A Study of Antimicrobial Activity Of Some Medicinal Plants Against Various Multiple Drug Resistant Pathogens

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Abstract - The antimicrobial activity of crude ethanol extract and hot water extract of four medicinal plants was studied. The extract of leaves, roots and stem of Catharanthus roseus, Eucalyptus mannifera, Coriandrum sativum and Tamarindus indica were evaluated using the agar well diffusion technique against Eschrechia coli, Salmonella typhi, Bacillus subtilis, Staphylococcus aureus, Pseudomonas aeruginosa and C. albicans using amoxicillin for bacterial strains and fluconozol for fungal strains as reference standard. The results showed that E .mannifera has the highest antimicrobial potential. All of its leaf, root and stem extracts were found to be active. The root extracts of all plants have maximum activity, however, in case of E. mannifera leaf extract were found to be more potent. T. indica was found to be least active against the pathogens. In T. indica none of the root and stem extracts showed activity against any of the pathogens. Only little activity was seen in leaf extracts.

Key words - Agar well diffusion techniques, reference standard, Catharanthus roseus, Eucalyptus mannifera, Coriandrum sativum, Tamarindus indica.

I. INTRODUCTION

Right from its beginning, the documentation of traditional knowledge especially on the medicinal uses of plants, has provided many important drugs of the modern day (Farnsworth, D.S., et. al., 2001). According to the WHO, medicinal plants would be the best source for obtaining variety of drug. The increasing failure of chemotherapeutics and antibiotic resistance exhibited by pathogenic microbial infectious agents has lead to the screening of several medicinal plants for their potential antimicrobial activity (Elizabeth, K.M., 2005). Antimicrobials of plant origin have enormous therapeutic potential. They are effective in treatment of infectious diseases while simultaneously mitigating many of the side-effects that are often associated with synthetic antimicrobials. The beneficial medicinal effects of plant materials typically result from the combination of secondary products present in the plants.

In plants these compounds are mostly the secondary metabolites such as alkaloids, steroids, tannins, flavonoids, resins fatty acid gums and phenol compounds which are capable of producing definite physiological action on body (Bishnu, J., et. al., 2009) These compounds are mainly derived from the barks, stems, leaves, flowers and fruits of plants and due to its antimicrobial property, it can be used to cure diarrhea, dysentery, cough, cold, cholera, fever, bronchitis etc.

Although some specific benefits can be traced to specific plant compounds, many herbs contain dozens of active constituents that together combine to give plant its therapeutic value. Consequently, it is believed that the whole plant has more effective healing properties than its isolated components. Any part of plant may contain active compounds. With this in mind, in present work, some selected plants are screened for their potential antimicrobial activity.

Madagaskar periwinkle (*Catharanthus roseus*) also known as sadabahar is an important medicinal plant of family Apocynaceae. It is cultivated mainly for its alkaloids, which are having anticancer activities. It is also possess antibacterial, antifungal, antidiabetic and antiviral activities. The extract of *C. roseus* did not exhibit antimicrobial activity against

Staphylococcus aureus.

Tamarind (*Tamarindus indica*) is a tree in the family Fabaceae. Photochemical studies revealed the presence of tannins, saponins, sesquiterpenes, alkaloids and phlobatamins and other extracts active against both gram positive and gram negative bacteria.

Eucalyptus *(Eucalyptus mannifera)* is a diverse genus of flowering trees (and a few shrubs) in the myrtle family, Myrtaceae. Species of Eucalyptus are cultivated throughout the tropics and subtropics area. Eucalyptus appears to help relieve symptoms of colds, flu, chest congestion, sore throat, bronchitis, pneumonia, and respiratory infections.

Coriander (*Coriandrum sativum*) popularly known as “Dhaniya” is an annual herb in the family Apiaceae. Chemicals derived from coriander leaves were found to have antibacterial activity against *Salmonella typhi* only. The present investigation is focused on screening of leaf

extract of plants for its antibacterial potential adapting routine the antibacterial assay technique.

MATERIALS AND METHODS

Collection of plant material:

The plant samples were collected and weighed.

