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EVALUATION OF ANTIBACTERIAL POTENTIAL OF *CANAVALIA GLADIATA* (JACQ.) DC.

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ABSTRACT

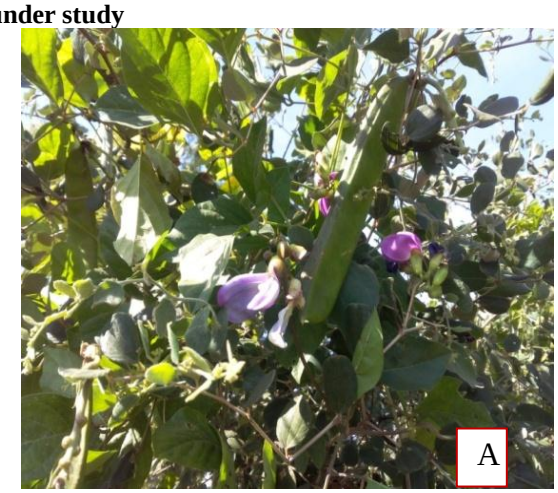
The present investigation were carried out to evaluate the antimicrobial potential of leaves and seed extracts of *Canavalia gladiata* against human pathogens viz *Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa* and *Bacillus subtilis* by using disc diffusion method. The five different solvents *viz* petroleum ether, chloroform, acetone, ethanol, and methanol were taken for extraction of complete phytoconstituents. The zone of inhibition of each extract against pathogenic bacteria was evaluated. The significant zones of inhibition was observed in leaves extracted with ethanol were found to be 20.0 mm against *Bacillus subtilis* followed by seed chloroform extracts i. e 14.0mm against *Bacillus subtilis.* Leaves acetonic extract shows 10.5 mm and 10.00 mm zone of inhibition against *Pseudomonas aeruginosa* and *Staphylococcus aureus* respectively, whereas, ethanolic extract of leaves exhibits 11.5 mm zone of inhibition against *Staphylococcus aureus*. Moreover, chloroform seed extracts found to be 11.0 mm and 10.00 mm zone of inhibition against *Bacillus sbstilis* and *Pseudomonas aeruginosa* respectively. Acetonic seed extracts exhibits 12.00 mm zone of inhibition against *Bacillus subtilis.* The ethanolic seed extracts exhibits 11.5mm zone of inhibition against *Staphylococcus aureus.* Methanolic seed extracts found to be 11.00mm and 10.00mm zone of inhibition against *Staphylococcus aureus* and *Pseudomonas aeruginosa* respectively.

KEYWORDS: Antibacterial; *Canavalia gladiata;* Bioactive Phytoconstituents

INTRODUCTION

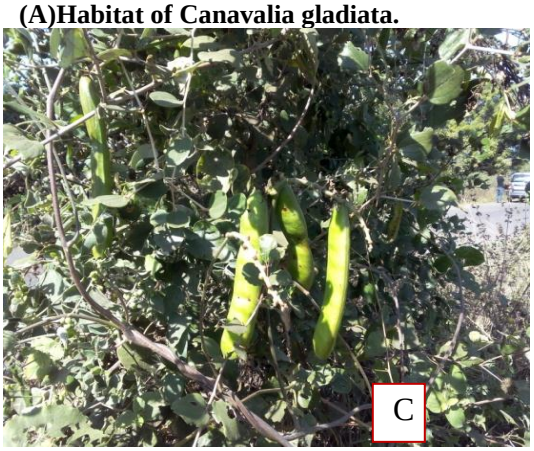
Canavalia gladiata commonly called as sword bean is a tropical plant widely distributed in Eastern and Western Ghats of South India (Janardhanan K *et al*., 2003) it has reported with significant level of protein (26-30%), desirable amino acids, fatty acids, starch (34-40%) and good mineral composition (Pugalenthi M and Vadivel V., 2005), the nutritional contents of *Canvalia gladiata* were found to be similar to that of daily edible legume grains and also a promising source of proteins (Siddhuraju P and Becker K, 2001; and Eknayake S *et al*., 1998). The existence of microbes is long before the evolution of human being but their involvement in causing disease was recognized in past few decades. The phytoconstituents are known to have their inhibitory effect on growth of microbes. From ancient time, peoples have been using wild plants part for treating various infectious diseases and some of the traditional medicines are still became a part of regular treatment of various chronic diseases (Rios and Recio, 2005). The medicinal plants derived secondary metabolites such as alkaloids, steroids, tannins and phenolic compounds showing antimicrobial activity. The synthetic antibiotics acting as a tool to cop-up with microbial infections but due to multiple drug resistance capacity of microbes as well as its sensitivity, immune suppression and allergic reactions of antibiotics, there is a urgent need of natural herbal medicines with safe and better therapeutic effects., Amit Kapoor *et al.*, (2015) and Chanda and Rakholiya, (2011). The plant derived antimicrobials provides a novel and important therapeutics, Silva, (2012). Ncube, Finnie, Staden, (2012). Most of the drugs which are being used in present days are obtained from plants and used in traditional systems of medicine (Sukanya *et al.*, 2009). The natural therapeutics are less toxic and cost effective (Harishchandra, *et al*., 2012).

