JOURNAL OF PURE AND APPLIED MICROBIOLOGY, December 2012. Vol. **6**(4), p. 1951-1954

Phytochemical and Antimicrobial Activity of *Xanthium strumarium*

Jameel A. Khader[1], Naser M. AbdElsalam[1], Riazullah[2,4], Iqbal Hussain[3], Badrullah[3] and Shumaila Noor[5]

[1]1AR-Riyadh Community College, King Saud University, Riyadh, Saudi Arabia.
[2]Department of Chemistry Government Degree College Ara Khel FR Kohat KPK Pakistan
[3]Department of Chemistry, Kohat University of Science and Technology, Kohat-26000, KPK, Pakistan.
[4]Department of Chemical Engineering, College of Engineering,
King Saud University, Riyadh, Saudi Arabia.
[5]College of Science Research Center, King Saud University Riyadh, Saudi Arabia.

(Received: 10 October 2012; accepted: 03 December 2012)

The antimicrobial activities of the Methanol and its sub fractions of chloroform, Ethyl acetate, and water extracts of the roots, stem and leaves of *Xanthium strumarium* were conducted. The bacterial strain used were *Staphylococcus aureus, Klebsiella pneumoniae, Salmonella typhymurium* and *Escherichia coli.* The fungal species including *Aspergillus fumigatus, Fusarium solani, Aspergillus niger* and *Aspergillus flavus*. Phytochemical analysis was also performed using the literature methods. All fractions of root extract showed significant activities against *E. coli* and *Klebsiella pneumonia.* Methanol, chloroform and water fraction of stem extract also found active against *Salmonella typhymurium.* Some fractions of stem, root and leaves extract were also give positive result against different fungi. In the present study, the selection of medicinal plant parts is based on the fact that most of these plant parts were not previously screened against multidrug resistant pathogenic

Key words: Antimicrobial activity, phytochemicals, *Xanthium strumarium* L.

Herbs are the source of medicine production and for the treatment of various diseases[1]. From natural sources impressive numbers of modern drugs have been isolated. A lot of medicinal plants are utilized in modern medicine where they take up a very significant place as raw materials for important drugs and plants used for traditional medicine contain a wide range of substances that can be used to treat chronic as well as infectious diseases.

* To whom all correspondence should be addressed.
E-mail: afridiriaz@yahoo.com

X. strumarium is an annual herb with a short, stout, hairy stem. Leaves broadly triangular-ovate or suborbicular; flower heads in terminal and axillary racemes; white or green; numerous; male upper most; female ovoid, covered with hooked bristles; Fruit obovoid, enclosed in the hardened involucre, with 2 hooked beaks and hooked bristles. Flowering time in India is August-September. It can be propagated through seeds. This weed is easily dispersed through animals as the fruits have hooked bristles and 2 strong hooked beaks[2]. The whole plant, specially root and fruit, is used as medicine. According to Ayurveda, *X. strumarium* is cooling, laxative, fattening, anthelmintic, alexiteric, tonic, digestive, antipyretic, and improves appetite, voice, complexion, and memory.

It cures leucoderma, biliousness, and poisonous bites of insects, epilepsy, salivation and fever. The plant of *Xanthium* yields xanthinin which acts as a plant growth regulator. Antibacterial activity of xanthinin has also been reported. Seed yields semi-drying edible oil (30-35%) which resembles sunflower oil and used in bladder infection, herpes, and erysipelas. Cake can be used as manure whereas shell can be used as activated carbon. The plant has been reported as fatal to cattle and pigs[3, 4].

MATERIALS AND METHODS

Plant Material

This is a common plant and grows in different parts of Pakistan. It was collected in March- June in flowering season and was identified by the help of plant taxonomist.

Antimicrobial activity

Preparation of crude extract

100 g of each of the coarsely powdered plant material was taken and extracted with methanol. Then this crude of methanol is further fractionating into n-hexane, Chloroform, ethyl acetate and water. The extracts were filtered and sodium chloride solution was then added to the filtered extract to form precipitates. The precipitates were then separated, air dried and transferred to air tight amber glass container. The crude extract was dissolved in chloroform and water to make the final concentration, which was kept in refrigerator till use[5].

