Studies on Phytochemical Investigations and Antimicrobial Activity of an Endangered Orchid *Geodorum densiflorum* (Lam) Schltr

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Abstract:

Geodorum densiflorum, an endangered species is a member of family Orchidaceae having distributed in Ghodazari Dam near Nagbhid of Chandrapur district. The pseudo-bulbs are found to useful as nutraceutical particularly on debility, stomach troubles, insect bite, wounds, rheumatic swellings, diabetes and complaints related to women health. The present paper deals with qualitative phytochemical analysis and antimicrobial activity of pseudobulbs of *Geodorum densiflorum.* The pseudobulbs showed alkaloids, glycosides, phytosterols, tannins and proteins and antimicrobial activity against *Bacillus cereus, Bacillus subtilis, Staphylococcus aureus, Escherichia coli, Pseudomonas aurigienosa and Salmonella typhi.*

Key words: Phytochemical investigations, Antibacterial Activity, *Geodorum densiflorum.*

Introduction:

Ethnomedicinal plants play a vital role in maintaining human health and contribute towards improvement of human life. The ethno-botanical information is being prominently used for the formulation of alternative drugs and gaining much significance because of its efficacy and negligible side effects. The skill and practices nourished by tribal communities are also increasingly acknowledged by the pharmaceutical industries due to the presence of novel phytoconstituents.

Plants have provided a source of inspiration for novel drug compounds as plant-derived medicines have made significant contribution towards human health. Phytomedicines can be used for the treatment of diseases as is done in case of Unani and Ayurvedic system of medicines or it can be the base for the development of a medicine, a natural blueprint for the development of new drugs.

Geodorum densiflorum (Lam) Schltr., locally known as hargatthi, (Family: Orchidaceae) is a terrestrial herb with buried or half buried, ovoid-conical pseudobulbs. The plants are distributed in a restricted locality and seem to be exploited heavily for the purpose of crude formulations. They are mostly perenated by pseudo-bulbs. The tubers are found to useful as nutraceutical particularly on debility, stomach troubles and complaints related to women health.

The pseudo-bulbs of *G. densiflorum* are used as medicine for the treatment of various diseases (Rao, 1979). It's an endangered species (Sheelavantmath et al., 2000). The pseudobulb is used to regularize menstrual cycle (Dash et al., 2008) and in diabetes by the traditional practitioners. The underground pseudobulb of the plant has been found to possess anti-diabetic property (Roy and Banerjee, 2002).

The present paper deals with qualitative phytochemical analysis and antibacterial activity of pseudobulbs of such an endangered orchid *Geodorum densiflorum.*

Material and Methods:

The pseudobulbs of *Geodorum densiflorum* (Lam) Schltr. (Fig. 1) were collected from Ghodazari Ghodazari Dam near Nagbhid of Chandrapur district in August, 2014. The plant specimens were identified and authentificated from PGTD STM Nagpur University, Nagpur. The pseudobulbs of *Geodorum densiflorum* were washed under running tap water, shade dried and then homogenized to fine powder and stored in airtight bottles.

Preparation of Crude Extract:

Different solvents like Petroleum ether, chloroform, methanol, ethanol and water were chosen for successive solvent extraction based on polarity using Soxhlet extraction apparatus and the extracts of *Geodorum densiflorum* were concentrated under reduced pressure using rotary evaporator (Gunasekaran and Selvarajan, 2009).

Phytochemical Tests:

Solvent free extract obtained as above was then subjected to qualitative tests for identification of various plant constituents of each sample.

Standard phytochemical screening methods were applied to each plant extracts, so as to test them for alkaloids, glycosides, phytosterols, tannins and proteins following the techniques of Harborne (1996), Sofowora (1984), Kokate (1994) and Evans (2002). (Table. 1)

Antibacterial Screening:

Test Organisms:

Authentic cultures of three Gram +ve and three Gram -ve bacteria viz., *Bacillus cereus, Bacillus subtilis, Staphylococcus aureus, Escherichia coli, Pseudomonas aurigienosa and Salmonella typhi* were obtained from NCL, Pune, India and they are used for the antibacterial activity against the prepared plant extracts.

