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Research Article

Antimicrobial activity of extractives of *Solidago canadensis* L.

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ABSTRACT

The anti - bacterial activity of various extracts viz., Hexane, Chloroform, Ethyl acetate and 50% Aqueous – ethanol of the whole plant of *Solidogo candensis L* was studied by disc diffusion method using Muller Hinton Agar media and the zone of inhibition for various extracts was compared with that of standard Ciprofloxacin (5 micrograms / disc). All extract showed potential anti – bacterial activity comparable to that of the standard drug against the tested organisms. The MIC for various extracts was 300 micrograms / ml for Hexane and Chloroform extract and 200 micrograms / ml for ethyl acetate and 50% aqueous – ethanol extract. Where, hexane showed MIC of 200 micrograms / ml except for *Salmonella typhi* which was as comparable with that of the standard Ciprofloxacin (5 micrograms / disc). Hence the present study brought to light the scientific data documentation with respect to the anti – infective property of the plant *Solidogo candensis L.*

Keywords: Anti-bacterial activity; Disc diffusion method.

INTRODUCTION

Solidago canadensis L. belongs to the family Asteraceae, widely distributed across North America., occurring in almost every state of USA and throughout Canada, India etc… Numerous interesting secondary metabolites such as flavonoids, tri-terpenoids, saponin, phenolic acids, glucosides, polysaccharides, diterpenes and essential oils (Thiem B. et al, 2001) were reported for the genus *Solidago.* Earlier investigations on the plant *Solidago canadensis* have lead to the isolation of flavonoids (Apáti P et al 2003 and Krepinsky J et al 1962), phenolic acids (Kalemba D et al 1992), sesquiterpenes (Bohlmann F et al 1980), diterpenes (Anthonsen T et al 1969 and Reznicek G et al 1990) and saponins (Reznicek G et al 1990). The flowers of the plant were used in traditional American practice as an analgesic (Rousseau J et al 1945), burns and ulcer treatment (Arnason T et al 1981), febrifuge (Smith H. H et al 1933), GIT (Moerman D et al 2000 and Turner N et al 1980) and liver (Moerman D et al 2000) aids. In European phytotherapy for the treatment of chronic nephritis, cystitis, urolithiasis, rheumatism and as an antiphlogistic (O'Brien J et al 2000). In spite of the wide spread use of *S. canadensis* and phyto-constituents reported, there hardly exists any documentation on the pharmacological profile of the plant. Hence in the present study an attempt was made to illustrate the anti-microbial property of the plant *S. canadensis L.*

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MATERIAL AND METHODS

The fresh plant material (whole plant) was collected fresh from the rain forest areas of Tirunelveli district and Ooty / Tamil Nadu during June 2008. And its authenticity was confirmed by Survey of Medicinal Plant Unit, Siddha. C.C.R.A.S. Govt. of India, Palayamkottai, Tirunelveli-627 002. Tamilnadu, India. The voucher specimen of the plant *Solidago canadensis* was deposited in the herbarium (Number: D - 01062008) of the Department of Pharmacognosy, Vel's college of pharmacy, old pallavaram, Chennai - 600 117. The following micro-organisms were procured from standard laboratory maintained in the Institute of Microbiology, Madras Medical College, Chennai – 600 003 and used for the study.

Bacteria: *Escherichia coli, Staphylococcus aureus, coagulase-negative staphylococci, Candida albicans, Klebsiella pneumoniae, Pseudomonas aeruginosa, Salmonella typhi, Salmonella para typhi A, Salmonella para typhi B, Enterobacter aerogenes, Shigella dysenteriae, Actinobacter baumanni, Seratia liquefaciens* and *Proteus vulgaris.*

The medium MH agar, Ciprofloxacin discs (5 micrograms / disc) were obtained from Hi- media Laboratories limited, Mumbai-400 086.

EXPERIMENTAL

Preparation of plant extracts

Freshly collected plant material (whole plant) was dried in shade, then coarsely powdered. One kg of powder was extracted in an aspirated bottle with Hexane, Chloroform, Ethyl acetate and 50% aqueous –

Table 1: Anti-bacterial activity of various extracts of *Solidago canadensis* L.

