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"ANTIMICROBIAL EFFICACY OF AN ENDEMIC PLANT SPECIES (*GLORIOSA SUPERBA LINN.*)"

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ABSTRACT

Herbal drugs are of great importance due to the easier availability and their lower cost. In spite of the side effects of the synthetic antibiotics and therapeutic drugs, natural herbs still remain as one of the best pool of new structural type. The use of natural drugs in the present time due to the demerits of synthetic drugs, are best alternatives. Therefore, the present study is based mainly on the Antimicrobial efficacy of acetone, ethanol, methanol and hexane extracts of *Gloriosa superba* L. The root and stem part of the plant was taken for evaluating the antimicrobial activity of the plant against selected test organisms such as *E.coli, S.aureus, A.niger* and *A.flavus*. Almost all the extracts showed Antimicrobial activity against tested organisms, comparable to the standards used (Ampicilin against bacteria, and Fluconazole against fungi) and even higher than standard drugs in some extracts. The acetone extract of the plant showed the highest antifungal activity against *E.coli.*

KEYWORDS: Herbal drugs, Medicinal plants, Antimicrobial efficacy, *Gloriosa superba.*

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INTRODUCTION

Medicinal plants constitute the main source of pharmaceuticals and health care products (Ivanova et al., 2005).Extraction and characterization of several active phytocompounds from these green factories have given birth to some high activity profile drugs (Mandal et al.,2007).The use of traditional plants in the industrialized societies have been traced to the extraction and development of several drugs from these plants(Shrikumar et al.,2007). The increased number of microbial strains and the appearance of strains with reduced susceptibility to antibiotics are increasing continuously. This increase has been attributed to indiscriminate use of broad spectrum antibiotics. This kind of antibiotics and synthetic drugs not only expensive but are also often with adulterations and side effects (Sieradzki et al.,1999).Thus, there is a need to search for better alternatives with lesser or no side effects to control microbial infections. The plant *G. superba* L. is a climber which scrambles over other plants with the aid of tendrils at the ends of their leaves and can reach up to 3 meters in height. They have showy flowers, distinctive because of their pronouncedly reflexed petals, ranging in color from a greenish-yellow through yellow, orange, red and sometimes even a deep pinkish-red [Fig.1]. According to Nadkarni (1976), the root tubers are tonic, antiperiodic, cholagogue, alterative and purgative. The white flour prepared from its root tubers is given with honey in gonorrhoea and alone in leprosy, colic and intestinal worms (Dastur,1962).For promoting labour pain, a paste of the root tubers is applied over the supra-public region and the vagina. A paste of these tubers is considered antidote against snake-bite (cf. Asolkar et al.,1992). According to Dey (1994), the juice of the leaves are used for killing lice in the hair. All parts of the plant contain colchicines and related alkaloids and are therefore dangerously toxic if ingested, especially the tubers; contact with the stems and leaves can cause skin irritation. Various preparations of the plant are also used in traditional medicines for a variety of complaints in both Africa and India. Therefore, in present study, attempts have been made to evaluate the Antimicrobial efficacy of the medicinal plant *Gloriosa superba* L.

Figure 1
Gloriosa supeba L.

MATERIALS AND METHODS

A. Collection

G. superba L. was collected from botanical garden of Dr. Y. S. Parmar University of Horticulture & Forestry, Nauni, Solan (Himachal Pradesh), Sh.Kapur Chand Kulish Smrti Udhyaan and Department of Botany Himachal Pradesh University Shimala. Plant was identified by comparing with those available in the Herbarium, Department of Botany, University of Rajasthan, Jaipur, India.

B. Preparation of plant extracts

The collected plants were shade dried and finely powdered. The root and stem parts of the plant were extracted from constant agitation for 48-72 hrs. The extracts were filtered using Whatman No. 1 filter paper and then concentrated *in vacuo* at 40 °C using a Rotary evaporator and stored at 4°C (Harborn, 1984).

C. Test Microorganisms used

Bacterial and Fungal strains were purchased from IMTECH, Chandigarh, India. *Escherichia coli* (MTCC730), *Staphylococcus aureus* subsp. *aureus* (MTCC 1144), *Aspergillus flavus* (MTCC 277), *A. Niger* (MTCC 281) were used as test microbes.

D. Culture of test microbes

For bacterial culture, Nutrient media was prepared by adding different constituents of media (Beef Extract 3.0 g + Peptone 5.0 g + Agar 15.0) were dissolved in one liter distilled water and autoclaved at 15 lbs pressure and 121˚C temperature for 15-20 minutes then the 25-30 ml medium was poured in sterilized Petri-plates under aseptic conditions in Laminar Air flow chamber. The bacterial suspension was prepared in nutrient broth (Beef Extract 3.0 g + Peptone 5.0 g).