Preparation of plant extracts:

Aqueous extracts: 20 g of each sample was placed in 200 ml distilled water and was boiled at 100ºC with constant stirring. After which it was filtered twice using filter paper Whattmann no. 1.

Organic Extracts: 20 g of each plant sample was crushed and was placed in 200 ml of ethanol which was then placed on rotary shaker for overnight. It was then filtered with filter paper (Whattmann no. 1). The solvent was evaporated using Rotary vacuum shaker to concentrate the solution. The obtained extract was stored in vials.

Sub culturing of microorganisms:

Microorganisms namely *Eschrechia coli, Salmonella typhi, Bacillus subtilis, Staphylococcus aureus* and *Pseudomonas aeruginosa* were subcultured from pure culture in nutrient broth.

Agar well diffusion:

6 mm wells were made on NA plates. 100 µl of each plant leaf extract was filled in wells. Antibiotic was used for control and plates were incubated at 37ºC for 24 h. The assessment of antmicrobial activity was based on measurement of diameter of inhibition zone formed around the well (Sharma, A., et. al., 2008).

II. RESULT

Table-1: Zone of Inhibition of different pathogens obtained using organic Distilled water leaf extracts of different plants

S.no.	Organisms	Plant	Zone of inhibition of Organic extract (dia. in mm)	Zone of inhibition of D/w extract (dia. in mm)
1.	*E. coli*	Antibiotic	35 mm	35 mm
		E. mannifera	21 mm	-
		C. roseus	15 mm	-
		T. indica	15 mm	-
		C. sativum	-	-
2.	*B. subtilis*	Antibiotic	35 mm	35 mm
		E. mannifera	22 mm	22 mm
		C. roseus	-	15 mm
		T. indica	-	-
		C. sativum	-	
3.	*S. aureus*	Antibiotic	30 mm	30 mm
		E. mannifera	23 mm	-
		C. roseus	-	-
		T. indica	19 mm	-
		C. sativum	-	-
4.	*S. typhi*	Antibiotic	26 mm	26 mm
		E. mannifera	18 mm	13 mm
		C. roseus	12 mm	-
		T. indica	10 mm	-
		C. sativum	-	12 mm
5.	*P. aeruginosa*	Antibiotic	30 mm	30 mm
		E. mannifera	20 mm	15 mm

		C. roseus	20 mm	-
		T. indica	-	-
		C. sativum	-	-
6.	*C. albicans*	Antibiotic	30 mm	30 mm
		E. mannifera	8 mm	5 mm
		C. roseus	-	-
		T. indica	-	6 mm
		C. sativum	-	-

