Pakistan J. Pharm. Sci.2(1): 29- 34, 1989

SAUDI FOLK MEDICINE: PHYTOCHEMICAL AND ANTIMICROBIAL SCREENING

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ABSTRACT

Plants of 25 families, encompassing 30 species were selected on the basis of their folklore uses and literature data for the present screening. Besides phytochemical screening the plant extracts were prepared and tested for their antimicrobial activity. The result of the testing showed that about 77% of these plants exhibited some level of antibacterial activity. The most common chemical constituents found in these plants were sterols and/ or triterpenes, falvonoids, alkaloids and tannins. Volatile oils, volatile bases, saponins, coumarins, anthraquinones and cardiac glycosides were also detected.

Introduction

During the last few decades a number of investigators conducted several surveys for antimicrobial substances from plants and showed that antibiosis is not uncommon among higher plants (Al-Shamma and Mitscher 1979; Malcolm and Sofowora 1969; Bhkuni et al. 1974; Leven et al. 1979; Farouk et al. 1983). In many cases chemical studies lead to the isolation of compounds responsible for the antimicrobial activity.

As a part of our work on the 'Saudi Folk Medicine Project' which covers a diversity of topics, we recently reported the anti-microbial activity of thirty-two plants (Shah et al. 1988). In this communication we wish to report our findings on the antimicrobial and prelminary phytochemical screening of other plants commonly used in Saudi folk medicine.

Materials and Methods

The plant materials were collected by the field survey team of our project and identified by the plant Taxonomy unit of our college. The dried plant materials were crushed and extracted with 95% ethanol. The solvent was evaporated in vacuum at low temperature and the crude extract thus obtained was used for the antimicrobial testing (Mitscher et al. 1972). In the case of *C ommiphora molmol, Eerula asafoetida* and *Viola odorata,* however, water extracts were used.

Table 1: Organisms used in the screening of the sample for antimicrobial activity.

No.	Organism	NCTC No.*	Classification
1.	*Staphylococcus aureus*	6571	Gram positive
2.	*Bacillus subtilis*	10400	– do –
3.	*Pseudomonas aeruginosa*	10662	Gran negative
4.	*Proteus vulgaris*	4635	– do –
5.	*Escherichia coli*	10418	– do –
6.	*Candida albicans* Mycological reference Laboratory School of Tropical Medicine & Hygiene, London.	3153	Yeast
7.	*Shigeila flexneri*	Lab. strain King Khalid University Hospital	Gram negative
8.	*Shigella sonnei*	– do –	— do –
9.	*Shigella boydia*	– do –	– do –

*National collection type culture (NCTC).

Antimicrobial screening:

The plant extracts were tested by ager dilution method at a concentration of 3 mg, 2 mg and 1 mg for the antibacterial and antifungal activity as described earlier (Mitscher et al. 1972, Shah et al. 1988) against the organisms mentioned in Table I. Plants showing activity at 1 mg/ml concentration were further studied on lower dilutions to determine their MICs.

Phytochemical screening:

The presence or absence of alkaloids, flavonoids, tannins, cardiac glycosides, saponins, coumarins, anthraquinones, glucosinolates, cyanogenic glycosides, sterols and/or riterpenes, volatile oils and volatile bases was checked according to the standard procedures (Farnsworth 1966, Al-Yahya 1985).

Results and Discussion

The result of our present studies are presented in Table-2, arranged alphabetically ac-cording to their families with their botanical names, plant pans, their uses and results of the screening tests.

Table 2: Phytochemical and antimicrobial screening of some plants used in Saudi folk medicine.