Description	***Staph***	***CONS***	***Candida***	***E.coli***	***Klebsiella***	***Pseudomonas***	***S.typhii***
Control	+	+	+	+	+	+	+
Ciprofloxarin	5	5	5	5	5	5	5
Hexane	> 100 < 200	> 100 < 200	> 100 < 200	> 100 < 200	> 50 < 100	> 50 < 100	> 200 < 300
Chloroform	> 200 < 300	> 200 < 300	> 100 < 200	> 200 < 300	> 200 < 300	> 100 < 200	> 100 < 200
Ethyl acetate	> 100 < 200	> 100 < 200	> 100 < 200	> 100 < 200	> 100 < 200	> 100 < 200	> 100 < 200
50% Aqueous ethanol	> 50< 100	> 50 < 100	> 50 < 100	> 100 < 200	> 100 < 200	> 50 < 100	> 50 < 100
Description	***S.para typhii A***	***S.para typhii B***	***Enterobacter***	***Shigella***	***Acitenobactor***	***Sheritia***	***Proteus vulgaris***
Control	+	+	+	+	+	+	+
Ciprofloxarin	5	5	5	5	5	5	5
Hexane	> 50 < 100	> 50 < 100	> 100 < 200	> 100 < 200	> 50 < 100	> 50 < 100	> 50 < 100
Chloroform	> 50 < 100	> 200 < 300	> 200 < 300	> 100 < 200	> 50 < 100	> 200 < 300	> 100 < 200
Ethyl acetate	> 50 < 100	> 50 < 100	> 50 < 100	> 100 < 200	> 50 < 100	> 50 < 100	> 50
50% Aqueous ethanol	> 100 < 200	> 50 < 100	> 50 < 100	> 50 < 100	> 50 < 100	> 50 < 100	> 100 < 200

(+) Indicates growth of the organism. Values are an average of triplicate. Ciprofloxacin (5µg/disc) SD 060 from Hi-media Laboratories, Mumbai 400080, India.

Table 2: Zone of inhibition (mm) of various extracts of *Solidago canadensis* L.

Description Organisms	**Standard ciprof-loxacin**	**Hexane extract**	**Chloroform extract**	**Ethyl acetate extract**	**50% Aqueous – ethanol extract**
Staphylococcus aureus	16	18	20	20	22
coagulase-negative staphylococci	19	20	22	22	18
Candida albicans	-	-	-	-	-
Escherichia coli	25	12	13	12	14
Klebsiella pneumoniae	18	16	18	18	20
Pseudomonas aeruginosa	26	18	18	14	8
Salmonella typhi	20	10	14	8	10
Salmonella para typhi A	20	12	10	8	8
Salmonella para typhi B	22	10	10	8	10
Enterobacter aerogenes	20	20	10	10	22
Shigella dysenteriae	25	12	8	10	6
Acinetobacter bau-mannii	22	16	14	18	12
Serratia liquefaciens	20	10	12	10	10
Proteus vulgaris	25	14	12	12	16

Values are an average of triplicate. Ciprofloxacin (5µg/disc) SD 060 from Hi-media Laboratories, Mumbai 400080, India.

ethanol by cold maceration process for 3 – 7 days. All extracts were filtered through Whatmann filter paper no. 1 and evaporated on a water bath and finally dried in vacuum to get residue. This residue of all extracts were suitably diluted with DMF (Dimethyl Formamide) to get a final concentration of 1000 micrograms / ml and used for the study.

Anti-bacterial activity (N.Deepa et al 2004**)**

The plates were prepared MH agar and the extracts of various dilutions were added and allowed to solidify and dry. A loop full of bacterial cultures was inoculated and incubated at 37°C for 24 hours. Results were read by the presence or absence of growth of organisms (Table 1) and the MIC was determined. The same procedure was followed for the investigation of all the extracts. The zone of inhibition shown by various extract on tested organisms was also recorded based on the MIC concentration. (Table 2).

RESULTS AND DISCUSSION

All extracts demonstrated anti-bacterial activity as shown in Table 1, against the tested bacteria. The results of all the extracts were as comparable with that of the standard Ciprofloxacin (5 micrograms / disc) (Table 2).

The results of the present study indicated the anti-microbial properties of various extracts i.e. Hexane, Chloroform, Ethyl acetate and 50% aqueous – ethanol of *Solidago canadensis L.* The same was comparable with standard Ciprofloxacin (5 micrograms / disc) against the tested organisms. The presence of flavonoids, terpenoids and other phyto-constituents may be the contributing components for the expressed anti-bacterial activity investigated in the present study. However the role of these phyto-constituents in the anti-bacterial property has to be explored in detail in near feature. Among the tested organisms all extracts showed better activity except the Chloroform extract which showed a higher range MIC. Among the tested bacteria the extracts were found to be comparably effective against, *Staphylococcus aureus, coagulase-negative staphylococci, Klebsiella pneumoniae and Acinetobacter baumannii.* In particular, 50% Aqueous ethanol and hexane extract were effective against *Enterobacter aeirogenes* (Table 2).

CONCLUSION

These findings of the present study support beneficial effects of the extracts against the pathogenic organisms. Further investigations with respect to Bio - activity guided fractions may lead to scientific justification and validation of Bio - active component which may be responsible for the expressed pharmacological property and may lead to identification of the novel template with potent biological activity. This may throw light on the minds of the researchers for future development of new template in phyto -medicine with potent anti-infective property.

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