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ANTIMICROBIAL SCREENING OF SOME ARID TILIACEOUS PLANTS

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Arid zone of Rajasthan shows great phytodiversity from this arid region, Tiliaceous plants like *Corchorus depressus, Corchorus tridens* and *Grewia tenax* were screened for their antimicrobial properties. Ethyl ether and alcoholic extracts of leaves of all these selected plant species showed positive reactions against bacterial pathogens *i.e. Staphylococcus aureus, Escherichia coli* and a fungal pathogen *Candida albicans.* The leaves of these selected plant species were analysed for flavonoid contents *i.e.* Quercetin and Kaempferol. The total flavonoid content 1.46 mg/gdw was found in leaves of *Corchorus tridens* while 1.13mg./gdw in leaves of *Grewia tenax.*

Keywords : Antimicrobial screening; Arid zone of Rajasthan; Flavonoids; Kaempferol; Quercetin; Tiliaceous plants.

Arid zone of Rajasthan is a potential and rich source of plant species. The Tiliaceous plants are a potential soruce of phytochemicals of pharmaceutical interest such as flavonoids, sterols, alkaloids, phenolic compounds, sulphides, isothiocyanates, anthocynins, terpenoids etc. These are the active principles which act as antioxidants, anticarcinogenic, antimicrobials and immunity stimulants. A number of arid zone plants have been screened for their antimicrobial activities and evaluation of antimicrobial principles[1-7]. From Gajner area of Bikaner district plants like *Corchorus depressus, Corchorus tridens,* and *Grewia tenax* were screened for their antimicrobial properties. Fresh leaves of the selected Tiliaceous plant species were collected and pulverized into a paste. Cold extraction was done by blending the paste with ethyl ether and 50% ethanol in the ratio of 1 : 2, in a Waring Blender at 2500 rpm for 10 min. The mixture was centrifuged at 3000 rpm. The supernatant was evaporated to dryness and the residue was suspended in double distilled water. The micro-organisms used for screening were *Staphylococcus aureus* (Gram positive), *Escherichia coli* (Gram negative) and *Candida albicans* (Fungal pathogen). The growth medium used for *Staphylococcus aureus* and *Escherichia coli* was Nutrient broth (10% peptone, 0.5% labanco and 0.5% NaCl, pH adjusted to 7.5) and for *Candida albicans* Sabourands liquid medium (1% peptone, 4% glucose, pH adjusted to 5.8). Paper discs of known concentration of standard antibiotics namely chloramphenicol, penicillin and mycostatin were used for comparison. Blank paper discs were used as control. Control discs dipped in ethyl ether and 50% ethanol, plates (5 each for *Staphylococcus aureus, Escherichia coli* and *Candida albicans)* were employed for each extract. The ratio of inhibition zone the various test samples was compared with the inhibition zone from the high concentration antibiotic reference discs.

Extraction of Flavonoid Contents (Antimicrobial principles) : Dried and powdered leaves of the selected medicinal plant species were sepatately soxhlet extracted with 80% hot ethanol[8] on a water bath for 24 hrs. Each of the extracts was concetrated and concentrate re-extracted with petroleum ether (Fraction-I), ether (Fraction-II) and ethyl acetate (Fraction-III) in succession. Fraction-III was dried *in vacuo* and the resultant was hydrolysed with 7% H_2SO_4 for 2 hrs. The mixture was filtered and the filterate extracted with ethyl acetate. Concentrated ether and ethyl acetate fraction were applied on TLC plates along with standard reference compounds and the plates developed with the solvent system n-butanol, acetic acid and water (4:1:5) when kaempferol and quercetin were detected. The compounds were isolated by preparative TLC and crystallized, mp (quercetin 309-311^0 C and kaempferol 271-273^0 C). IR spectra compared well with their authentic samples. Quantitative estimation of flavonoid contents was carried by method for quercetin[9-10] and for kaempferol[11].

Antimicrobial screening of all the selected medicinal plant species is given in Table 1. The present study indicates that ethyl ether and alcoholic extracts of leaves of *Corchorus depressus, Corchorus tridens* and *Grewia tenax* have showed antimicrobial activity against all test organisms. Thus the activity of all these test extracts against both bacteria and fungal pathogen indicates that selected plants are resistant to bacterial and fungal attacks due to the presence of some biologically active secondary

Table 1. Antimicrobial activity of leaf extracts of selected medicinal plant species and reference antibiotics.