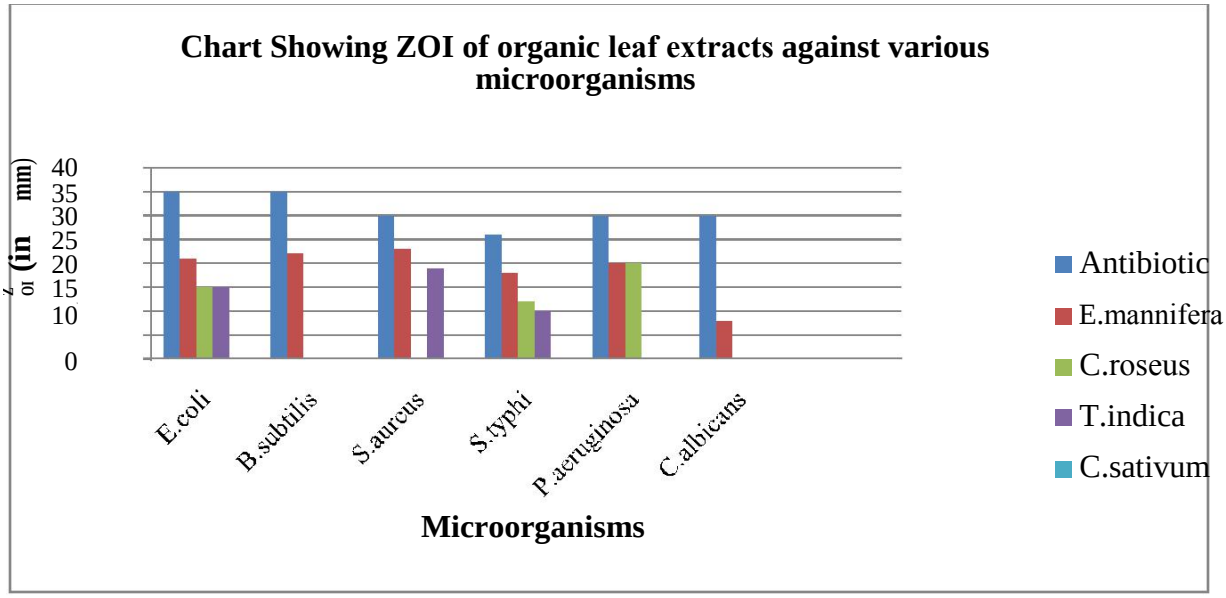

Figure 1: chart showing ZOI of organic leaf extracts against various microorganisms

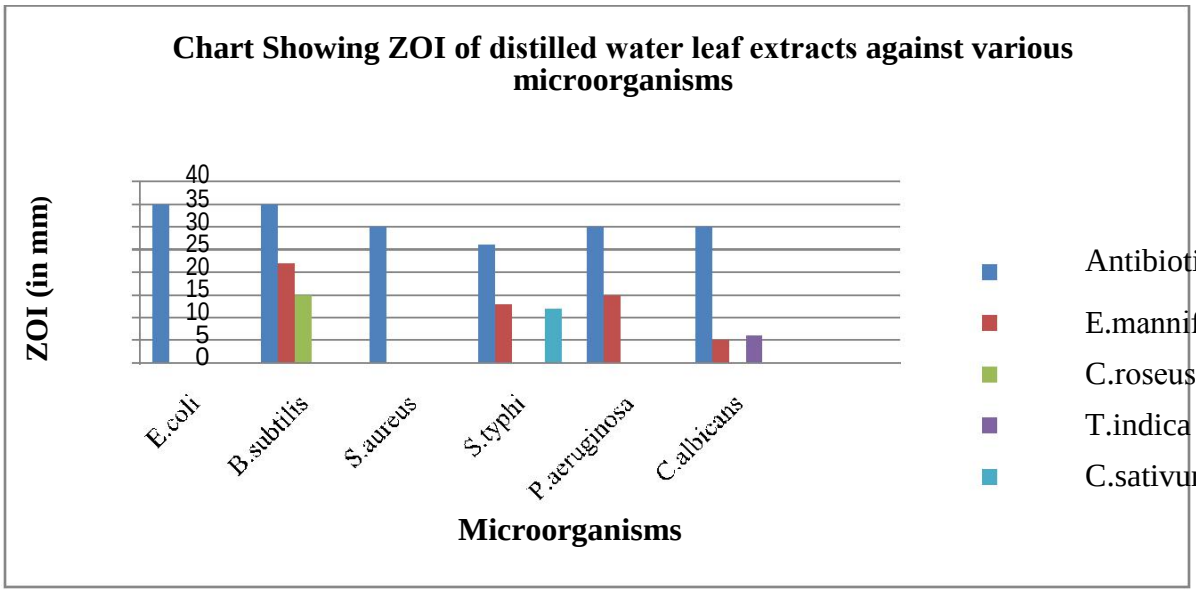

Figure 2: Chart showing ZOI of distilled water leaf extracts against various microorganism

Table-2: Zone of Inhibition of different pathogens obtained using organic and distilled water root extracts of different plants