Plant under study

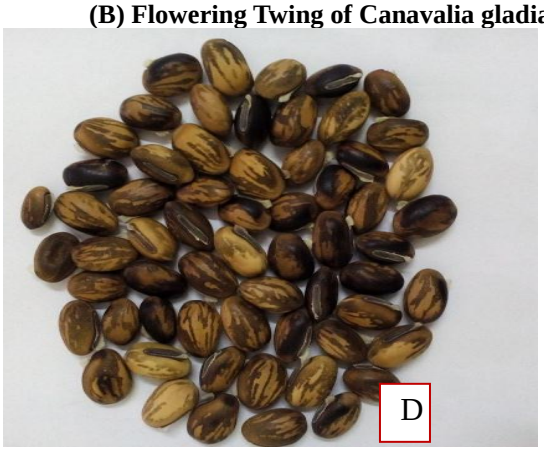


(A)Habitat of Canavalia gladiata.

(B) Flowering Twing of Canavalia gladiata



(C) Pods of Canavalia gladiata.



(D) Seeds of Canavalia gladiata.

MATERIAL AND METHOD

Collection of plant material

The leaves and dry pods of *Canavalia gladiata* (Jacq.) DC., were collected from the field near power house Morshi road, Amravati, Maharashtra.

Identification of plant material

Identification of plant material was done with the help of standard floras; the flora of British India, Flora of Amravati District (Dhore, 2002). The herbarium specimen were prepared and submitted to Department of Botany, Sant Gadge Baba Amravati University, Amravati.

Extraction

10 gm powder was filled in the thimble (made up of filter paper) and extracted successively with petroleum ether, chloroform, acetone, ethanol, and methanol solvent in 180 ml for 24 hours using soxhlet extraction assembly. The temperature of apparatus maintained at the boiling point for each solvent. The extractions were carried out according to specific characteristics of solvent and increasing values of their polarity. The obtained extracts were filtered through whatman filter paper no.42 for free and clear extract. This extract then concentrated up to the 20 ml and resultant 20 ml extract stored in small sterile airtight bottles at 4^0 C temperature.

Bacterial Culture

Antimicrobial screening of all the extract was done by using the standard four bacterial cultures two of gram positive (*Staphylococcus aureus; Bacillus subtilis*) *and* two of gram negative (*Escherichia coli*; *Pseudomonas aeruginosa)* were employed in the present study. The cultures were obtained from P. G. Department of Microbiology, Sant Gadge Baba Amravati University, Amravati.

Antimicrobial Test

The agar discs diffusion methods (Collins and Lyne, 1987) were employed for the antimicrobial test. A loop full of bacterial culture was inoculated into a nutrient broth medium and incubated for 24 hours at 37^0C. Nutrient agar (Himedia) was selected as the bacterial medium. 15 mm of the sterilized medium was poured in the pre-autoclaved petriplates and allowed to solidify. The cultured broth was swabbed on the agar surface. Sterile discs of 6 mm diameter were impregnated with 20µl of extract then placed on the media and gently pressed down to ensure contact with the medium. Then petriplates with bacterial strains incubated at 37 ^{0}C for 24 hours. The diameter of zone of inhibition including discs was measured after 24 hours.

