Plant Archives Vol. 21, No. 2, 2021 pp. 704-708 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2021.v21.no2.109

COMPARISON OF ANTIBACTERIAL EFFICACY OF VARIOUS EXTRACTS OF *CURCULIGO ORCHIOIDES* AND DIFFERENT ANTIBIOTICS AGAINST SELECTED HUMAN PATHOGENS

Jasmin S., Reju J. and Thampiraj S.
Department of Botany and Research Center, Scott Christian college, Tamilnadu,
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu India
*Corresponding E-mail: reju2just@gmail.com

(Date of Receiving : 26-06-2021; Date of Acceptance : 31-08-2021)

ABSTRACT

The main objective of this study was to evaluate the antibacterial activities of selected plant *Curculigo orchioides* using different solvent extracts. The antibacterial activities were determined against human pathogens viz. *Klebsiella pneumoniae*, *Escherichia coli, Proteus vulgaris, Salmonella typhi* and *Staphylococcus aureus*. The highest value observed from N butyl alcohol extracts of *Curculigo orchioides* showed antibacterial activity against *Klebsiella pneumoniae* (inhibition zone 21mm). Moreover the bioactivity exhibited showed a wide variation among the selected pathogens with the plant extracts were studied. All the tested human pathogens were highly sensitive to ciprofloxacin with the zone of inhibition above 33 mm. Further study is necessary to detect and evaluate the actual constituents responsible for the antibacterial activity of the valuable medicinal plant investigated, for its successful utility.

***Keywords*:** Antibacterial activity, *Curculigo orchioides*, Human pathogens, Bio active compounds, Solvent extracts

INTRODUCTION

The frequency of life-threatening infections caused by various pathogenic microorganisms has increased world-wide and it has become an important cause of morbidity and mortality (Al-Bari *et al*., 2006). Due to the indiscriminate application of synthetic antibiotic drugs, many infectious microorganisms have developed resistance against them (Ahmad *et al*., 1998). Moreover, most of the synthetic drugs are associated with serious side effects (Cunha, 2001) and most of them are relatively expensive (Rat *et al*., 2004). In this situation, there is an urgent need to discover alternative, more active, broad spectrum and safer antimicrobial agents (Frontling, 1987; Vermani, 2002). Drugs based on plants are thus gaining attraction worldwide (Cragg and Newman, 2009). The bioactive compounds, especially secondary metabolites present in the plants are responsible for the therapeutic nature of plants (Ameenah, 2006; Valsalam *et al*., 2019).

The plant *Curculigo orchioides* is a perennial herb having tuberous fleshy roots, leaves and flowers. This plant has tremendous medicinal properties with immune-stimulant, anti-diabetic, aphrodisiac, and anti-oxidant activity (Jena *et al*., 2021). The present study is a comparative analysis of anti-microbial activity of various extracts of *Curculigo orchioides* with some known antibiotics against selected human pathogens.

MATERIALS AND METHODS

Collection of medicinal plants

Fresh and healthy *Curculigo orchioides* plants were collected from various locations of Kanyakumari District. Leaves were extracted and shade dried for ten days and extracts with solvents such as ethanol, n-butyl alcohol, isopropyl alcohol, benzene and acetone were prepared. The extracts obtained from the respective solvents were stored for further use (Bruneton, 1995).

Antimicrobial activity

The selected micro-organisms were cultured on nutrient agar**.** The extracts were tested for their anti-microbial activity using disc diffusion method. Synthetic discs with the antibiotics Chloramphenicol, Tetra-cycline, Ampicillin, Ciprofloxacin, Erythromycin and Neomycin respectively were used for comparison. A total of five human pathogens *Staphylococcus aureus, Escherichia coli, Proteus vulgaris, Klebsiella pneumonia* and *Salmonella typhi* were used as test organism. The agar plates were inoculated with test organisms and sterile and dried disc with plant extracts and synthetic discs were placed on the agar surface. The inoculated plates were incubated at 37^0C over night and the inhibition zone was recorded (Bauer *et al.,* 1966). Sterile plain disc (5mm) without plant extract was used as control. The inhibitory zone around test paper discs indicates the absence of bacterial growth and that was recorded as positive test and the absence of zone as negative test.

