ISSN : 0974 - 7435 Volume 5 Issue 3

Trade Science Inc.

BioTechnology

An Indian Journal

FULL PAPER

BTAIJ, 5(3), 2011 [167-170]

Antimicrobial activity of *Striga hermonthica*

Elhadi N.Mahmoud[1]*, Hanan A.Wahab[2], Ibrahim M.Abu Alfutuh[1], Mohamed O.A.Elsheikh[3]

[1]College of Pharmacy and Health Sciences, Ajman University of Science and Technology, (UAE)

[2]Faculty of Pharmacy, University of Khartoum, (SUDAN)

[3]Department of Pharmacognostic Sciences, Zayed Complex for Herbal Research and Traditional Medicne, Health Authority, Abu Dhabi, (UAE)

E-mail : jrac.elhadi@ajman.ac.ae

Received: 3rd February, 2011 ; Accepted: 13th February, 2011

ABSTRACT

Crude extracts from different morphological parts of *Striga hermonthica* (Scrophulariaceae) were prepared and screened for antimicrobial activities. For antibacterial activity, the extracts are tested against the growth of Gram positive (*Bacillus subtlis* and *Staphylococcus aureus*) and Gram negative (*Pseudomonas aeruginosa* and *Escherichia coli*) bacteria. For antifungal activity, the extracts are tested against *Aspergillus niger*, *A.flavus* and *Candida albicans.* Most of the extracts showed good antibacterial activity against the growth of Gram positive bacteria, and some of them exhibited positive antibacterial activity against the growth of Gram positive as well as Gram negative bacteria; at concentrations of 1-5 mg/ml extract. This as compared with 4 mg/ml Ampicillin or Neomycin. The petroleum ether extracts were found to be devoid of any antibacterial activity. The methanol and ethyl acetate extracts of the flowers showed a fungicidal activity against cultures of *A. niger* and *A. flavus* at concentration 1 mg/ml. With *C. albicans*, the same extracts showed a fungistatic and fungicidal activity at concentrations 1 mg/ml and 5 mg/ml, respectively. This as compared with 3-5 mg/ml Ketaconazole.

KEYWORDS

Striga hermonthica;
Extracts;
Antibacterial;
Antifungal activity.

INTRODUCTION

In the last few years, the antimicrobial properties of plants have been investigated by a number of researchers world wide.

Striga hermonthica (Del.) Benth. (Scrophulaceae) is an obligate parasite which attacks the roots of a wide range of field cereal crops. It is widely distributed in tropical and subtropical regions. In the Sudan, it thrives on sorgum and millet[1].

The herb is used traditionally for treatment of skin diseases, vitiligo, leorosy, wounds and to releive headache[2-4] and for diabetes[5].

In West Africa the plant is traditionally used in dermatosis, leprosy and jaundice treatments[6]. Contraceptive[7], a weak antiplasmodial[8] and antioxidant[9] activities of *S. hermonthica* have been reported. The insecticidal potentialities of the species has also been reported[10].

These folkloric uses initiated our study on the anti-

FULL PAPER

microbial activity of this plant.

Phytochemical investigations revealed the presence of flavonoids from the whole plant extracts[11,12].

In Sudan, no investigations on this species are carried for antimicrobial activities.

MATERIALS AND METHODS

Plant material

The plant material was separatedly collected from different plots at Shambat area (Khartoum North), in July 2008, and authenicated by the Department of Agronomy, Faculty of Agriculture, University of Khartoum. Voucher specimens have been deposited in the Herbarium of Pharmacognosy, Faculty of Pharmacy, University of Khartoum.

Extraction and preparation of extracts

The plant material consisting of flowers, roots, and stems (aerial parts) was separatedly air-dried and gound. 10 g of each morphological part from *Striga hermonthica* plant was extracted separately and successively with petroleum ether (60-80^0), chloroform, and 70% methanol using Soxhlet apparatus. The floral methanolic extract was concetrated and re-extracted with ethyl acetate. The extracts were evaporated under vacuum and the residues were separately dissolved or suspended in the same extracting solvent (10 ml) and kept in refrigerator till use. Aqueous extracts were prepared by maceration with distilled water for 24 hours. The residue was then filtered and the final volume was adjusted to 10 ml with distilled water and the solution used immediately.

Tested bacteria

Six standard bacterial strains were obtained from the National Collection Type Culture (NCTC). They were Gram positive: (*Bacillus subtilis* NCTC 8236, and *Staphylococcus aureus* NCTC 6447) and Gram negative bacteria (*Pseudomonas aeruginosa* NCTC 6796 and *Escherichia coli* NCTC 8196).