OBSERVATIONS

Table No. 1. Zone of inhibition (mm) of *Canavalia gladiate* (Jacq). DC., leaves extracts against human pathogens.

Solvent	*Escherichia coli*		*Staphylococcus aureus*		*Pseudomonas aeruginosa*		*Bacillus subtilis*	
	Control	Extract	Control	Extract	Control	Extract	Control	Extract
P. Ether	7.0	8.0	6.5	8.5	7.0	8.0	8.0	10.5
Chloroform	8.5	9.5	7.5	9.0	8.0	8.0	7.0	9.5
Acetone	7.5	8.0	6.5	10.0	7.0	10.5	8.0	9.5
Ethanol	8.0	9.5	7.5	11.5	7.0	9.5	15.0	20.0
Methanol	6.5	7.5	7.0	9.5	7.5	8.0	7.0	9.5

Table No. 2: Zone of inhibition (mm) of *Canavalia gladiate* (Jacq). DC., seed extracts against human pathogens.

Solvent	*Escherichia coli*		*Staphylococcus aureus*		*Pseudomonas aeruginosa*		*Bacillus subtilis*	
	Control	Extract	Control	Extract	Control	Extract	Control	Extract
P. Ether	7.5	8.0	7.0	9.0	7.5	8.0	9.0	12.0
Chloroform	7.0	11.0	7.0	9.0	7.0	10.0	10.0	14.0
Acetone	7.0	8.5	7.0	9.0	7.5	10.0	8.0	12.0
Ethanol	7.5	11.5	6.5	11.5	7.5	10.0	9.0	11.0
Methanol	7.0	9.0	7.0	11.0	7.0	10.0	8.0	12.0

RESULT AND DISCUSSION

The *Canavalia gladiata* preliminary screening reveals the presence of various bioactive phytoconstituents *viz* alkaloids, carbohydrate, protein, amino acids, glycoside, tannins, saponin, flavonoids, steroids, and phenolic compounds (Pawar DS, Nasreen S., 2016). The presence of different phytoconstituent in *Canavalia gladiata* have wide range of significance and used in variety of applications (Lena 2010). The secondary metabolites have pivotal role against different stresses faced by the plants. Plant derived antimicrobial compounds have significant therapeutic potential as they can be used to heal many diseases without any side effects. The leaves and seed extracts of *Canavalia gladiata* against human pathogen viz *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Bacillus subtilis* were tested by using disc diffusion method. Highest zones of inhibition was observed in *Canavalia gladiata* leaves extracted with ethanol were found to be 20.0 mm against *Bacillus subtilis* followed by seed chloroform extracts shows 14.0mm zone of inhibition against *Bacillus subtilis.* Leaves acetonic extract shows 10.5 mm and 10.00 mm zone of inhibition against *Pseudomonas aeruginosa* and *Staphylococcus aureus aureus* respectively, whereas, ethanolic extract of leaves exhibits 11.5 mm zone of inhibition against *Staphylococcus aureus*. Moreover, chloroform seed extracts found to be 11.0 mm and 10.00 mm zone of inhibition against *Bacillus sbstilis* and *Pseudomonas aeruginosa* respectively. Acetonic seed extracts exhibits 12.00 mm zone of inhibition against *Bacillus subtilis.* The ethanolic seed extracts exhibits 11.5mm zone of inhibition against *Staphylococcus aureus*, whereas, Methanolic seed extracts found to be 11.00mm and 10.00mm zone of inhibition against *Staphylococcus aureus* and *Pseudomonas aeruginosa* respectively. Similarly, Pugalenthi M *et al.*, (2010), reported that the *Canvalia ensiformis* aqueous and chloroform extracts shows a prominent antimicrobial activity against *S.aureus, S.pyrogens, E. coli, P. aeruginosa and K. pneumonia*. Moreover, (Heslem, 1989) tannins were reported in aqueous extract of *Canvalia gladitata* as a diuretic agent.

CONCLUSION

The leaves and seeds of *Canavalia gladiata* are the good source of bioactive compounds with antimicrobial potential against different pathogenic bacteria. This primary data of evaluation of antimicrobials will be helpful for future researchers for further exploration of diverse potential of the plants in the field of pharmacology and herbal medicine.

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Conflict of interest statement: The authors declared no conflict of interest.

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