RESULTS AND DISCUSSION

Antibiotics are the main therapeutic agents used against bacterial infections. But the higher level of genetic variability among bacteria enables them in developing antibiotic resistance rapidly. Development of novel as well as higher potent antibiotics is necessary all the time (Selvamony *et al.*, 2020). The extracts of *Curculigo orchioides* with various

solventsshowed a wide variation in the anti-bacterial activity among the selected pathogens studied (Table 1; Figure 1).

Ethanolic extract of *Curculigo orchioides* showed maximum antibacterial activity (20mm) against *Proteus vulgaris*. No activity was found against *Salmonella typhi*. Acetone extract of *Curculigo orchioides* showed maximum antibacterial activity (16 mm) against *Escherichia coli* and *Proteus vulgaris*. No activity against *Staphylococcus aureus* is observed. Benzene extract of *Curculigo orchioides* showed maximum antibacterial activity (18mm) against *Staphylococcus aureus* and no activity against *Klebsiella pneumonia*. N-butyl alcoholic extracts of *Curculigo orchioides* showed maximum antibacterial activity (21mm) against *Klebsiella pneumoniae* and minimum activity (10mm) against *Salmonella typhi*. Iso propyl alcoholic extracts of *Curculigo orchioides* showed maximum antibacterial activity (18mm) against *Escherichia coli* and had no activity against *Proteus vulgaris.*

Table 1 : Antibacterial activity of different solvent extracts of *Curculigo orchioides* against selected human pathogens

Human pathogens	Solvents	Zone of inhibition (mm)
Escherichia coli	Ethanol	9
	Acetone	16
	Benzene	11
	n-Butyl alochol	16
	Isopropyl alcohol	18
Klebsiella pneumoniae	Ethanol	18
	Acetone	9
	Benzene	0
	n-Butyl alochol	21
	Isopropyl alcohol	11
Salmonella typhi	Ethanol	0
	Acetone	12
	Benzene	17
	n-Butyl alochol	10
	Isopropyl alcohol	8
Staphylococcus aureus	Ethanol	6
	Acetone	0
	Benzene	18
	n-Butyl alochol	14
	Isopropyl alcohol	9
Proteus vulgaris	Ethanol	20
	Acetone	16
	Benzene	14
	n-Butyl alochol	11
	Isopropyl alcohol	0

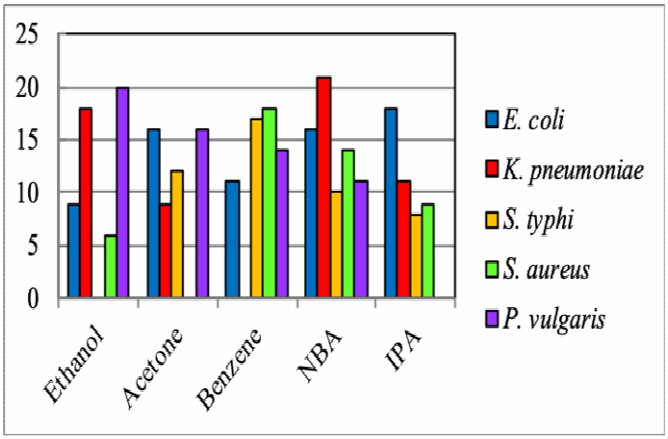

Fig. 1 : Antibacterial activity of different solvent extracts of *Curculigo orchioides* against selected human pathogens

