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COMPARATIVE ANTIMICROBIAL EFFICACY STUDY ON THE EXTRACTS OF *POLYGALA JAVANA* DC. AND COMMERCIAL ANTIBIOTICS AGAINST SELECTED HUMAN PATHOGENS

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Abstract

In the current study, the synergistic antimicrobial efficacy of Polygala javana derived extracts in combination with antibiotics has been assessed on selected pathogens using different solvent extracts. Stem, root, flower and leaf derived powders of *Polygala javana* were extracted by using Soxhlet apparatus using the solvents viz., acetone, benzene, ethanol n-butyl alcohol and isopropyl alcohol against five bacterial strains such as Gram positive bacteria *Staphylococcus aureus* and Gram negative bacteria *Escherichia coli, Klebsiella pneumonia, Salmonella typhi,* The standard drug, Ciprofloxacin 10ug/disc was used as control and zone of inhibition ranged between 23mm and 43mm. The N-Butyl Alcohol extract recorded the highestzone of inhibition in all extract of *Escherichia coli* at 1000ug/disc. acetone extract against *Proteus vulgaris* at 250µg/disc concentration showed lowest mean of zone of inhibition. Synthetic discs with the antibiotics Chloramphenicol, Tetramycin, Ampicillin, and Gentamycin respectively were used for comparison All the tested human pathogens were highly sensitive to Gentamycin with the zone of inhibition above 20mm. The antibacterial activity of commercial antibiotics was reported to be higher than that of the plant extracts.

Key words: Antibacterial activity, Bio-active compounds, Human pathogens, *Polygala javana* and Solvent extracts.

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Introduction:

The search for newer sources of antibiotics is a global challenge pre-occupying research institutions, pharmaceutical companies, and academia, since many infectious agents are becoming resistant to synthetic drugs (Dougharie*t al*., 2007).The search for newer sources of antibiotics is a global challenge pre-occupying research institutions, pharmaceutical companies, and academia, since many infectious agents are becoming resistant to synthetic drugs (Latha and Kannabiran, 2006). The local use of natural plants as primary health remedies, due to their pharmacological properties, is quite common in Asia, Latin America, and Africa (Bibithae*t al.*, 2002). Sofowora (1982) and Balandrin *et al.*, (1985) defined medicinal plants as a plant in which one or more organs contain substances that can be used for therapeutic purposes or which it precursors for the manufacturing of drugs are useful for disease therapy. Since medicinal plants do not nearly save people from feeling pain but permit them to emerge unscathed, they deserve investigation. Each part of papaya tree possesses economic value when it is grown on a commercial scale (Krishna *et al.*, 2008). Even though the active components are normally extracted from all parts of the plant, the concentration of these components vary from structure to structure. The present study is a comparative analysis of anti-microbial activity of various extracts of with some known antibiotics against selected human pathogens.

Materials and methods:

Fresh and healthy *Polygala javana* plants were collected from various locations of Thiruvananthapuram District. Leaves were washed and shade dried for two weeks and extracts with solvents such as petroleum ether chloroform, ethyl acetatewere prepared. The extracts obtained from the respective solvents were stored for further use (Bruneton, 1995). Antimicrobial activity the selected micro-organisms were cultured on nutrient agar. The extracts were tested for their anti-microbial activity using disc diffusion method. Synthetic discs with the antibiotics Chloramphenicol, Tetramycin, Ampicillin, and Gentamycinrespectively were used for comparison. A total of four human pathogens *Staphylococcus aureus*, *Escherichia coli*, *Aspergillus niger*and *Candida albicans*were used as test organism. The agar plates were inoculated with test organisms, sterile and dried disc with plant extracts and synthetic discs such as Chloramphenicol, Tetramycin, Ampicillin, and Gentamycin were placed on the agar surface. The inoculated plates were incubated at 37^0C overnight and the inhibition zone was recorded (Bauer *et al.*, 1966). Sterile plain disc (5mm) without plant extract was used as control. The inhibitory zone around test paper discs indicates the absence of bacterial growth and that was recorded as positive test and the absence of zone as negative test.

Results and Discusssion

Antibiotics are the main therapeutic agents used against bacterial infections. But the higher level of genetic variability among bacteria enables them in developing antibiotic resistance rapidly. Development of novel as well as higher potent antibiotics is necessary all the time (Selvamony*et al.*, 2020). The extracts of*polygala javana*with various extracts and different antibiotics against selected human pathogens solventsshowed a wide variation in the anti-bacterial activity among the selected pathogens studied. in *polygala javana*stem *Eschirichia*

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coli possess high inhibition zone showing between 9 and 21mm Among all the solvent, the N-Butyl Alcohol extract showed the highest zone of inhibition. They showed 21.6mm at 1000ug/disc and 17 mm at 250ug/disc. Acetone extract showed Minimum zone of inhibition. This extract showed 13 mm at 1000 ug/disc and 9 mm at 250ug/disc of the concentration. Positive control Ciprofloxacin 10ug/disc exhibit between 23 mm and 28 mm.

In *Polygala javana* root *Eschirichia coli* inhibition zone showing between 13 and 21mm. Among all the solvent , the N-Butyl Alcohol extract showed the highest zone of inhibition. They showed 21mm at 1000ug/disc and 16mm at 250ug/disc. Benzene extract showed Minimum zone of inhibition. This extract showed 17mm at 1000 ug/disc and 13 mm at 250ug/disc of the concentration. Positive control Ciprofloxacin 10ug/disc exhibit between 23 mm and 28 mm.