The bacteria were activated and cloned three successive times in nutrient agar and stored on nutrient agar slants at 4 °C. Subsequent cultivation and tests weredone on nutrient agar medium.

Tested fungi

The tested fungi, *Aspergillus niger*, *A.spergillus flavus* and *Candida albicans* were obtained from the National Health Laboratory, Sudan. The fungal cultures were maintained on Sabouraud and dextrose agar medium incubated at 25^{0}C for 7 days. The fungal growth was harvested andwashed with sterile normal saline, and finally suspended in 100 ml of sterile normal saline and the suspension was stored in refrigerator till used.

Antibacterial activity

Bacteria were cultured in nutrient agar at 37^{0}C for 24 hrs. The cup plate agar diffusion method[12] was adopted, with some minor modifications, to asses the antibacterial activity of the prepared extracts.

Simultaneously, *solvent* controls involving the addition of the respective solvent instead of the extracts were carried out.

Ampicillin and neomycin were used as refernce antibacterial agents in concentrations that gave an inhibition zones comparable to those of the tested extracts.

After incubation, the diameters of the resultant growth inhibition zones were measured, averaged and the mean values were recorded.

Antifungal activity

Agar Diffusion method[12] was used. 0.5 ml sample of each extract and 0.1 ml of each fungal suspension were mixed thouroughly with 20 ml of pre-sterlized Sabouraud dextrose agar medium, *w*hich was maintained at 45^0*C*. The inoculated medium was poured into sterile petri dishes, allowed to solidify, and incubated at 25^{0}C for 7days. In the controls petroleum ether (60-80^0), chloroform, 70% methanol, ethyl acetate and sterile water were used in place of the test extracts. Each extract sample was tested in four replicates.

Amphotericin C and ketoconazole were used as positive controls.

RESULTS AND DISCUSSION

A- Antibacterial

The results of antibacterial activities of different extracts at different

concentrations are presented in TABLE 1. The con-

TABLE 1 : Antibacterial activity (inhibition zone mm) of *Striga hermonthica* extracts

Plant parts	Extracts	Conc. mg/ml	B.s.	S.a.	E.c.	P.a.
Flowers	Petroleum ether	1,5,10	-	-	-	-
	Chloroform	1	14	12	-	-
		5	16	14	8	8
		10	17	15	9	9
	Ethyl acetate	1	20	15	20	16
		5	22	16	22	18
		10	23	17	23	19
	Methanol	1	19	15	19	16
		5	22	16	22	18
		10	23	17	23	19
	Aqueous	100	15	18	15	17
		200	17	21	17	19
Roots	Petroleum ether	1,5,10	-	-	-	-
	Chloroform	1	9	12	-	-
		5	10	13	-	-
		10	11	14	-	-
	Methanol	1	11	10	12	12
		5	12	11	13	13
		10	13	12	14	14
	Aqueous	100,200	-	-	-	-
Aerial parts	Petroleum ether	1,5,10	-	-	-	-
	Chloroform	1	11	12	-	-
		5	12	13	-	-
		10	13	14	-	-
	Methanol	1	14	11	15	12
		5	15	12	16	13
		10	16	13	17	14
	Aqueous	100	11	14	12	11
		200	13	16	14	13
Ampicillin		4	21	16	23	17
		2	18	12	20	14
		1	17	11	18	12
Neomycin		4	17	17	21	18
		2	15	15	19	16
		1	13	14	18	13

B.s.: *Bacillus subtilis*; S.a: *Staphylococcus aureus*; E.c.: *Escherichia coli*, P.a.: *Pseudomonas aeruginosa*

centrations of the extracts are calculated on basis of plant material (i.e. 10 g).

The aqueous extracts of flowers and aerial parts possessed antibacterial activity against the tested organisms, but no activity was shown by the aqueous extract of the roots. The petroleum ether extracts were found to be devoid of any antibacterial activity.

As shown from the table, the methanol extracts of flowers and aerial parts possessed more pronounced activity than those of the roots as compared with ampicillin and neomycin. The higest activity was noticed against *B.subtilis* and *E. coli.*

The flowers chloroform extract showed moderate activity against Gram negative bacteria at concentrations 5 and 10 mg/ml, while the chloroform extracts of roots and aerial parts were not active against the same organisms at the same concentrations.

The flowers ethyl acetate and methanol extracts possessed nearly the same antibacterial activity.

It can be inferred from the results that most of the extracts showed good antibacterial activity against Gram positive and Gram negative bacteria. In the present investigation the flowers extracts showed potential antibacterial activity compared with other morphological parts.