S.no.	Organisms	Plant	Zone of inhibition of Organic extract (dia. in mm)	Zone of inhibition of D/w extract (dia. in mm)
1.	*E. coli*	Antibiotic	35 mm	35 mm
		E. mannifera	16 mm	14 mm
		C. roseus	14 mm	-
		T. indica	-	-
		C. sativum	10 mm	10 mm
2.	*B. subtilis*	Antibiotic	35 mm	35 mm
		E. mannifera	16 mm	16 mm
		C. roseus	10 mm	6 mm
		T. indica	-	-
		C. sativum	16 mm	8 mm
3.	*S. aureus*	Antibiotic	30 mm	30 mm
		E. mannifera	8 mm	4 mm
		C. roseus	10 mm	8 mm
		T. indica	-	-
		C. sativum	-	8 mm
4.	*S. typhi*	Antibiotic	26 mm	26 mm
		E. mannifera	18 mm	12 mm
		C. roseus	12 mm	10 mm
		T. indica	-	-
		C. sativum	8 mm	10 mm
5.	*P. aeruginosa*	Antibiotic	30 mm	30 mm
		E. mannifera	16 mm	10 mm
		C. roseus	10 mm	10 mm
		T. indica	-	-
		C. sativum	-	6 mm
6.	*C. albicans*	Antibiotic	30 mm	30 mm
		E. mannifera	16 mm	14 mm
		C. roseus	12 mm	10 mm
		T. indica	-	-
		C. sativum	-	16 mm

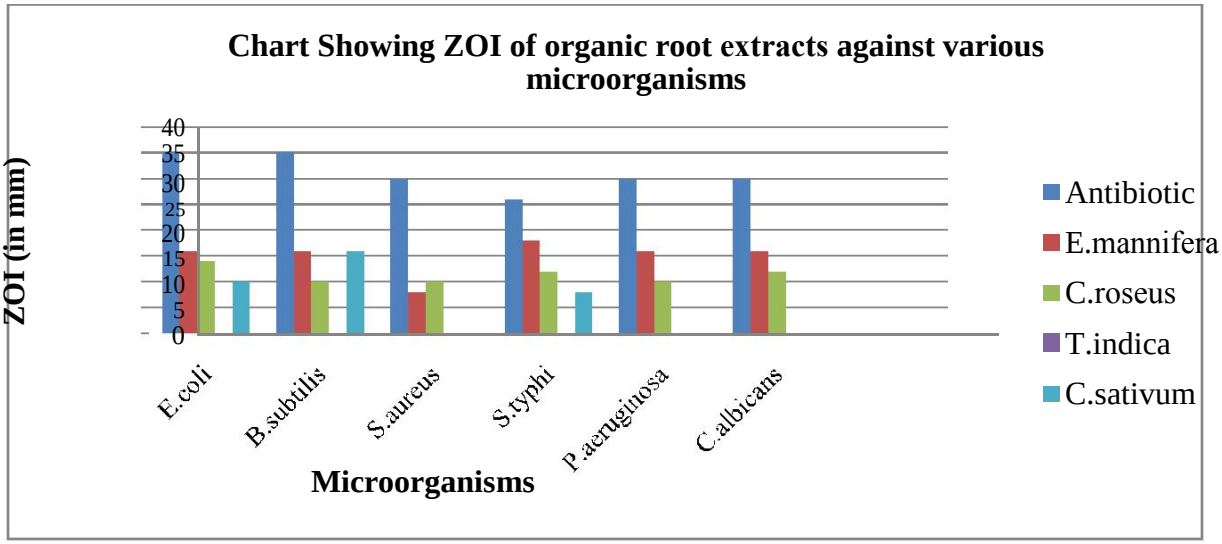

Figure 3: Chart showing ZOI of organic root extracts against various microorganisms