Seven antibiotics Chloramphenicol, Tetracycline, Ampicillin, Ciprofloxacin, Erythromycin, Kanamycin and Neomycin were tested against five bacterial strains *Escherichia coli, Klebsiella pneumonia, Salmonella typhi, Staphylococcus aureus* and *Proteus vulgaris* to determine the sensitivity towards antibiotics. Results of the present study reveals that the chloramphenicol inhibited the growth of two bacterial strains such as *Staphylococcus aureus* and *Proteus vulgaris* with zone of inhibition above 17mm. *Escherichia coli*, *Klebsiella pneumoniae* and *Salmonella typhi* showed resistance against Chloramphenicol. Tetracycline inhibited the growth of four bacterial strains such as *Escherichia coli*, *Klebsiella pneumoniae, Salmonella typhi* and *Staphylococcus aureus* with the zone of inhibition above (22mm). *Proteus vulgaris* was not sensitive to Tetracycline. *Staphylococcus aereus* alone was sensitive to Ampicillin, whereas all the

other bacterial strains showed resistance against Ampicillin. Erythromycine showed antibacterial activity against *Proteus vulgaris*, *Staphylococcus aureus*, *Klebsiella pneumoniae* and *Salmonella typhi* with the zone of inhibition above (11mm). *Escherichia coli* showed resistance against Erythromycin. Kanamycin inhibited the growth of all the tested bacterial strain with the zone formation above (15mm). Neomycin also showed antibacterial activity against all the tested human pathogens with the zone of inhibition above (20mm). All the tested human pathogens were highly sensitive to ciprofloxacin with the zone of inhibition above (33mm).

Table 2 : Efficiency of different antibiotic drugs against selected human pathogens

Antibiotics	Zone of Inhibition				
	Escherichia coli	*Klebsiella pneumoniae*	*Salmonella typhi*	*Staphylococcus aureus*	*Proteus vulgaris*
Chloramphenicol	0	0	0	17	18
Tetracycline	27	23	22	29	0
Ampicillin	0	0	0	12	0
Ciprofloxacin	33	52	40	34	33
Erythromycin	0	23	18	28	11
Kanamycin	21	15	23	23	21
Neomycin	25	33	20	22	21

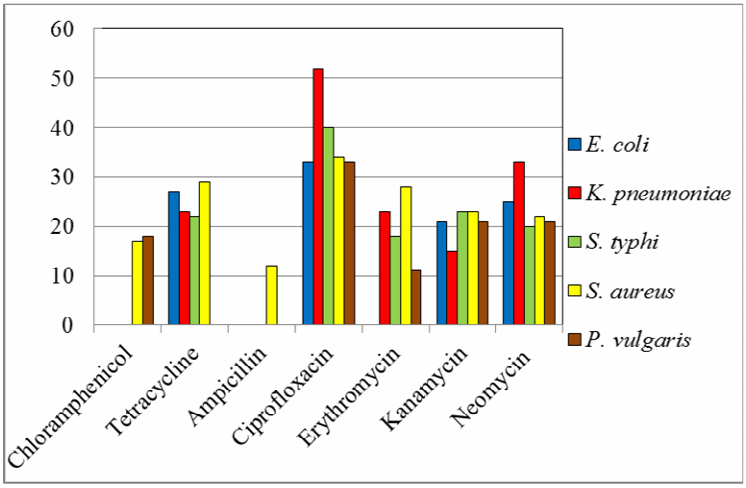

Fig. 2 : Efficiency of different antibiotic drugs against selected human pathogens

The comparative study of sensitivity of different human pathogens towards plant extracts of *Curculigo orchioides* and different antibiotics is given in Table: 3, Figure: 3. *Escherichia coli* was sensitive towards all extracts obtained from *Curculigo orchioides*. At the same time *Escherichia coli* showed resistance towards synthetic antibiotics, Chloramphenicol, Ampicillin and Erythromycin. *Klebsiella pneumoneae* was insensitive towards benzene extract of *Curculigo orchioides*, but sensitive towards all other plant extracts. *Klebsiella pneumoneae* was insensitive towards the antibiotics Chloramphenicol and Ampicillin. *Salmonella typhi* was found to be sensitive towards all extracts of *Curculigo orchioides* except ethanol extract. The antibiotics Chloramphenicol and Ampicillin couldn't check the growth of *Salmonella typhi*. *Staphylococcus aureus* was sensitive to all antibiotics and various extract of *Curculigo orchioides* except acetone extract. *Proteus vulgaris* was insensitive towards Isopropyl alcohol extract and the antibiotics tetracycline and ampicillin.