For fungus culture, Sabouraud agar dextrose agar medium (SDA) was prepared for the cultivation of fungus. The constituents of SDA medium (Glucose 40.0 g + Casein peptic digest of animal tissue 5.0 g + Agar 15.0 g) were dissolved in one liter distilled water and autoclaved at 15 lbs and 121˚C for 15-20 minutes then the 25-30 ml medium was poured in sterilized Petri plates under aseptic conditions in Laminar Air flow chamber. The Fungal suspension was prepared in SDA broth.

E. Screening of antimicrobial culture

Well diffusion method was adopted for screening of bacterial and fungal culture. The different test microbes were processed using a sterile spreader over previously sterilized culture medium plates and the zone of inhibition were measured around the wells, those were prepared by gel puncher and different concentrations as 10,12,14 and 16 µg of extract were pipetted and carefully added to the wells. The nutrient agar plates were incubated at 37˚C for 24 hrs. and the Sabouraud agar plates were incubated at Room temperature for 48 hrs. The zones of inhibition were then measured and the mean of two replicates recorded.

RESULT AND DISCUSSION

After screening the extracts of Root and Stem part of the plant *Gloriosa superba*, satisfactory results were observed against tested bacteria and fungi. This was in corroboration with the earlier study done by Srinivasan et al. (2001), Ekwenye and Elegalam (2005) and Karthikumar et al. (2007). In the present study, all the extracts were found active against tested microorganisms. In the screening of the root extract [Table-1,Fig.2,3] of the plant, Acetone extract showed better results in comparison to the standard drugs against *E.coli* (A.I.- 1.18) and satisfactory results against *S.aureus* (A.I.-0.92) and *A.flavus* (A.I.-0.57).Ethanol extract showed better results than standard drugs against *E.coli* (A.I.-1.12) and noticed good results against *S.aureus* (A.I.-0.9) and *A.flavus* (A.I.-0.67). In the Methanol extract of the root part, results were found better than standard drugs against *E.coli* (A.I.-1.09) and noticed comparable results with standard drugs against *S.aureus* (A.I.-0.92)

and *A.flavus* (A.I.-0.89).Hexane extract showed comparable antimicrobial activity against *E.coli* (A.I.-0.65) and *S.aureus* (A.I.-0.87). While in the screening of the stem part extract of the plant [Table-2], Acetone extract showed good results against *E.coli* (A.I.-0.75), *S.aureus* (A.I.-0.75) and *A.flavus* (A.I.-0.50).Ethanol extract exposed highest antimicrobial activity against *E.coli* (A.I.-1.03), and against *S.aureus* (A.I.-0.60) results were also found effective. Methanol extract showed noticeable antimicrobial activity against *E.coli* (A.I.-0.87), *S.aureus* (A.I.-0.52) and *A.flavus* (A.I.-0.60).Hexane extract of root part extract also showed fine results against *E.coli* (A.I.-0.59), *S.aureus* (A.I.-0.50) and *A.flavus* (A.I.-0.71). As a result, the root part extract of the plant *Gloriosa superba* L. showed extensive and immense results in terms of inhibition zone and thus expressed the capability to restrict sound effectively some of the bacteria and fungi as this antimicrobial ability was found lesser effectively in the stem extract of the experimented plant against those same microorganisms. Amongst all the extract of both root and stem part of the plant, highest antimicrobial activity was observed in acetone extract against *E.coli*.

Table 1
Antimicrobial Efficacy in terms of inhibition zone of root part extract of Gloriosa superba L.against selected bacteria and fungi.

Test microorganisms	Standard I.Z.* (mm)	Concentration (µg/ml)	Acetone		Ethanol		Methanol		Hexane	
			I.Z*(mm)	A.I.	I.Z*(mm)	A.I.	I.Z*(mm)	A.I.	I.Z*(mm)	A.I.
E.coli	16	10	17.5	1.09	17.0	1.06	17.0	1.06	10.5	0.65
		12	16.5	1.03	17.5	1.09	18.0	1.12	9.0	0.56
		14	18.5	1.15	18.0	1.12	17.0	1.06	11.5	0.71
		16	19.0	1.18	18.0	1.12	17.5	1.09	10.5	0.65
S.aureus	20	10	17.5	0.87	17.0	0.85	17.0	0.85	-	-
		12	18.0	0.9	17.0	0.85	17.5	0.87	16.5	0.82
		14	18.0	0.9	17.5	0.87	17.5	0.87	17.0	0.85
		16	18.5	0.92	18.0	0.9	18.5	0.92	17.5	0.87
A.niger	32	10	7.0	0.21	9.0	0.28	8.5	0.26	9.5	0.29
		12	8.5	0.26	9.0	0.28	8.5	0.26	9.5	0.29
		14	9.0	0.28	9.0	0.28	9.0	0.28	10.5	0.32
		16	9.5	0.29	9.0	0.28	10.0	0.31	11.0	0.34
A.flavus	28	10	16.5	0.58	19.5	0.69	23.0	0.82	-	-
		12	16.0	0.57	19.0	0.67	23.5	0.83	9.5	0.33
		14	16.5	0.58	19.5	0.69	25.0	0.89	9.5	0.33
		16	16.0	0.57	19.0	0.67	25.0	0.89	9.5	0.33

I.Z. = Inhibition zone, A.I. = Activity index
****I.Z. in mm are the mean value of the two replicates***

Table 2
Antimicrobial Efficacy in terms of inhibition zone of stem part extract of Gloriosa superba L. against selected bacteria and fungi.

