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Antibacterial activity of *Christella dentata* frosk. Study in different seasons

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ABSTRACT

*The antibacterial activity of the alcoholic and chloroform extracts of *Christella dentata* is planned to investigate in present study. *Christella dentata* is traditionally use as herbal medicine. *Christella dentata* show very effective antimicrobial potential against *Bacillus subtilis*, *Escherichia coli*, *Salmonella typhi* and *Staphylococcus aureus*. The antibacterial activity of *Christella dentata* were also carried out in three different seasons summer, winter and rainy. The extracts of *Christella dentata* were prepared in alcohol and chloroform and compared with the 1 unit strength of antibiotic tetracycline and alcohol and chloroform also use as a cotrol.*

Key Words : Antibacterial, *Christella dentata*.

INTRODUCTION

Herbal medicine is the oldest form of healthcare known to mankind. Herbs had been used by all cultures throughout history. It was an integral part of the development of modern civilization. Primitive man observed and appreciated the great diversity of plants available to him [7]. The plants provided food, clothing, shelter, and medicine. Much of the medicinal use of plants seems to have been developed through observations of wild animals, and by trial and error [17].

As time went on, each tribe added the medicinal power of herbs in their area to its knowledgebase. They methodically collected information on herbs and developed well-defined herbal pharmacopoeias. Indeed, well into the 20th century much of the pharmacopoeia of scientific medicine was derived from the herbal lore of native peoples [12]. Many drugs commonly used today are of herbal origin. Indeed, about 25% of the prescription drugs dispensed in the India contain at least one active ingredient derived from plant material. Some are made from plant extracts; others are synthesized to mimic a natural plant compound [3].

Men used some common Pteridophytes in their routine health care system to treated diseases such as bones fracture, cough and cold, carbuncle, cardiac problem, pyorrhoea, headache, blood clotting, throat pain, cut or wound etc.[11]. Several investigators reported previously about phytochemical and biological activities of several fern and fern allies of *Huberzia* species [15].

Most of the ferns show positive results with the difference in the degree of bioactivity between species to species. But interestingly, intraspecific difference in biological activity was observed in the case of the fern *Christella parasitica* (L.), which is a highly polymorphic species. Some gatherings of this species show more biological activity in contrast to some other gatherings [6]. In order to understand such differences in biological activity, studies on morphological and phytochemical bioactivities of different gatherings were carried out based on the information from the literatures [18].

It is known that the fern *Christella parasitica* is a polymorphic species with the variation in size of the entire plant, pubescens, and depth of lobing of pinnae etc. In the mean time there are two distinct morphotypes. They are glandular and eglandular morphotypes. The leaves of the former bear orange-coloured and elongated glands on the lower side of the costa, costules and veins, but such glands are absent in the latter [13].

On the basis of these fact the present study designed for investigate the possible antibacterial action of the alcoholic and chloroform extracts of *Christella dentata* which is traditionally use as herbal medicine. Antibacterial activity of the alcoholic and chloroform extracts of *Christella dentata* against *Bacillus subtilis*, *Escherichia coli*, *Salmonella typhi* and *Staphylococcus aureus*, was investigated. Seasonal sampling of the *Christella dentata* were also carried out in three different seasons summer, winter and rainy. The extracts of *Christella dentata* were prepared in alcohol and chloroform and compared with the 1 unit strength of antibiotic tetracycline.

EXPERIMENTAL SECTION

Whole plants of *Christella dentata* were collected from Rajaji National park Utrakhand and washed with tap water, followed by a wash with sterilized distilled water, Screen and trim medicinal plants or fragments defined beforehand with care. At the same time, put aside a part of the fresh medicinal plant which after being weighed- is dried out at 50°C for 12 to 24 hours. Weigh the mixture again to get its dry weight, that generally corresponds to 20-30% of the fresh weight; and thereafter 100 g of plant material was taken and macerate in 250 ml of absolute alcohol, on other hand 100 g of plant material was macerate in 250 ml of chloroform (lab Reagent),

The macerate is preserved in a cool and dark place and kept in air-tight container for 3 weeks; shake from time to time; At the end of the 3 weeks, Grind and let immediately macerate in ethyl alcohol 95%; add to the blend the amount of distilled water necessary to get a degree of about 95% alcohol and also retrieve the liquid from pressing strongly out the residue of the macerated plant; blend the whole mixture and these samples were stored at room temperature for 48-72hrs in dark away from direct sun-light. It was stirred at 12hr. intervals by means of sterile glass rod.. After 72 h of alcoholic and chloroform treatments, each extract was filtered through muslin cloth and re-filtered by passing through Whatman filter paper no. 42. This process of extraction was

repeated with the same volume of alcohol. The filtrate was evaporated gently to get the requested ratio compared with the theoretical weight of dry matter.

The test organisms *Bacillus subtilis*, *Escherichia coli*, *Salmonella typhi* and *Staphylococcus aureus* were obtained from IMTECH, Chandigarh and inoculated evenly in uniform quantity in Petri-plate containing suitable sterilized media. Whatman filter paper discs (0.5 cm dia) were used to test the antibacterial activity of alcoholic and chloroform extract (prepared as above) with its aqueous dilution (25%-75%). Each extract was also compared with 1 unit strength of tetracycline antibiotic. Distilled water, alcohol and chloroform were used as control.