Table 3 : Comparative analysis of activity of different extracts of *Curculigo orchioides* and synthetic antibiotics against various human pathogens

Test organism	Zone of Inhibition (mm)											
	Plant extract					Antibiotics						
	Ethanol	Acetone	Benzene	NBA	IPA	Chloramphenicol	Tetracycline	Ampicillin	Ciprofloxacin	Erythromycin	Kanamycin	Neomycin
E. coli	9	16	11	16	18	0	27	0	33	0	21	25
K. pneumoniae	18	9	0	21	11	0	23	0	52	23	15	33
S. typhi	0	12	17	10	8	0	22	0	40	18	23	20
S. aureus	6	0	18	14	9	17	29	12	34	28	23	22
P. vulgaris	20	16	14	11	0	18	0	0	33	11	21	21

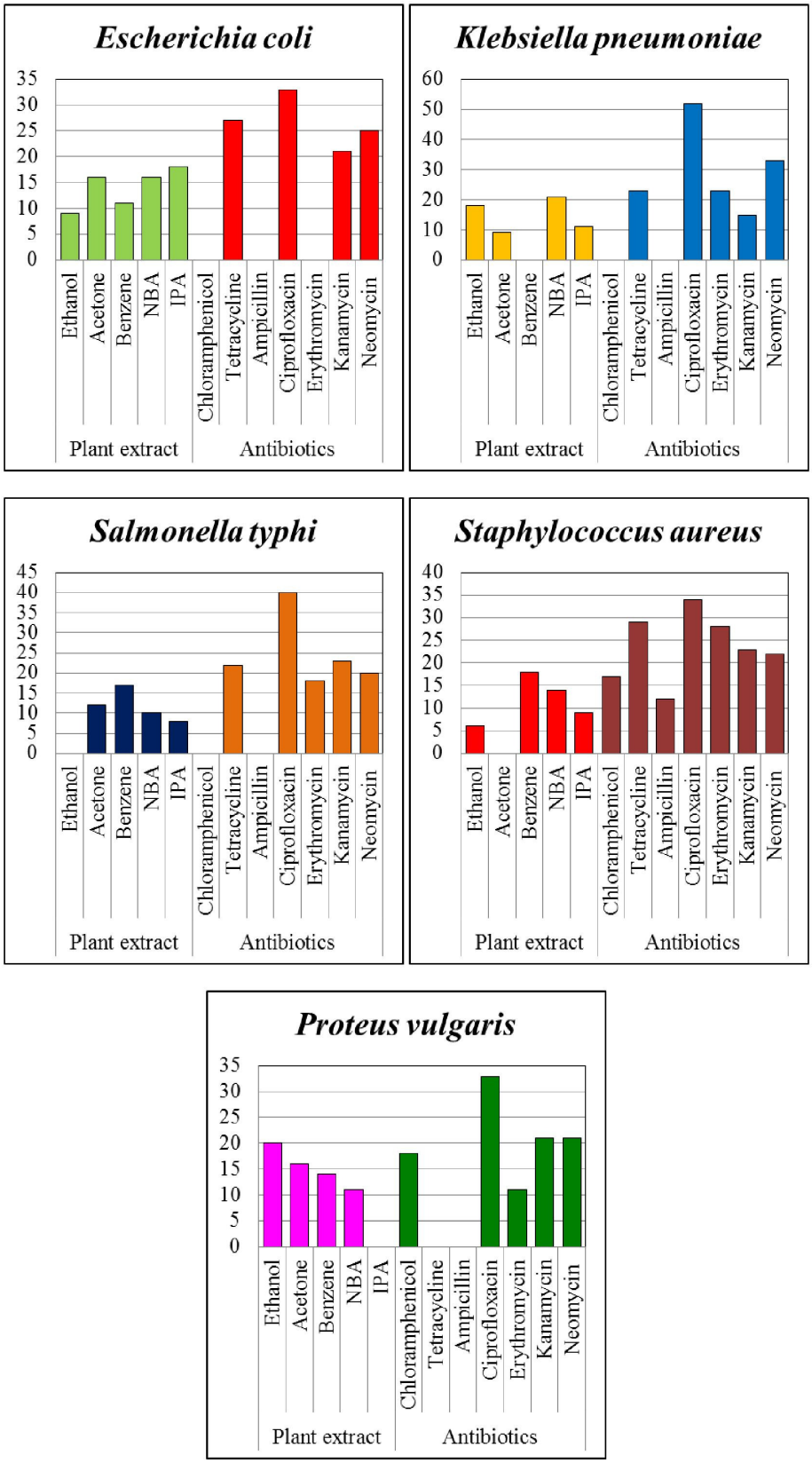

Fig. 3 : Comparative analysis of activity of different extracts of *Curculigo orchioides* and synthetic antibiotics against various human pathogens

The antibiotic compounds are synthetic commercial compounds that inhibit individual micro organisms. They contain a known concentration of a particular compound. However, the natural compounds are synergetic compounds and their susceptibility is low. Hence the antibacterial activity of antibiotics is higher than the natural compounds.

Acknowledgement

The authors are thankful to the authorities of Scott Christian College for providing facilities to carry out the work.

REFERENCES

Ahmed, I.T.; Mohamed, Z. and Mohamed, F. (1998). Screening of some Indian Medicinal plants for their antimicrobial properties. *J. Ethanopharmac.* 62: 83-193.

Al-Bari, M.A.A.; Sayeed, M.A. and Rahman, M.S. (2006). Characterization and antimicrobial activities of extract in a phenolic acid derivative produced by *Streptomyces Bangladeshiensis*, novel species collected in Bangladesh. Res. *J.Med. and Med. Sci.* 1: 77-81.

Ameenah Gurib-Fakim (2006). Medicinal plants: Traditions of yesterday and drugs of tomorrow. *Mot Aspects Med.* 27: 1-93.