Test microorganisms	Standard I.Z.* (mm)	Concentration (µg/ml)	Acetone		Ethanol		Methanol		Hexane	
			I.Z*(mm)	A.I.	I.Z*(mm)	A.I.	I.Z*(mm)	A.I.	I.Z*(mm)	A.I.
E.coli	16	10	8.5	0.53	12.5	0.78	9.5	0.59	-	-
		12	11.0	0.68	13.0	0.81	12.0	0.75	-	-
		14	11.5	0.71	14.0	0.87	13.5	0.84	9.0	0.56
		16	12.0	0.75	16.5	1.03	14.0	0.87	9.5	0.59
S.aureus	20	10	8.5	0.42	11.5	0.57	9.5	0.47	-	-
		12	11.0	0.55	12.0	0.6	10.0	0.5	9.5	0.47
		14	10.5	0.52	12.0	0.6	10.5	0.52	9.5	0.47
		16	11.0	0.55	12.0	0.6	10.5	0.52	10.0	0.5
A.niger	32	10	-	-	-	-	9.5	0.29	7.5	0.23
		12	-	-	-	-	9.5	0.29	8.0	0.25
		14	9.5	0.29	-	-	10.5	0.32	8.0	0.25
		16	9.5	0.29	7.5	0.23	11.0	0.34	8.5	0.26
A.flavus	28	10	6.0	0.21	12.0	0.42	16.0	0.57	17.5	0.62
		12	8.5	0.30	12.0	0.42	17.0	0.60	19.5	0.69
		14	9.0	0.32	12.5	0.44	16.5	0.58	20.0	0.71
		16	14.0	0.5	13.5	0.48	17.0	0.60	20.0	0.71

I.Z. = Inhibition zone, A.I. = Activity index
***I.Z. in mm are the mean value of the two replicates**

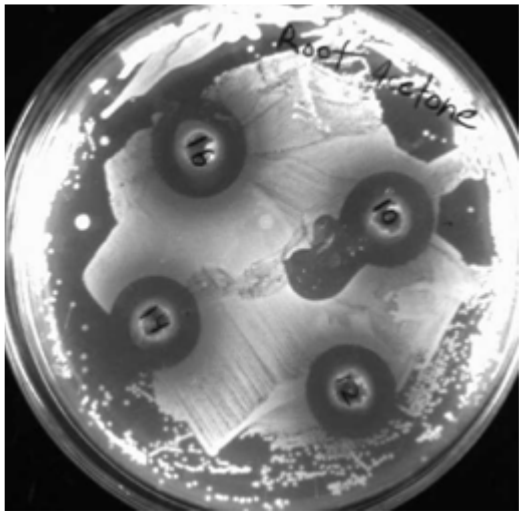

Figure 2
Antimicrobial activity of Root extract against E.coli (Acetone).

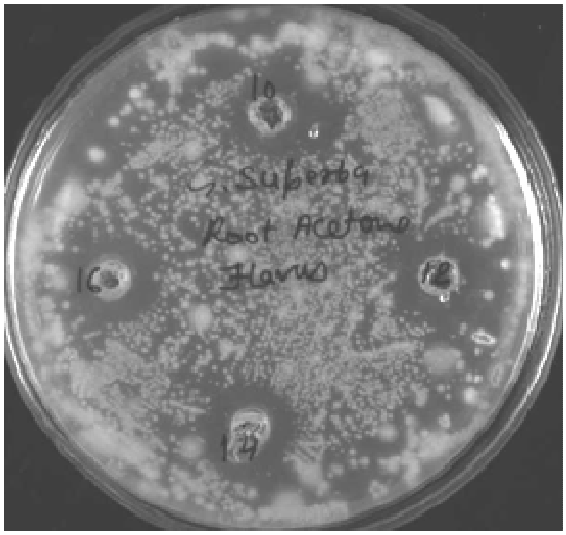

Figure 3
Antimicrobial activity of Root extract against A.flavus (Acetone).

CONCLUSION

The various medicinal plants constitute a large amount of various compounds of diverse type of chemical structures. Due to the advantages of such medically applicable compounds, the medicinal plants needed to extensive investigation to exploit their therapeutic ability to various diseases. The present study and results offer a possible use of various extracts of *Gloriosa superba* L. These results explain the Indian herbal plants have the higher potential as antimicrobials.

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