The water extract showed relatively low antibacterial activity as compared with the methanol, ethyl acetate, and chloroform extracts

B- Antifungal

Unlike the antibacterial screening results of S. *hermonthica,* which gave pronounced activity, the results of the antifungal activity of different morphological parts of the same species revealed a lower antifungal activity. See TABLE 2.

The petroleum ether extracts of different morphological parts showed no activity against all tested organisms.

Flower extracts were found to be the most active plant extracts. They exhibited a fungicidal activity against *Asergillus niger* and *A.flavus*. With *C. albicans,* the same extracts showed a fungistatic and fungicidal activity at concentrations 1 mg/ml and 5 mg/ml, respectively.

Roots extracts at different concentration showed a fungistatic activity against *A. niger at* 10mg/ml and no activity against *C. albicans*

The aerial parts extracts exhibited a fungicidal activity against *A.flavus* and *A. niger* and a fungistatic activity against *C. albicans* at 5 mg/ml concentration.

FULL PAPER

TABLE 2 : Antifungal activity of *Striga hermonthica* extracts

Plant parts	Extracts	Conc. mg/ml	*A.niger*	*A.flavus*	*C.albicans*
Flowers	pet. ether	1,5,10	-	-	-
	chloroform	1	±	±	±
		5,10	+	+	+
	ethyl acetate	1	+	+	±
		5,10	+	+	+
	methanol	1	+	+	±
		5,10	+	+	+
	aqueous	100	+	+	±
		200	+	+	+
Roots	pet. ether	1,5,10	-	-	-
	chloroform	1,5	-	-	-
		10	±	±	-
	ethyl acetate	1,5	-	-	-
		10	±	-	-
	methanol	1,5	-	-	-
		10	±	+	-
	aqueous	100,200	-	-	-
Aerial parts	pet. ether	1,5,10	-	-	-
	chloroform	1	-	-	-
		5	+	+	±
		10	+	+	±
	ethyl acetate	1	±	±	-
		5	+	+	±
		10	+	+	+
	methanol	1	±	±	-
		5,10	+	+	±
	aqueous	100	±	±	-
		200	+	+	±
Amphotericin C		2,3,4,5	+	+	±
Ketoconazole		1	±	±	±
		2	+	+	±
		3,4,5	+	+	+

(+) Fungicidal (±) Fungistatic (-) No activity

CONCLUSION

This study has revealed the antimicrobial activity of *Striga hermonthica*. It has further confirmed that the plant extracts could be used for the treatment of various infections. Further work is reccomended to study the possible utilization of the plant in applied microbiological uses.

ACKNOWLEDGEMENTS

The authors are grateful to the National Health Laboratory, Sudan for providing fungal organisms and assisting in antifungal screening.

REFERENCES

[1] L.J.Musselman, F.N.Hepper; J.Kew Bull., **41**, 205-221 **(1986)**.
[2] A.Farouk, A.K.Bashir, A.K.M.Salih; Fitoterapia, **54**, 3-7 **(1983)**.
[3] D.Abbiw; 'Useful Plants of Ghana', IT Publications Ltd., Southampton, London, U.K., 1-15 **(1990)**.
[4] H.S.N.Hussein, Y.Y.Deeni; Inter.J.Pharmacog, **29(1)**, 51-56 **(1991)**.
[5] H.E.Hatil; Ethnobotanical Leaflets, **13**, 203-10 **(2009)**.
[6] O.G.Nacoulma; Plantes médicinales et pratiques médicales traditionnelles au Burkina-Faso: cas du plateau central. Thèse d'état Université de Ouagadougou, Ouagadougou, Burkina-Faso. 261 **(1996)**.
[7] M.K.Choudhury, Z.G.Marting, A.S.Agbaji, A.J.Nok, S.Mukhopadyay; Indian J.Pharm.Sci., **62(5)**, 396-397 **(2000)**.
[8] L.C.Okpako, E.O.Ajaiyeoba; Afr.J.Med.Med.Sci., **33(1)**, 73-5 **(2004)**.
[9] K.Martin, P.O.Albert, G.N.Odile; Biotechnol.Agron. Soc.Environ., **10(1)**, 17-23 **(2006)**.
[10] B.Moussa, B.Abdourahamane, A.Toudou; Biotechnol.Agron.Soc.Environ., **10(1)**, 3-6 **(2006)**.
[11] I.Z.Khan, M.Aqil, B.Kolo; Ultra Scientist of Physical Sciences, **10(2)**, 278-280 **(1998)**.
[12] M.K.Choudhury, A.L.Phillips, A.Mustapha; Phytother.Res., **12(2)**, 141-143 **(1998)**.
[13] F.Kavanagh; 'Analytical Microbiology', Academic Press, New York and London, **2**, 1-13 **(1972)**.