Bauer, A.W.; Kirby, W.M.M.; Sherris, J.C. and Turck, M. (1966). Antibiotic Susceptibility Testing by a Standardized Single Disk Method *American Journal of Clinical Pathology*, 45(4): 493–496.

Bruneton, J. (1995). Pharmacognosy Phytochemistry, Medicinal plants. Lavoisier Publishing, 265-380.

Cragg, G.M. and Newman, D.J. (2009). Biodiversity: A continuing source of novel drug leads. *Pure Appl Chem.* 77: 7-24.

Cunha, B.A. (2001). Antibiotic side effects. *The Med. Clin. North Am.,* 85: 149-185.

Frontling, R.A. and Rathway, N.J. (1987). Recent trends in the discovery, developing and evaluating of antifungal agents. *Proc. Int. Tele Symp*, *J.R. Prous Barcelona*.

Jena, M.K.; Kancharla, S. and Kolli, P. (2021). *Curculigo Orchioides* (Kali Musli): A Plant with Huge Medicinal Properties. *Plant Cell Biotech. And Mol. Biol.*, 22(27-28): 48-56.

Rat, A.C. and Boissier, M.C. (2004). Rheumatoid arthritis, direct and indirect costs. *Joint Bone spine*. 71(6): 518-524.

Selvamony, S.; Sujin, R.M.; Geetha, V.S. and Jeeva, S. (2020). Ethnobotanical study of medicinal plants used by the Kani tribes of Pechiparai Hills, Western Ghats, India *Acta Ecologica Sinica*, https://doi.org/10.1016/j.chnaes.2020.04.005

Valsalam, S.; Agastian, P.; Arasu, M.V.; Al-Dhabi, N.A.; Ghilan, A.K.M.; Kaviyarasu, K.; Ravindran, B.; Chang, S.W. and Arokiyaraj, S. (2019). Rapid biosynthesis and characterization of silver nanoparticles from the leaf extract of *Tropaeolum majus* L. and its enhanced *in-vitro* antibacterial, antifungal, antioxidant and anticancer properties. *J. Photochem. Photobiol., B: Biol.*, 191 (2019): 65-74.

Vermani, K. and Garg, S. (2002). Herbal medicines for sexually transmitted diseases and AIDS. *J. Ethnopharmacol.*, 80: 49-66.