In leaves *Eschirichia coli inhibition* showing between 15mm and 24mm respectively. Among all the solvent, the N-Butyl Alcohol extract showed the highest zone of inhibition. It showed 24mm at 1000ug/disc and 21mm at 250ug/disc. Benzene extract showed Minimum mean zone of inhibition. This extract showed 20 mm at 1000 ug/disc and 15 mm at 250ug/disc of the concentration. Positive control Ciprofloxacin 10ug/disc exhibit between 25 mm and 28 mm. Four antibiotics Chloramphenicol, Tetracycline, Ampicillin, and Gentamycin were tested against four bacterial Gram positive bacteria *Staphylococcus aureus* and Gram negative bacteria *Escherichia coli, Klebsiella pneumonia, Salmonella typhi*to determine the sensitivity towards antibiotics. Results of the present study reveals that the chloramphenicol inhibited the growth of bacterial strains such as Staphylococcus aureus with zone of inhibition above 15mm. *Escherichia coli* showed resistance against Chloramphenicol. Tetracycline inhibited the growth of bacterial and fungal strains such as with the zone of inhibition above (22mm). *Staphylococcus aureus* and *Candida albicans* was sensitive to Ampicillin, whereas all other bacterial strains showed resistance against Ampicillin. Gentamycin also showed antibacterial activity against all the tested human pathogens with the zone of inhibition above (15mm).

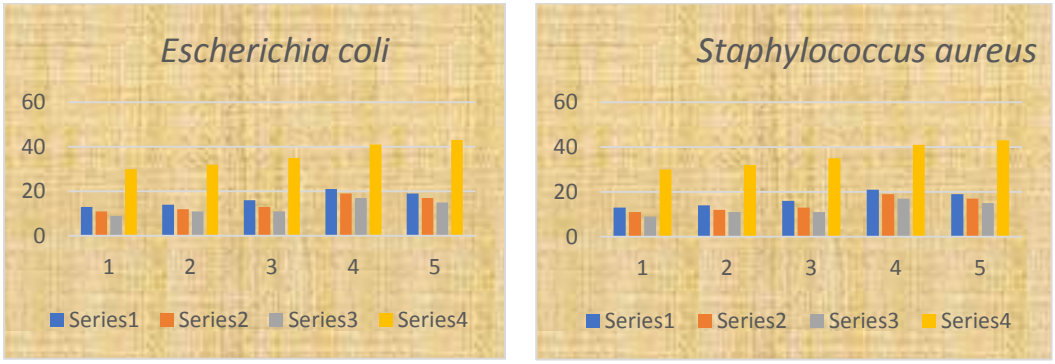

Figure 1. Activity of *P.javana* extract against *E. Coli* and *S. aureus*

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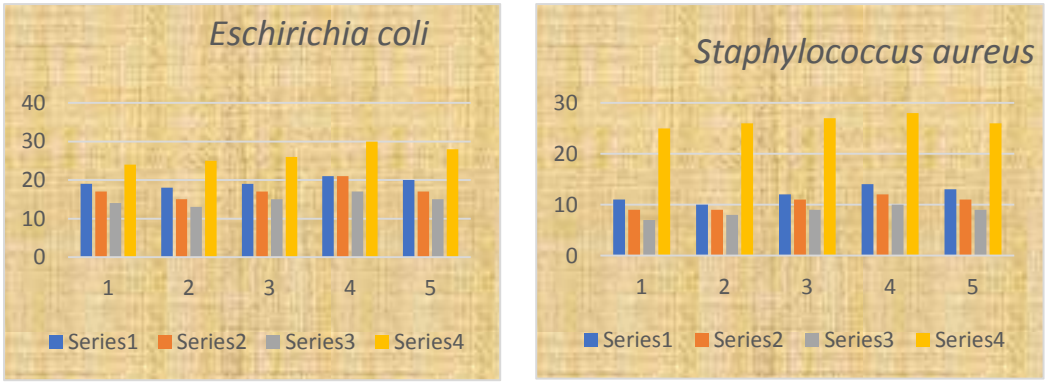

Figure 1. Activity of standard antibiotic (Ampicillin, and Gentamycin) against *E. Coli* and *S. aureus*

Table 1 Antibacterial efficacy of different antibiotics against selected human pathogens

Bacterial strains	**Zone of inhibition (mm)**				
	AM	**CI**	**CH**	**ER**	**TE**
Staphylococcus aureus	R	29	28	18	31
Pseudomonas aeruginosa	R	19	23	R	R
Klebsiella pneumonia	R	22	24	R	47
Proteus vulgaris	R	R	12	16	32
Escherichia coli,	R	R	11	R	R

The comparative study of sensitivity of different human pathogens towards plant extracts, *Staphylococcus aureus* was insensitive to all extract but sensitive to all antibiotics. *Escherichia coli* was sensitive towards all extracts. At the same time *Escherichia coli* showed resistance towards synthetic antibiotics, Chloramphenicol and Ampicillin. sensitive towards all other plant extracts. The antibiotic compounds are synthetic compounds that particularly inhibit individual microorganism. They contain a known concentration of particular compounds. The natural compounds are synergetic compounds and susceptibility is low. Hence the antibacterial activity of antibiotics is higher than the natural compounds. Uthiraselvam *et al. (*2012) showed that *polygala javana* crude extract of petroleum ether leaf extract has maximum activity (9mm) against *Escherichia coli*, the crude methanol stem extract has maximum activity (10mm) against *Pseudomonas aeruginosa* and the crude methanol root extract has maximum activity (11mm) against *Proteus vulgaris.*

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