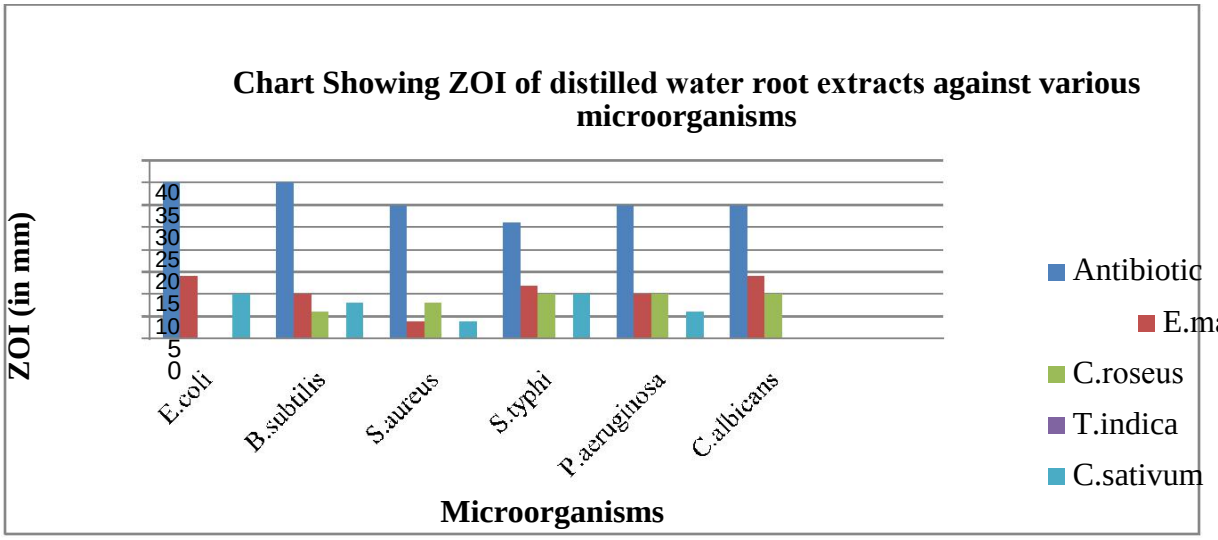

Figure 4: Chart showing ZOI of distilled water root extracts against various microorganism

Table-3: Zone of Inhibition of different pathogens obtained using organic stem extracts of different plants

S.no.	Organisms	Plant	Zone of inhibition of Organic extract (dia. in mm)	Zone of inhibition of D/w extract (dia. in mm)
1.	*E. coli*	Antibiotic	35 mm	35 mm
		E. mannifera	10 mm	12 mm
		C. roseus	12 mm	10 mm
		T. indica	-	-
		C. sativum	10 mm	14 mm
2.	*B. subtilis*	Antibiotic	35 mm	35 mm
		E. mannifera	10 mm	10 mm
		C. roseus	16 mm	16 mm
		T. indica	-	-
		C. sativum	-	8 mm
3.	*S. aureus*	Antibiotic	30 mm	30 mm
		E. mannifera	8 mm	6 mm
		C. roseus	8 mm	16 mm
		T. indica	-	-
		C. sativum	4 mm	4 mm
4.	*S. typhi*	Antibiotic	26 mm	26 mm
		E. mannifera	16 mm	10 mm
		C. roseus	8 mm	14 mm
		T. indica	-	-
		C. sativum	6 mm	6 mm
5.	*P. aeruginosa*	Antibiotic	30 mm	
		E. mannifera	10 mm	
		C. roseus	12 mm	
		T. indica	-	30 mm
		C. sativum	-	12 mm
6.	*C. albicans*	Antibiotic	30 mm	-
		E. mannifera	10 mm	-
		C. roseus	4 mm	6 mm
		T. indica	-	30 mm
		C. sativum	-	12 mm