RESULT AND DISCUSSION

The present study clearly indicates that alcoholic and chloroform extract of *Christella dentata* possesses antibacterial activity. Data present in table No. 1-3 show the antibacterial effect of alcoholic and chloroform extract of *Christella dentata* in three different seasons summer, winter and rainy. It is clearly revealed that on increasing the concentration of plant extract the size of inhibition zone increases markedly.

The effective zones of inhibition of undiluted alcoholic extract of *Christella dentata* in winter season measured against *Bacillus subtilis*, *Escherichia coli*, *Salmonella typhi* and *Staphylococcus aureus*, were 5.4 mm, 4.8 mm, 5.7 mm, 5.0 mm. and diluted alcoholic extract of 80% dilution showed 4.1 mm, 4.1 mm, 4.3 mm, 4.0 mm. 50% dilution showed 3.4 mm, 3.1 mm, 3.4 mm, 3.1 mm, 20% dilution showed 1.5 mm, 1.5 mm, 2.0 mm, 1.5 mm. Such zones formed by chloroform extract of *Christella dentata* in winter season were measured to be 5.3 mm, 4.8 mm, 5.6 mm, 4.8 mm, and diluted chloroform extract of 80% dilution showed 4.1 mm, 3.5 mm, 3.0 mm, 3.5 mm, 50% dilution showed 3.2 mm, 2.7 mm, 1.7 mm, 1.8 mm. 20% dilution showed 1.4 mm, 1.2 mm, 1.1 mm, 1.0 mm, (Table 1)

Table 1: Antibacterial effect of *Christella dentata* in summer season

Test organism	Diluted Alcoholic extract			Antibiotic Tetracycline	Diluted Chloroform extract		
	80%	50%	20%		80%	50%	20%
<i>Bacillus subtilis</i>	4.1	3.4	1.5	10.0	4.1	3.2	1.4
<i>Escherichia coli</i>	4.1	3.1	1.5	12.0	3.5	2.7	1.2
<i>Salmonella typhi</i>	4.3	3.4	2.0	15.0	3.0	1.7	1.1
<i>Staphylococcus aureus</i>	4.0	3.1	1.5	14.0	3.5	1.8	1.0
	Undiluted Alcoholic extract Replicates				Control Alcohol	Control water	Effective Inhi.Zone
	1	2	3	Mean			
<i>Bacillus subtilis</i>	10.2	10.4	10.6	10.4	5.0	Nil	5.4
<i>Escherichia coli</i>	9.6	9.9	9.9	9.8	5.0	Nil	4.8
<i>Salmonella typhi</i>	10.5	10.7	10.9	10.7	5.0	Nil	5.7
<i>Staphylococcus aureus</i>	10.0	10.0	10.0	10.0	5.0	Nil	5.0
	Undiluted Chloroform extract Replicates				Control Chloroform	Control water	Effective Inhi.Zone
	1	2	3	Mean			
<i>Bacillus subtilis</i>	10.5	10.3	10.1	10.3	5.0	Nil	5.3
<i>Escherichia coli</i>	9.9	9.8	9.7	9.8	5.0	Nil	4.8
<i>Salmonella typhi</i>	10.6	10.8	10.4	10.6	5.0	Nil	5.6
<i>Staphylococcus aureus</i>	9.6	9.8	10.0	9.8	5.0	Nil	4.8

Table 2: Antibacterial effect of *Christella dentata* in winter season

Test organism	Diluted Alcoholic extract			Antibiotic Tetracycline	Diluted Chloroform extract		
	80%	50%	20%		80%	50%	20%
<i>Bacillus subtilis</i>	3.9	3.1	1.1	10.0	3.8	2.9	1.1
<i>Escherichia coli</i>	3.8	2.9	1.2	12.0	3.3	2.4	1.0
<i>Salmonella typhi</i>	4.1	3.1	1.8	15.0	2.7	1.4	1.0
<i>Staphylococcus aureus</i>	3.8	2.7	1.1	14.0	3.2	1.3	0.92
	Undiluted Alcoholic extract Replicates				Control Alcohol	Control water	Effective Inhi.Zone
	1	2	3	Mean			
<i>Bacillus subtilis</i>	10.0	10.0	10.0	10.0	5.0	Nil	5.0
<i>Escherichia coli</i>	9.4	9.3	9.5	9.4	5.0	Nil	4.4
<i>Salmonella typhi</i>	10.1	10.3	10.2	10.2	5.0	Nil	5.2
<i>Staphylococcus aureus</i>	9.5	9.7	9.5	9.6	5.0	Nil	4.6
	Undiluted Chloroform extract Replicates				Control Chloroform	Control water	Effective Inhi.Zone
	1	2	3	Mean			
<i>Bacillus subtilis</i>	9.8	9.8	9.8	9.8	5.0	Nil	4.8
<i>Escherichia coli</i>	9.4	9.5	9.3	9.4	5.0	Nil	4.4
<i>Salmonella typhi</i>	10.1	10.1	10.1	10.1	5.0	Nil	5.1
<i>Staphylococcus aureus</i>	9.2	9.4	9.3	9.3	5.0	Nil	4.3

