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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 3 (2): 348-349, 2000

Chemical composition and antibacterial activity of *Suaeda fruticosa* Forsk From Cholistan, Pakistan

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Abstract: Proximate chemical composition, mineral constituents and antibacterial activity *of Suaeda fruticosa* (Kali Lani) was carried out. Determination of chemical constituents showed the presence of total carbohydrates 0.66 percent (0.34 percent reducing and 0.32 percent non-reducing), moisture contents 87.9 percent and ash contents 6.0 percent. Ether extract of the plant showed acid value 0.56, iodine value 0.02, refractive index 1.36 and pH value 8.0. The percentage of mineral constituents was, sodium 1.40, potassium 0.55, calcium 2.40, magnesium 2.04, carbonates 0.12, bicarbonates 0.85 and Chlorides 1.40. Results of antibacterial activity of plant extracts in water, acetone, ethanol and ether against *Klebsiella, Staphylococcus* and *E. coli* indicated that plant possesses potent antibacterial activity. *E. coli* showed resistance to the standard antibiotic i.e., Streptomycin while its growth was inhibited by acetone and ether extracts.

Key word: Chemical composition, antibacterial activity of *Suaeda fruticosa* forsk

Introduction

Medicinal plants have served through the ages as a constant source of medicament for the treatment of a variety of diseases. A bulk of rural population in Asia and Africa rely mainly on drugs of plant origin for medical relief and in the Indo-Pakistan sub-continent well over 70 percent of the population falls in this category (Atta-ur-Rehman, 1979).

Cholistan desert covering an area about 26,000 km^2 is full of medicinal plant resources. Climatically this desert is characterized by highly variable precipitation, extreme variation of diurnal temperature and high evaporation rate. During summer temperature reaches upto 50°C. The soil of this desert is sandy and at places it is saline, iterspaced with stabilized and unstabilized sand dunes of varying heights (Akram *et al*., 1991). Due to harsh environmental conditions and periodic droughts, the vegetation cover is scanty. During the rainy season (July to September) this desert blooms and is covered with herbaceous vegetation. But during the summer season perennials, drought resistant plants are able to adjust themselves against the punishing environment of the area. Most of the endemic plant species of this desert have medicinal importance and local people use these plants for the cure of various diseases. *Suaeda fruticosa* Forsk. (Kali Lani) is a perennial shrub, commonly found in the highly saline plain areas of Cholistan desert. It belongs to family Chenopodiaceae. Locally this plant has great importance because it is browsed by the camels; people burn this plant as fuelwood and to prepare 'sajji' which is used to wash clothes. Medicinally this plant is used for the treatment of wounds. It is laxative, diuretic and emetic. It increases the menses, ophthalmia, diarrhoea, eye sight and in excess doses causes abortion and induces vomiting (Chaudhry and Arshad, 1987). Gul-e-Rana *et al*. (1990) determined the chemical composition and nutritive value of *Panicum antidotale*, collected from various occasions of Cholistan desert. Iqbal *et al*. (1981) determined the chemical composition of *Haloxylon recurvum* and its ash, collected from Cholistan desert. The author also estimated protein, sugar and ash contents on dry matter basis. Chughtai *et al*. (1979) determined the alkaloids from the leaves of *Cocculus villosus.*

So far as antibacterial activities are concerned no such work has been carried out on this plant. However, various other scientists have reported the antibacterial and antifungal activity of various other plant species. Mahmood *et al*. (1991) resulted that the chemical constituents of *Raphasus sativus* possesses a massive hepatoprotective activity due to its valuable ingredients. Rizwani and Ahmed (1995) determined the antimicrobial activity of an ornamental plant, Water Hyacinth. Tanker *et al*. (1995) investigated *in vitro* antimicrobial and antifungal activities of some *Sternbergia* species and Lycorine.

The present study was envisaged to determine the chemical composition and antibacterial activity of *Suaeda fruticosa* collected from Cholistan desert.

Materials and Methods

Samples of *Suaeda fruticosa* were collected from Cholistan desert and subjected for the determination of proximate chemical composition and antibacterial activities.

Chemical composition: The plant samples were analysed for the determination of moisture contents, ash contents and carbohydrates (reducing and non-reducing). Acid value, iodine value, refractive index and pH was determined from the ether extract of the plant. The chemicals and solvents used for this study were of analytical grade and all the methods were taken from Official Methods of Analysis (AOAC, 1984).

Antibacterial activity: The plant was subjected for ether, acetone, ethanol and water extractions. Each extract was used for the study of antibacterial activity of the plant against three bacterial species i.e., *Klebsiella* (Gram-negative), *Staphylococcus* (Gram-positive) and *Escherichia coil* (Gram-negative). All of these bacteria were grown in bacterial growth media prepared by following Baker and Silverton (1982) and Hewitt (1977). Plant extracts in different solvents were applied on these bacteria in high and low doses by using agar diffusion assay. To compare the results a standard antibiotic (Streptomycin) was used as control. Streptomycin Sulphate injections containing 1 gram streptomycin base per vial were used. The control was also applied in high and low doses.