Plants	Leaf extract	Test Organisms				
		S. aureus		*E. coli*		*C. albicans*
		I/C[a]	I/P[a]	I/C[a]	I/S[a]	I/m[a]
Corchorus depressus	Ether extract	0.38	0.43	0.41	0.38	0.81
	Alcoholic extract	0.44	0.50	0.77	0.70	0.65
Corchorus tridens	Ether extract	0.67	0.92	0.79	0.89	0.92
	Alcoholic extract	0.71	0.82	0.89	0.94	0.73
Grewia tenax	Ether extract	0.58	0.80	0.76	0.81	0.82
	Alcoholic extract	0.60	0.73	0.71	0.84	0.70

a=Ratio of diameters of the inhibition zone to leaf extracts (10µg) under observation (I) and diameter of inhibition zone due to standard reference antibiotics; C = Chloramphenicol (30µg) against *S. aureus* = 30 mm and *E. coli* 32 mm; P=Penicillin (10 units) against *S. aureus* = 32mm; S=Streptomycin (10µg) against *E. coli*=20 mm; M=Mycostatin (100 units) against *C. albicans* =32mm.

products. Maximum antimicrobial activity was exhibited by the leaf extracts (Ethyl ether and alcoholic extract) of *Corchorus tridens* against all the test pathogens. The flavonoid contents (mg./gdw) from leaves of selected plant species are given in Table 2.

Table 2. Flavonoid contents (mg/gdw) from leaves of selected medicinal plant species.

Plants	Quercetin	Kaempferol	Total contents
Corchorus depressus	0.68	0.61	1.29
Corchorus tridens	0.79	0.67	1.46
Grewia tenax	0.54	0.59	1.13

The present investigation shows that among all the plant samples tested the total flavonoid contents were found to be 1.46mg/gdw in leaves of *Corchorus tridens* while 1.13mg/gdw in *Grewia tenax.* The quercetin 0.79 mg/gdw was found in leaves of *Corchorus tridens,* while 0.54 mg/gdw in *Grewia tenax.* The amount of kaempferol 0.67 mg/gdw was found in leaves of *Corchorus tridens,* while 0.59 mg/gdw in *Grewia tenax.* The Tiliaceous plant species of arid zone of Rajasthan are potential source of antimicrobial principles. These medicinal plants are resistant to bacterial and fungal attacks due to presence of biologically active substances *i.e.* antimirobial principles. These medicinal plants retain potentialities to synthesize the flavonoid contents which are active principles against bacterial as well as fungal pathogens. Due to presence of these secondary products the selected plants can be used in drug and pharmaceutical industries.

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References

1. Nag T N, Mathur C S and Goyal S C 1979, Phytochemical studies of *Tribulus terrestris* and *Agave wightii,* contents of primary and secondary products. *Comp. Physiol. Ecol.* **4** 157-160.
2. Singh V, Sethia M, Mathur K and Nag T N 1988, Flavonoids of some arid zone plants of Rajasthan. *Ind. J. Pharm. Sci.* March-April, **88** 133.
3. Ahmed-El-Sawi S, Abd-El-Megeed HF and Ali A M 1999, Flavonoid and antimicrobial volaties from *Adhatoda vasica* Nees. *Pharmaceutical and Pharmacological Letters* **9**(2) 52-56.
4. Ahmed I and Beg Arina Z 2001, Antimicrobial and phytochemical studies on 45 Indian medicinal plants against multi-drug resistant human pathogens. *J. Ethnopharmacology* **2** 113-123.
5. Kapoor B B S and Ranga P 2003, Flavonoids from Asteraceous medicinal plants of Rajasthan desert. *J. Phytol. Res.* **16**(1) 101-102.
6. Kapoor B B S and Kumar S 2005, Herbal plants of Rajasthan desert : A potential source of antimicrobial principles. *J. Arid Land Studies,* Japan **16** 425-426.
7. Kapoor B B S, Bhumika and Khatri J S 2007, Antimicrobial activities of some medicinal tree species of Hanumangarh district of Rajasthan. *J. Phytol. Res.* **20**(2) 325-326.
8. Subramanian S S and Nagarajan S 1969, *Curr. Sci.* (India) **38** 65.
9. Kariyone T, Hashimato and Y Kinnira M 1993, *J. Pharm. Soc.* (Japan) **73** 253-256.
10. Naghski J, Feuske (Jr.) C S and Couch I F 1975, *J. Pharm. Assoc.* **40** 613.
11. **Mabry T J, Markham K R and Thomas M B 1970, *The systemic identification of flavonoids,* Springer Verlag, Berlin, 119.**