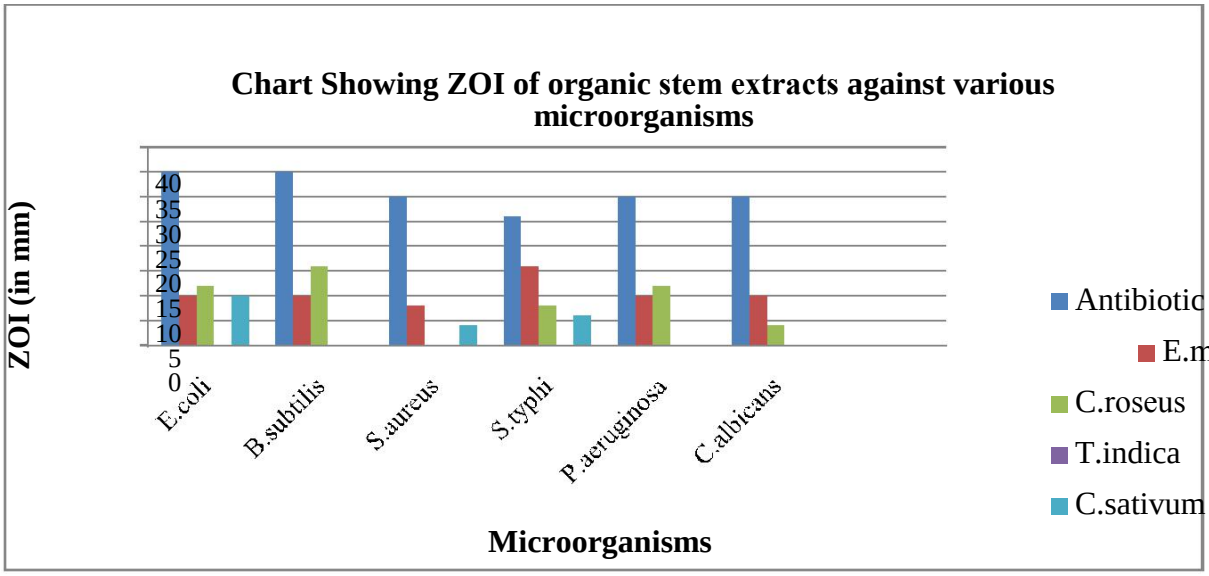

Figure 5: Chart showing ZOI of organic stem extracts against various microorganisms

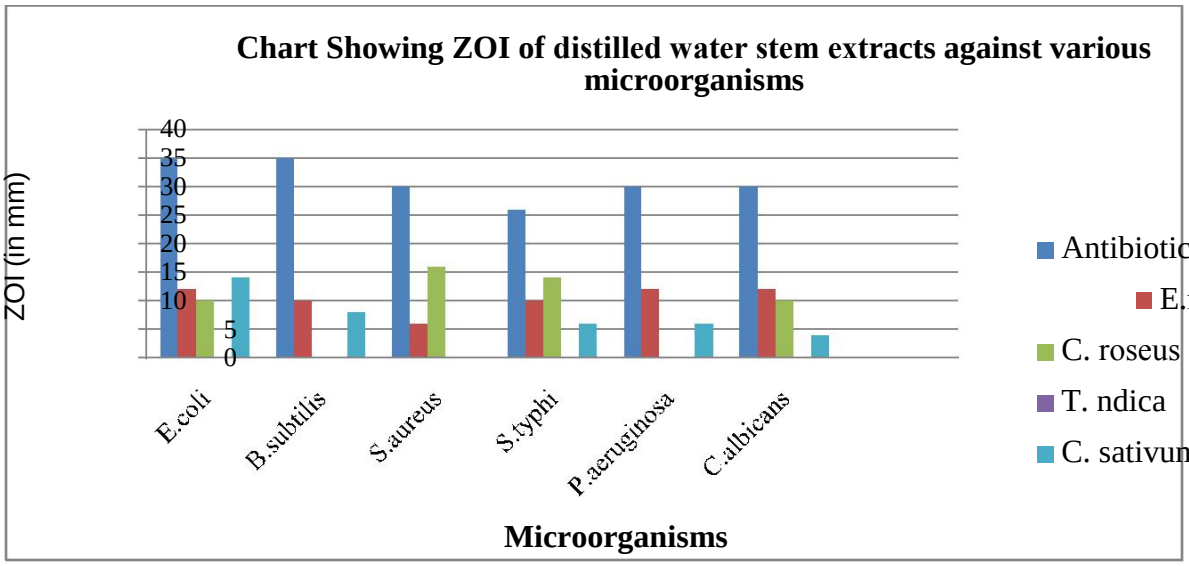

Figure 6: Chart showing ZOI of distilled water stem extracts against various microorganisms

III. DISCUSSION

The results of the determinations of the antimicrobial activity of four plant extracts against 6 microbial strains were shown in the Tables 4.1-4.6 and figures 4.1-4.6.