The data obtained were analyzed statistically and means were separated using DMR test (Steel and Torrie, 1980).

Results and Discussion

The proximate chemical composition of *Suaeda fruticosa* is given in Table 1. The moisture contents of this plant are 87.9 percent and ash percentage is 6.00 percent. The total carbohydrates in this plant are 0.66 percent out of which 0.34 percent are reducing and 0.32 percent are non-reducing carbohydrates. The iodine value is 0.02 which indicates that the plant possesses very little unsaturation in the fatty acids. Acid value of ether extract of this plant is 0.56 which shows that free fatty acids are present but in small amount. Refractive index and pH value were 1.36 and 8.0 respectively at 21.5°C temperature.

The mineral contents of the plant are 1.40 percent sodium, 0.50 percent potassium, 2.40 percent calcium, 2.04 percent magnesium, 0.12 percent carbonates, 0.85 percent bicarbonates and 1.40 percent Chlorides. These results are similar to the findings of Iqbal *et al*. (1981).

Data pertaining to inhibition zone of bacteria i.e., *Klebsiella, Staphylococcus* and *E. coli* against different extracts of *Suaeda fruticosa* has been incorporated in Table 2. In *Klebsiella* the average inhibition zone recorded was between 17.00 mm in ethanol extract at high dose and 0.0 mm in water extract at high and low doses. Maximum inhibition zone i.e., 30.75 mm and 26.50 mm was

recorded in control (Streptomycin) at high and low doses. Within the plant extracts ethanol extract at high and low doses and ether at high and low doses showed enhancing results in retarding the growth of bacteria, while the water extract remained ineffective. These results indicate that although the bacteria has been killed by the acetone, ethanol and ether extracts of the plant but the control (Streptomycin) remained more active in killing the bacteria (*Klebsiella*).

Table 1: Proximate chemical composition of *Suaeda fruticosa*

Proximate composition (%)	
Moisture contents	87.90
Ash contents	6.00
Carbohydrates	0.66
Reducing	0.34
Non-reducing	0.32
Acid value	0.56
Iodine value	0.02
Refractive index	1.36
pH value	8.00
Mineral contents	
Sodium	1.40
Potassium	0.50
Calcium	2.40
Magnesium	2.04
Carbonates	0.12
Bicarbonates	0.85
Chloride	1.40

Table 2: Bacterial inhibition zones of different extracts of *Suaeda fruticosa* (mm)

		Bacteria		
Extracts	Dose	*Klebsiella*	*Staphylococcus*	*E. coli*
Acetone	High	10.50f	20.50c	14.00b
	Low	11.50ef	16.00dc	12.50b
Ethanol	High	17.00c	13.00ef	0.00c
	Low	13.00def	14.00def	0.00c
Ether	High	16.50cd	16.50d	16.00a
	Low	14.50cde	12.00f	13.00b
Water	High	0.00g	0.00g	0.00c
	Low	0.00g	0.00g	0.00c
Control	High	30.75a	31.75a	0.00c
	Low	26.50b	26.50b	0.00c

Values in the same column with the same letters do not differ significantly ($p < 0.05$)

In *Staphylococcus* inhibition zone was recorded between 20.5 mm in acetone extract at high dose and 0.00 mm in water extract at high and low doses. Maximum inhibition zone was recorded by the control (Streptomycin) i.e., 31.75 mm and 26.50 mm at high and low doses, respectively. Within the plant extracts acetone extract at high and low doses and ether extract at high and low doses killed more bacteria as compared to ethanol extract (high and low doses). While the water extract at its both doses (high and low) remained inactive to check the growth of bacteria. These results indicate that in *Staphylococcus* the trend is again same, although different plant extracts except water retarded the growth of bacteria but the control remained more active in killing the bacteria.

In *E. coli* the inhibition zone recorded in between the plant extracts ranges from 16.00 mm in acetone extract at high dose to 0.00 mm in Ethanol and water extracts at both high and low doses. In this case the control (Streptomycin) remained totally inactive in checking the growth of *E. coli* having 0.00 mm inhibition zone at its both high and low doses. In plant extracts acetone and ether extracts at low and high doses were found active in retarding the growth of bacteria while ethanol and water extracts remained totally inactive. It has been concluded from the results discussed above that in *Klebsiella* and *Staphylococcus*, the three plant extracts (acetone, ethanol and ether) along with antibiotic remained effective in killing the bacteria. While in case of *E. coli* two extracts (acetone and ether) were only active in killing the bacteria as compare to the antibiotic.

The presence of low iodine percentage of this plant shows that there is no unsaturation in the plant oil but the results mentioned above indicate that there is a possibility of short chain monocarboxylic acids present in the plant oil which possesses the antibacterial character. It may further be assumed that the bactericidal action of *Suaeda fruticosa* is due to certain chemical substances which may be some alkaloids. Locally the burnt extract of this plant is used by the inhabitants to wash their clothes which contains carbonates of soda and potash, sulphate of soda and organic matters (Said, 1972). It indicates that the *Suaeda fruticosa* possesses certain alkaloids but for clear picture it require further investigations for the identification of active components.

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