Phytochemical analysis and Antimicrobial bioassay

Phytochemical analysis and Antimicrobial activities assay were conducted as described by Hussain *et al.*[6]

RESULTS AND DISCUSSION

The present study was initiated because of the increasing resistance to antibiotics of many skin pathogens including bacteria and fungi. Plant extracts and compounds are of new interest as antiseptics and antimicrobial agents in dermatology[7]. As a result, the phytochemical and antimicrobial activity of different parts *Xanthium strumarium* was screened against the most common skin pathogens.

Antibacterial activity

Root extract

Methanol extract

From Table 1 methanol root extract showed highest activity of 15 mm zone of inhibition against *Salmonella* followed by 13 mm against *Klebsiella* while it is inactive against *E. coli* and *Staphylococcus*.

Ethyl acetate extract

From Table 1 ethyl acetate root extract showed highest activity of 16 mm zone of inhibition against *Klebsiella* followed by 15 mm against *E. coli.*

Chloroform extract

Chloroform root extract showed highest activity 16 mm against *E. coli* followed by 15 mm against *Klebsiella.*

Water extract

17, 14 and 13 mm zone of inhibition showed by water root extract against *E. coli*, *Salmonella* and *Staphylococcus* respectively.

Stem extract

Methanol extract

From Table 1 methanol stem extract showed highest activity of 13 mm zone of inhibition against *E. coli* followed by 12 mm against *Salmonella* while it is inactive against *Staphylococcus* and *Klebsiella*.

Ethyl acetate extract

From Table 1 ethyl acetate stem extract showed highest activity of 13 mm zone of inhibition against *Staphylococcus* followed by 11 mm against *Salmonella.*

Chloroform extract

Chloroform stem extract showed highest activity 13 mm against *Klebsiella* followed by 12 mm against *Staphylococcus.*

Water extract

15 and 13 mm zone of inhibition showed by water stem extract against *E. coli* and *Staphylococcus* respectively.

Leaves extract

Methanol extract

From Table 1 methanol leaves extract showed highest activity of 18 mm zone of inhibition against *E. coli* followed by 17 mm against *Salmonella*.

Ethyl acetate extract

From Table 1 ethyl acetate leaves extract showed highest activity of 18 mm zone of inhibition

Table 1. A*ntibacterial activities of X. strumarium*

Name of bacteria	CH_3OH R+S+L	EtOAc[a] R+S+L	$CHCl_3$[a] R+ S+L	H_2O[a] R+S+L
E. coli	N+13+18	15+N+17	16+N+N	17+15+ 11
Staphylococcus	N+N+12	14+13+N	N+12+17	13+13+10
Klebsella	13+N+15	16+N+18	15+13+N	N+N+14
Salmonella	15+12+17	N+11+13	11+N+17	14+N+16

[a] Zone of inhibition in mm, N= Nil, R=Root, S=Stem, L=Leaves

Table 2. Antifungal activity of tested fractions of *X. strumarium*

Name of fungi	CH_3OH R+S+L	EtOAc[a] R+S+L	$CHCl_3$[a] R+S+L	H_2O[a] R+S+L
A. fumigatus	N+P+N	P+N+P	N+P+P	P+N+P
F. solani	N+P+P	N+P+P	P+N+P	P+N+P
A. niger	P+P+P	P+N+P	P+N+N	N+P+P
A. flavus	P+N+P	N+P+N	N+N+P	P+P+N

R=Root, S=Stem, L=Leaves, P=Positive, N=Negative

Table 3. Phytochemical screening of powder of *X. strumarium*

S. No.	Test	*X. strumarium*
1	Flavonoids	Positive
2	Saponins	Positive
3	Antraquinone	Positive
4	Terpenoids	Positive
5	Tannins	Positive
6	Reducing Sugar	Positive
7	Cardiac glycosides	Positive

against *Klebsiella* followed by 17 mm against *E. coli.*

Chloroform extract

Chloroform leaves extract showed highest activity 17 mm against *Staphylococcus* and *Salmonella.*

Water extract

16, 14, 11 and 10 mm zone of inhibition showed by water root extract against *Salmonella, Klebsiella, E. coli* and *Staphylococcus* respectively.

Antifungal activity

Root extract

Methanol friction

From Table 1 methanol root extract showed positive result against *Niger* and *Flavus.*

Ethyl acetate friction

Ethyl acetate root extract found active against *A. niger* and *A. fumigatus.*

Chloroform fraction

Chloroform fraction of *X. strumarium* root active against *A. niger* and *F. solani.*

Water extract

Water crude fraction of *X. strumarium* root found active against all tested four fungal strains except *A. niger*.