Botanical	Part used	Uses	Chemical constituents	Antimicrobial activity (MIC) mg/ml) S.a.	B.s.	Ps.a.	Pr.v.	E.c.	Sh.f.	Sh.s.	Sh.b.	C.a.
Bolanitaceae												
Balanites aegyptiaca (L.) Del.	Fruits	Washing wounds and dressing	Al, CG, SP, TN, SL/TP	1	1	0	1	0	0	0	0	0
Beraginaceae												
Heliotropium strigosum Wild	W.P.	Skin diseases	VO, TN, AL, SL/TP	0	0	0	0	0	0	0	0	0
Burseraceae												
Commiphora molmol Eng.	Gum (W.E.)	Antiseptic	Vo, resins	+**	+**	0	+**	+*	+*	+*	+*	+*
Chenopodiaceae												
Seidlitzia rosmarinus (Ehrenb.) Solms-Laub.	A.P.	Antimicrobial	AL, FD, TN, SP, SL/ TP, VO	3	0	0	0	0	0	0	0	0
Combretaceae												
Terminalia chebula Rotz.	Nuta	Wounds leprosy	TN FD, SL/ TP	1	0.5	0	2	0	0	0	0	0
Compositae												
Francoeuria crispa (Forssk.) Caes.	A.P.	Skin diseases	VB, FD, SL/ TP, VO	2	1	0	0	0	0	0	0	0
Rhanterium epapposum Oliv	A.P.	Antimicrobial	Al, FD, TN, CN, SL/TP, VB, VO.	0	0	0	0	0	0	0	0	0
Cruciferae												
Anastatica hierochuntical L.	W.P.	Gynicolocal	AL,FD,TN, GL, SL/TP.	0	3	0	0	0	0	0	0	0
Cucurbitaceae												
Cucumis prophatarum Jusl.	A.P.	Rabies veneral	FD, TN, SL/TP	0	3	0	0	0	0	0	0	0
Labiatae												
Salvia spinosa L.	A.P.	Gonorrhoea	AL, CG, FD, TN,CN, Sl/TP	0	2	0	0	0	0	0	0	0

Table 2: (Cont'd)

Botanical	Part used	Uses	Chemical constituents	Antimicrobial activity (MIC) mg/ml) S.a.	B.s.	Ps.a.	Pr.v.	E.c.	Sh.f.	Sh.s.	Sh.b.	C.a.
Lauraceae												
Cinnamomum zeylanicum Breyn.	Bark	Expectorant diarrhoea, Colds	FD, TN, CN, SL/TP, VO	3	1	0	2	2	2	3	2	1
Leguminosae												
Cassia fistula L	Fruit (W.E.)	Skin diseases and boils.	AL, FD, AQ, TN, SL/TP	2	0	0	0	0	0	0	0	0
Indigofera spinosa Forssk	A.P.	Eczema	FD, TN, SP, SL/TP	0	1	0	0	0	0	0	0	0
Trigonella anguina Del.	A.P.	Bronchitis	AL, FD, TN, VB, SL/TP, SP,	0	1	0	0	0	0	0	0	0
Liliaceae												
Aloe vera L.	W.P.	Skin diseases, leprosy.	TN, AQ ,SP, SL/TP	2	1	0	0	0	0	0	0	0
Lythraceae												
Lawsonia inermis L.	Leaves	Leprosy, Sore throat, skin diseases	FD, TN, AQ, SL/TP	1	0.5	2	1	3	3	3	3	2
Malvaceae												
Malva parviflora L.	W.P.	Cough	CG, FD, CN, SL/TP, TN.	0	2	0	0	0	0	0	0	0
Meliaceae												
Azadirachta indica A. Juss	Leaves	Sphilis,eye diseases wounds, leprosy	AL, CG, VO, TN,ST/TP.	0	0	0	0	0	0	0	0	0
Molluginaceae												
Mullugo cerivana (L.) Ser.	A.P.	Antiseptic	AL, FD, CN, TN, SL/TP	0	2	0	0	0	0	0	0	0
Papaveraceae												
Papaver somniferum L.	Seed	Cough, dysentry, diarrhoea	AL, FD, TN, SL/TP	0	0	0	0	0	0	0	0	0
Portulacaceae												
Portulaca quadrifolia L.	W.P.	Skin diseases	AL, TN, CG, SL/TP.	1	1	0	3	0	0	0	0	0

Table 2: (Cont'd)

