

ANTIBACTERIAL ACTIVITY OF EXTRACTS OF *PINUS ROXBURGHII* SARG.

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Key words: Antibacterial activity, Plant extracts, *Pinus roxburghii*

Abstract

Aqueous and alcoholic extracts of *Pinus roxburghii* leaves, stem, bark, male cone and female cone were tested for growth inhibitory activity against the bacterial plant pathogen *Agrobacterium tumefaciens* for four human pathogens, *Escherichia coli*, *Salmonella arizonae*, *S. typhi* and *Staphylococcus aureus*.

Five gram of fresh plant parts (leaves, stem, bark, and cones) were washed two - three times with tap- and distilled water and then surface sterilized with 90 % alcohol. Subsequently the plant materials were grounded in 50 ml of distilled water and alcohol separately for aqueous and alcoholic extracts, respectively. The alcoholic macerated were kept for 24 h at room temperature to evaporate the alcohol. In the remaining residue, 50 ml of distilled water was added. Macerated were squeezed through double layered muslin cloth and filtered through filter paper. After filtration a measured amount was centrifuged at 10,000 rpm for 20 minutes. The supernatants were filtered through Whatman No. 1 filter paper and then sterilized by passing through 0.2 µm disposable filters. The extract (10 %) thus obtained were used for the *in vitro* assays (Parihar *et al.* 2003).

The bacterial cultures were obtained from the Institute of Microbial Technology (IMTECH), Chandigarh, India and maintained on Nutrient Agar and Disc Diffusion Method (Nene and Thapliyal 1979) was used for testing the antibacterial activity of *P. roxburghii* against the test bacteria.

Antibacterial activity of plant part extracts of *P. roxburghii* on various human as well as plant pathogenic bacteria is shown in Table 1. It has been found that nearly all the plant part extracts have shown growth inhibitory effect against *A. tumefaciens*. In case of inhibitory effect against *E. coli*, it was found that except stem extracts all the remaining extracts have shown inhibitions. Alcoholic extracts of leaves and female cone were found effective against the growth of *S. arizonae* whereas none of the other extracts have shown inhibition against *S. arizonae*. Except aqueous extract of stem, all other extracts were found effective against the growth of *S. typhi*. In case of inhibitions against *S. aureus*, except alcoholic extract of bark and aqueous and alcoholic extracts of male cone, all the extracts have shown inhibitory effect against the growth of *S. aureus*.

Similar results have been found by various researchers in gymnosperms. Digrak *et al.* (1999) studied the antimicrobial activity of various gymnospermous plants, including *Pinus nigra* and found better results. Mammanti *et al.* (2000) investigated the antimicrobial properties of *Ginkgo biloba* leaves. Various other researchers like Kowlowski and Metraum (1999), Erdemglu and Sener (2001), Shibutani *et al.* (1998) and Bagei and Digrak (1997) also studied about the antimicrobial activity of gymnosperms.

It was concluded that antibacterial activity of *Pinus roxburghii* and its active constituents would be helpful in treating various kind of diseases of human as well as plants. Crude extracts and

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their interactions with different active fractions of the plants are needed to explore the exact mechanism of the interaction among the active phyto-constituents. Similarly, the efficacy of crude extracts or polyherbal preparations needs to be studied *in vivo* to assess their therapeutic utility.

Table 1. Antibacterial activity of plant part extracts of *Pinus roxburghii* Sarg. by disc diffusion method.

Plant parts	Extract	Diameter of inhibition zone (in mm)				
		<i>Agrobacterium tumefaciens</i>	<i>Escherichia coli</i>	<i>Salmonella arizonae</i>	<i>Salmonella typhi</i>	<i>Staphylococcus aureus</i>
Leaves	Aqueous	09	17	-	17	04
	Alcoholic	11	09	13	18	16
Stem	Aqueous	04	-	-	-	14
	Alcoholic	14	-	-	20	10
Bark	Aqueous	16	12	-	12	11
	Alcoholic	10	11	-	13	-
Male cone	Aqueous	11	17	-	17	-
	Alcoholic	13	11	-	12	-
Female cone	Aqueous	15	20	-	24	12
	Alcoholic	17	18	16	22	15

- = No inhibition observed.

Acknowledgements

Authors are thankful to Dr. S. P. Bohra, Head, Department of Botany, Jai Narain Vyas University, Jodhpur, Rajasthan for providing laboratory facilities. Thanks are due also to Dr. Tapan Chakraborti, Scientist and Curator, Institute of Microbial Technology (IMTECH), Chandigarh for supplying bacterial cultures.

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(Manuscript received on 15 May, 2004; revised on 5 June, 2006)