Stem Extract

Methanol extract

Methanol extract of stem active against *A. fumigatus, F. solani* and *A. niger* while ethyl acetate extract of *X. strumarium* stem active against *F. solani* and *A. flavus*.

Chloroform crude fraction of *X. strumarium* stem only active against *A. fumigatus* in all four tested fungi strain. Water crude fraction of *X. strumarium* stem found active against *A. niger* and *A. flavus.*

Leaves Extract

Methanol fraction of leaves inactive against *A. fumigatus* while active again the rest tested fungi strain.

Ethyl acetate crude fraction of leaves inactive against *A. flavus* while active again the rest tested fungi strain. Chloroform crude fraction

of *X. strumarium* leaves inactive against *A. niger* while active again the rest tested fungi strain. Water crude fraction of *X. strumarium* leaves found active against all test fungi strain except *A. flavus.*

From Table 3 it is clear that *X. strumarium* give positive result for Flavonoids, Saponins, Anthraquinone, Terpenoids, Tannins, Reducing Sugar and Cardiac glycosides. This plant species can be use as a source for isolation of different classes of natural product including Flavonoids, Saponins, Antraquinone, Terpenoids, Tannins, Reducing Sugar and Cardiac glycosides. Flavonoids are a group of phenolics that are found in varying amounts in foods and medicinal plants which have been shown to exert anti-allergic, anti-inflammatory, antimicrobial and antihepatotoxic activities[8, 9]. As the study of Srinivas *et al.,* only concern with methanolic fraction therefore our result not totally agree with his reported result. According to Srinivas *et al.,* there is no flavnoid and tennins in methanolic extract, Here we obtained positive result for both flavanoid and tennines in the whole plant[10].

CONCLUSION

The antimicrobial effects of extracts against the studied microbes suggest that, different crude parts of this plant species hold notable therapeutic action that can prop up the traditional practice of this plant in the treatment of disease causes by bacteria and fungi such as gastrointestinal infection, diarrhoea, respiratory and skin diseases. This study gives more specific results. It showed that which fraction of which part of plant again which bacteria and fungus will be screened for specific antibacterial and antifungal agent.

ACKNOWLEDGMENTS

The authors are thankful to the Deanship of Scientific Research, King Saud University Riyadh for funding this research work.

REFERENCES

1. Tyler VE. Rational Phytotherapy, 3rd edition; Springer-Verlag, Berlin, 1997.
2. Agharkar, SP., Medicinal plants of Bombay presidency. Pbl. Scientific Publishers, Jodhpur (India) ; 1991; 230.
3. Oudhia P and Tripathi RS. Possibilities of utilization of medicinal weeds to increase the income of the farmers. In: Abstract. National Seminar on Medicinal Plant Resources Development, Gandhi Labour Institute, Ahmedabad (India); 1998; 3.
4. Sastry TCS and Kavathekar KY. Plants for reclamation of wastelands. Pbl. Publications and Information Directorate, Council for Scientific and Industrial Research, New Delhi (India); 1990; 421-422.
5. Harborne JB. Phytochemical methods, London Chapman and Hall, Ltd, 1973; 49-88.
6. Hussain I, Rehman MUK, Riazullah, Muhammad Z, Khan K, Khan FA, Ullah Z and Haider S. Phytochemicals screening and antimicrobial activities of selected medicinal plants of Khyberpakhtunkhwa Pakistan. *African Journal of Pharmacy and Pharmacology* 2011; **5**(6): 746-750.
7. Maher Obeidat. Antimicrobial activity of some medicinal plants against multidrug resistant skin pathogens *Journal of Medicinal Plants Research* 2011; **5**(16): 3856-3860.
8. Robert J, Nijvelt DT, Nood V ELS, Van Hoorn DEC, Boelens PG, Van Norren K, Van Leeuwen PAM. Flavonoids. A Review of Probable Mechanism of Action and Potential Applications. *The Amer. J. Clinical Nutr*. 2001; **74**(4): 418- 425.
9. Yamamoto C, Gayner A. Therapeutic potential of inhibition of the NF-KB pathway in the treatment of inflammation and cancer, *J. Clinical Invest.* 2006; **107**(2): 135-142.
10. Srinivas P, Rajashekar V, Upender R, Venkateshwarulu EL and Anil KCH. Phytochemical Screening and in Vitro Antimicrobial Investigation of the Methanolic Extract of Xanthium strumarium Leaf", *Int. J. Drug Dev. & Res.,* 2011; 3(4): 286-293.