Table 3: Antibacterial effect of *Christella dentata* rainy season

Test organism	Diluted Alcoholic extract			Antibiotic Tetracycline	Diluted Chloroform extract		
	80%	50%	20%		80%	50%	20%
<i>Bacillus subtilis</i>	3.6	2.9	0.85	10.0	3.3	2.6	0.90
<i>Escherichia coli</i>	3.5	2.5	1.0	12.0	3.0	2.2	0.95
<i>Salmonella typhi</i>	3.8	2.8	1.5	15.0	3.5	2.5	1.1
<i>Staphylococcus aureus</i>	3.3	2.3	0.98	14.0	2.9	1.9	1.5
	Undiluted Alcoholic extract Replicates				Control Alcohol	Control water	Effective Inhi.Zone
	1	2	3	Mean			
<i>Bacillus subtilis</i>	9.9	9.3	9.3	9.5	5.0	Nil	4.5
<i>Escherichia coli</i>	9.1	9.2	9.0	9.1	5.0	Nil	4.1
<i>Salmonella typhi</i>	9.4	9.4	9.9	9.8	5.0	Nil	4.8
<i>Staphylococcus aureus</i>	9.2	9.3	9.1	9.2	5.0	Nil	4.2
	Undiluted Chloroform extract Replicates				Control Chloroform	Control water	Effective Inhi.Zone
	1	2	3	Mean			
<i>Bacillus subtilis</i>	9.1	9.6	9.2	9.3	5.0	Nil	4.3
<i>Escherichia coli</i>	8.4	8.9	9.1	9.0	5.0	Nil	4.0
<i>Salmonella typhi</i>	8.4	8.6	8.4	8.8	5.0	Nil	3.8
<i>Staphylococcus aureus</i>	8.8	9.2	8.7	8.9	5.0	Nil	3.9

The effective zones of inhibition of undiluted alcoholic extract of *Christella dentata* In summer season measured against *Bacillus subtilis*, *Escherichia coli*, *Salmonella typhi* and *Staphylococcus aureus*, were 5.0 mm, 4.4 mm, 5.2 mm, 4.6 mm. and diluted alcoholic extract of 80% dilution showed 3.9 mm, 3.8 mm, 4.1 mm, 3.8 mm. 50% dilution show 3.1 mm, 2.9 mm, 2.7 mm, 3.1 mm, 20% dilution showed 1.1 mm, 1.2 mm, 1.8 mm, 1.1 mm, Such zones formed by Chloroform extract of *Christella dentata* in summer season were measured to be 4.8 mm 4.4 mm, 5.1 mm, 4.3 mm, and diluted Chloroform extract of 80% dilution showed 3.8 mm, 3.3 mm, 2.7 mm, 3.2 mm, 50% dilution showed 2.9 mm, 2.4 mm, 1.4 mm, 1.3 mm. 20% dilution showed 1.1 mm, 1.0 mm, 1.0 mm, 0.92 mm, (Table 2).

The effective zones of inhibition of undiluted alcoholic extract of *Christella dentata* In rainy season measured against *Bacillus subtilis*, *Escherichia coli*, *Salmonella typhi* and *Staphylococcus*

aureus, were 4.5 mm, 4.1 mm, 4.8 mm, 4.2 mm. and diluted alcoholic extract of 80% dilution showed 3.6 mm, 3.5 mm, 3.8 mm, 3.3 mm. 50% dilution show 2.9 mm, 2.5 mm, 2.8 mm, 2.3 mm, 20% dilution showed 0.85 mm, 10.0 mm, 1.5 mm, 0.98 mm, Such zones formed by Chloroform extract of *Christella dentata* in rainy season were measured to be 4.3 mm 4.0 mm, 3.8 mm, 3.9 mm, and diluted Chloroform extract of 80% dilution showed 3.3 mm, 3.0 mm, 3.5 mm, 2.9 mm, 50% dilution showed 2.6 mm, 2.2 mm, 2.5 mm, 1.9 mm. 20% dilution showed 0.90 mm, 0.95 mm, 1.1 mm, 1.5 mm, (Table 3).

In the present work antibacterial potential of *Christella dentata* was studied against *Bacillus subtilis*, *Escherichia coli*, *Salmonella typhi* and *Staphylococcus aureus* which was compared to I unit strength of antibiotic tetracycline . The extract of plants were made in alcohol, chloroform and both solvent were used as control as well. It was noted that, *Christella dentata* was more effective against *Staphylococcus aureus*, as compared to *Bacillus subtilis*, *Escherichia coli*, and *Salmonella typhi*. Seasonal sampling of the *Christella dentata* were also carried out in three different seasons summer, winter and rainy. The extract of *Christella dentata* was more effective in summer season than rainy and winter season. The alcoholic extract of plants were more effective than chloroform extracts and both extracts of plants were found less effective than I unit strength of antibiotic tetracycline, however, these could be brought at par to the tetracycline by concentrating these extracts.

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