Botanical	Part used	Uses	Chemical constituents	Antimicrobial activity (MIC) mg/ml							
				S.a.	B.s.	Ps.a.	Pr.v.	E.c.	Sh.f.	Sh.s.	Sh.b.	C.a.
Rhamnaceae												
Zizyphus spina christi, (L.)Willd.	Fruit	Bronchitis, Skin infection	FD, VO, SP, SL/TP	0	0	0	0	0	0	0	0	0
Salvadoraceae												
Salvadora persica L.	A.P.	Leprosy, Gonorrhoea	FD, TN, SL/TP	0	0	0	0	0	0	0	0	0
Solanaceae												
Splanum nigrum L.	A.P.	Expectorant, eczema, syphilis	AL, FD, TN, VB, SL/TP.	0	0	0	0	0	0	0	0	0
Tamaricaceae												
Tamarix nilotica (Ehrenb.) Bge.	A.P.	Sore throat, dysentery, diarrhoea, antiseptic.	AL, CG, FD, SP, TN,SL/TP.	0	3	0	0	0	0	0	0	0
Typhaceae												
Typha domingensis Pers.	A.P.	Antimicrobial	FD, CN, SL/TP	1	1	0	0	0	0	0	0	0
Umbelliferae												
Anethum graveolus L.	Seeds	Abscess.	AL, FD, TN, SL/TP, VO.	0	2	0	0	0	0	0	0	2
Cuminum cyminum L.	Seeds	Leprosy, leucoderma	FD, CN, SL/TP, VO.	0	2	0	0	0	0	0	0	2
Ferula asafoetida	Seeds (W.E.)	Antimicrobial	FD, TN, CN, SL/TP	+**	+**	0	+**	0	0	0	0	+**
Violaceae												
Viola odoreta L.	A.P.	Expectorant	FD, TN, SL/TP	+**	+*	0	0	+*	+*	0	0	0

+* = 10% of extract in the media was active.; +** = 5% of extract in the media was active.

AP = aerial part; WP = whole plant; W.E. = water extract; AL = alkaloids; FD = flavonoids; SL/TP = sterols/triterpenes; CN = coumarins; AQ = anthraquinones; VO = volatile oils; VB = volatile bases; TN = tannins; CG = cardiac glycosides; SP = saponins; GL = glucosinolates; S.a. = Staphylococcus aureus; B.s. = Bacillus subtilis; Ps.a. = Pseudomonas aeruginosa; Pr.v. = Proteus vulgaris; E.c. = Escherichia coli; Sh.f. = Shigella flexneri; Sh.s = Shigella fleneri; Sh.s = Shigella sonnei; Sh.b. = Shigella boydia; C.a = Candida albicans.

The preliminary phytochemical screening revealed that the 30 plants belonging to 25 families selected for the present antimicrobial screening arc rich in different active phytochemical constituents. Most of the plants were found to contain sterols/triterpenes (96%), tannins (83%) and flavonoids (83%). Alkaloid test was positive in 50% of the plants while coumarins in 27%, saponines 23%, cardiac glycosides 20% and anthraquinones (10%) were observed. Volatile oils were detected in about 30%, volatile bases 13% and glucosinolates 3% of the plants.

The results of the antimicrobial screening were encouraging as about 77% of the plants showed antimicrobial activity. It is evident that the gram-positive organisms, S. au-teas and *B. subtilis* showed higher sensitivity to most of the extracts. Among the gram-negative bacteria the growth *of Pr. vulgaris* was inhibited by about 23% of the extracts. *E. coli* was affected by *L. inermis, C. molmol, V. odorata* and *C. zeylanicum* while the growth of *Pr. aeruginosa* was inhibited by *L. inermis* only. It is interesting to note that all the three *Shigella* strains were inhibited by *L. inermis. C. molmol* and *C. zeylanicum.*

These results add support to the claimed folklore use of these plants for some of the mentioned therapeutic purposes. The detailed fractionation, isolation of the active constituents and their toxicity studies are however, necessary to justify the safe use of these herbal drugs.

Acknowledgement

We are thankful to Mr. Mustafa O. Khalid for his assistance and King Abdulaziz City for Science and Technology, Riyadh for the financial support.

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