The results demonstrated a wide range of activities of the different medicinal plants and extracts against the tested organisms. The organic leaf extracts of *E. mannifera* were found to be more active against the pathogens than distilled water leaf extracts of the same. The organic leaf extract of *E. mannifera* showed ZOI ranging between 8-23 mm, with the highest ZOI against *S. aureus* (i.e. 23 mm). ZOI against *B. subtilis* was also shown 22 mm. The activity of distilled water leaf extracts of *E.mannifera* though did not show very good activity against most of the pathogens except *B. subtilis* (i.e. 22 mm). The activity of root extracts of *E. mannifera* was a little less than those of leaf extracts. Although not much variation was found between the activity of organic root extracts and distilled water root extracts. The ZOI of organic root extracts range between 8-18 mm with the highest value against *S. typhi* (i.e. 18 mm) while those of distilled water root extracts range from 4-14 mm with the highest value against *E. coli* and *C. albicans* which is 14 mm. The stem extracts of *E. mannifera* showed least activity of all i.e. leaves, roots and stem extracts. The ZOI showed by organic stem extract ranged from 8-16 mm with the highest value of 16 mm against *S. typhi* whereas that of distilled water stem extracts range from 6-12 mm with the highest value of 12 mm againt *E. coli, P. aeruginosa* and *C. albicans*.

The leaf extracts of *Catharanthus roseus* were not very much active against the selected pathogens, though organic leaf extract showed slightly better activity than d/w leaf extract which did not showed activity against any of the pathogens except *B. subtilis* (15 mm). The ZOI showed by different organic leaf extracts are 12 mm and 20 mm against *S. typhi* and *P. aeruginosa* respectively. The organic root extract showed consistently good activity against all pathogens ranging from 10-14 mm while that of distilled water root extracts range from 6 mm-10 mm, though no activity was shown against *E. coli* by distilled water root extracts. The organic and distilled water stem extracts showed the moderate activity. The organic stem extracts showed ZOI in range of 8-16 mm with maximum activity of 16 mm against *B. subtilis* and no activity against *S. aureus*. The distilled water stem extracts showed no activity against *B. subtilis* and *P. aeruginosa* whereas ZOI of 10 mm, 16 mm, 14 mm and 10 mm were recorded against *E. coli, S. aureus, S. typhi* and *C. albicans*.

Coriandrum sativum showed best activity against *S. typhi*. All the leaf, root and stem extract showed ZOI against *S. typhi*. The organic and distilled water leaf extracts were found almost inactive against the pathogens with an exception of leaf distilled water extract which showed activity only against *S. typhi* (i.e. 12 mm). The organic root extract showed ZOI against *E. coli, B. subtilis* and *S. typhi* which were 10 mm, 16 mm and 8 mm respectively. The distilled water root extract was found to be most potent with an activity range of 6-16 mm with the highest value against *C. albicans* (i.e. 16 mm). The stem extracts showed moderate activity with organic extract showing maximum ZOI of 10 mm against *E. coli* and distilled water stem extract showed 14 mm ZOI against *E. coli*. The distilled water root extract showed maximum activity of 16 mm whereas distilled water stem extract showed least activity of 4 mm against *C. albicans*.

Tamarindus indica found to be least active against all of the pathogens. No activity was showed by any of the root and stem extracts (organic or distilled water) of the plant. Whereas leaf extracts were active against *E. coli, S. aureus* and *S. typhi* with ZOI of 15 mm, 19 mm and 10 mm respectively. The distilled water leaf extract showed activity only against *C. albicans* (i.e. 6 mm).

IV. CONCLUSION

The results showed that *E. mannifera* has the highest antimicrobial potential. All of its leaf root and stem extracts were found to be active. The root extracts of all plants have maximum activity, however, in case of *E. mannifera* leaf extract were found to be more potent. *T. indica* was found to be least active against the pathogens. None of the root and stem extracts showed activity against any of the pathogens. Only little activity was seen in leaf extracts. The stem extracts of *C. sativum* according to previous research works are said to have maximum activity out of leaf, seed and stem extracts, however according to our results roots extracts were found to have more activity than stem extracts.

V. REFERENCES

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