 ± 0.89	1.8 ± 0.44	0.8 ± 0.83	6.8 ± 0.44
5	*Proteus vulgaricus*	0.68 ± 0.78	0.8 ± 0.44	1.4 ± 0.89	1.4 ± 0.54	7.2 ± 0.83

CONCLUSION

Several genus of the *Acalypha* species have been studied and demonstrated that they have antioxidant, wound healing, post-coital antifertility, neutralization of venom, antibacterial, antifungal and antitrypanosomal activities (Perez Gutierrez RM.,*et al*,(2006), (Marwah RG., *et al* (2007), (Shirwaikar A., *et al* (2004). The present investigations on Medicinal plant *Acalypha chengalpattensis* is considered as a clinically effective and safer alternative to the synthetic antibiotics. The screenings of this medicinal plant showed potential source of antimicrobial agents.

ACKNOWLEDGEMENTS

The authors are thankful to the management of St. Joseph's College, (Autonomous), Tiruchirappalli – 620 002, for providing necessary facilities to carry out this research work.

REFERENCES

Adeloye, O. Adewale, Lecturer II, Department of Chemistry, Faculty of Science, Obafemi Awolowo. (2007). University, Ile-Ife, Osun State, Nigeria. Akinpelu, A. David, Senior Lecturer, Department of Microbiology, Faculty of Science, Obafemi. Studies on antimicrobial, antioxidant and phytochemical analysis of *Urena lobata* Leave extract. *Journal of Physical and Natural sciences.* Volume 1, Issue 2, 2007.

Awolowo University Ile-Ife, Osun State, Nigeria. Ogundaini, O. Abiodun, Professor, (2007). Department of Pharmaceutical Chemistry, Faculty of Pharmacy. Studies on antimicrobial, antioxidant and phytochemical analysis of *Urena lobata* Leave extract. Journal of Physical and Natural sciences. Volume 1, Issue 2, 2007.

Balakrishnan N, Panda A B, Raj N R, Shrivastava A and Prathani R. (2009). The Evaluation of Nitric Oxide Scavenging Activity of *Acalypha Indica* Linn. Root. Asian J. Research Chem. 2 (2): April. -June, 2009.

Colombo MI., Bosisio E. Pharmacological activities of *Chelidomium majus L* (Paveraceae). Pharmacol Res 1996; 33: 127-34.

Devi. K. G. Karthikai Devi, G. Thirumaran, R. Arumugam and P. Ananthara. (2010). Antibacterial Activity of Selected Medicinal Plants from Parangipettai Coastal Regions; Southeast Coast of India. Academic Journal of Plant Sciences 3 (3): 122-125.

Hart CA, Kariuki S (1998). Antimicrobial resistance in developing countries. Br. Med. J. 317: 647-650.

Iwu MM, Duncan AR, Okunji CO. (1999). New Antimicrobials of Plant Orgin. In: Janick J, editor. Studies on antimicrobial, antioxidant and phytochemical analysis of *Urena lobata* Leaf extract. *Perspectives on new crops and new uses*. Alexandria: Asha press: p. 457-62.10. 12.

Kabir, O. A., Olukayode, O., Chidi, E. O., Christopher, C. I. and Kehinde, A. F. (2005). Screening of crude extracts of six medicinal plants used in South-west Nigerian orthodox medicine for anti methicillin resistant *Staphylococcus aureus* activity. *BMC complementary and alternative medicine*. (Cited 10th July 2009) http://www.biomedcentral.com/1472- 6882/5/6.

Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria. Obafemi, A. Craig, Professor, (2007). Department of Chemistry, Faculty of Science, Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria. Studies on antimicrobial, antioxidant and phytochemical analysis of *Urena lobata* Leave extract. Journal of Physical and Natural sciences. Vol-1, Issue 2.

Renu Solanki., (2010). Pharmacie Globale. International Journal Of Comprehensive Pharmacy, 4 (10).

Shariff, N., Sudarshana, M.S., Umesha, S. and Prasad, P. (2006). Antimicrobial activity of *Rauvolfia tetraphyla* and *Physalis minima* leaf and callus extracts. African Journal of Biotechnology 5: 946-950.

Sofowora A (1996). Research on medicinal plants and traditional medicine in Africa. *J. Altern. Complement. Med*. 2 (3): 365-372.

Sujatha, S. (2005). Complementary and alternative therapies in palliative care: a transition from modern medicine to traditional medicine in India. J Cancer pain Symptom Palliation 1: 25-9.

Perez Gutierrez RM, Vargas SR. (2006). Evaluation of the wound healing properties of *Acalypha langiana* in diabetic rats. Fitoterapia. 77:286-289.

Marwah RG, Fatope MO, Mahrooqi RA, Varma GB, Abadi HA, Al- Burtamani SKS. (2007). Antioxidant capacity of some edible and wound healing plants in Oman. Food Chem, 101:465-470.

Shirwaikar A, Rajendran K, Bodla R, Kumar CD. (2004). Neutralization potential of Viper *russelli russelli* (Russell's viper) venom by ethanol leaf extract of Acalypha indica. J.Ethnopharmacol. 94:267-273.