Disc Diffusion Method:

Antibacterial activity is studied by using the disc diffusion method (Kirby et al., 1966). The discs were put in a clean dry glass bottle and sterilized at 121°C for 15 min in an autoclave. Broth dilution assay was used to screen the extracts for antibacterial activity. The diameter of zone of inhibition of each well was recorded. The results of antibacterial activity were tabulated in Table-2.

Results:

It was clear from the experimental data presented in Table-1 that the substances like alkaloids, glycosides, phytosterols, tannins and proteins were medicinally active components of the pseudobulbs of *Geodorum densiflorum*. The petroleum ether extract confirms the presence of alkaloids, glycosides and phytosterols. Acetone extract confirms the presence of alkaloids, glycosides, tannins and proteins. Benzene extract confirms the presence of alkaloids, tannins,

proteins and phytosterols. Chloroform extract confirms the presence of alkaloids, phytosterols and tannins. Ethanol extract confirms the presence of alkaloids and glycosides. Distilled water extract confirms the presence of alkaloids, phytosterols and proteins.

The results of antimicrobial screening of the extracts revealed that the methanolic and ethanolic extracts show significant antimicrobial activity than petroleum ether, chloroform, ethanol and water extract against almost all the test bacteria and showed zone of inhibition of 12-16 mm and 10-13 mm (Table-2) respectively. The petroleum ether and chloroform extracts showed moderate activity and the water extract showed lesser activity against the microorganisms. Water extract did not showed activity against *Bacillus subtilis and Pseudomonas aurigienosa.*

Discussion:

The use of medicinal plants plays a vital role in covering the basic health needs in developing countries and these plants may offer a new source of antibacterial, antifungal and antiviral agents with significant activity against infective microorganisms (Munoz et. al., 2003; Coelho et. al., 2004). The presences of these bioactive components in the crude drugs have been linked to their activities against disease causing microorganisms and also offering the plants themselves protection against infection by pathogenic micro-organisms (El-Mahmood *et. al.*, 2008).

The obtained results may provide a support to use of the plant in folk and traditional medicine. Based on this, further chemical and pharmacological investigations to isolate and identify minor chemical constituents in *Geodorum densiflorum* to screen other potential bioactivities may be recommended.

This type of study will guide the pharmaceutical companies to select the required part of the plant which yields maximum quantity of required active ingredient for the therapeutic preparations. (Table. 2)

Table. 1- Qaulitative phytochemical investigations of various extracts of pseudobulbs of *Geodorum densiflorum* (Obtained by successive solvent extraction of plant material)

Plant Part Used	Tests	Reagents	Petrolem Ether Extract	Acetoe Extract	Benzene Extract	Chlorofom Extract	Ethanol Extract	Water Extract
PSEUDOBULBS	Alkaloids	Mayer's Test	+	+	+	+	+	+
	Glycosides	Libbermann Burchard's Test	+	+	-	-	+	-
	Phytosterols	Libbermann's Burchard's Test	+	-	+	+	-	+
	Tannins	Ferric Chloride Test	-	+	+	+	-	-
	Proteins	Biurete Test	-	+	+	-	-	+

(Phytochemicals: Present= +, Absent= -)

Table. 2- Showing antibacterial activity of extracts of pseudobulbs of *Geodorum densiflorum*.

Test organisms	Zone of inhibition (in mm)				
	Petroleum ether	Chloroform	Methanol	Ethanol	Water
Bacillus cereus	11	8	14	12	7
Bacillus subtilis	9	9	12	10	-
Staphylococcus aureus	8	7	16	13	6
Escherichia coli	7	11	16	12	9
Pseudomonas aurigienosa	9	9	12	10	-
Salmonella typhi	9	10	13	10	10

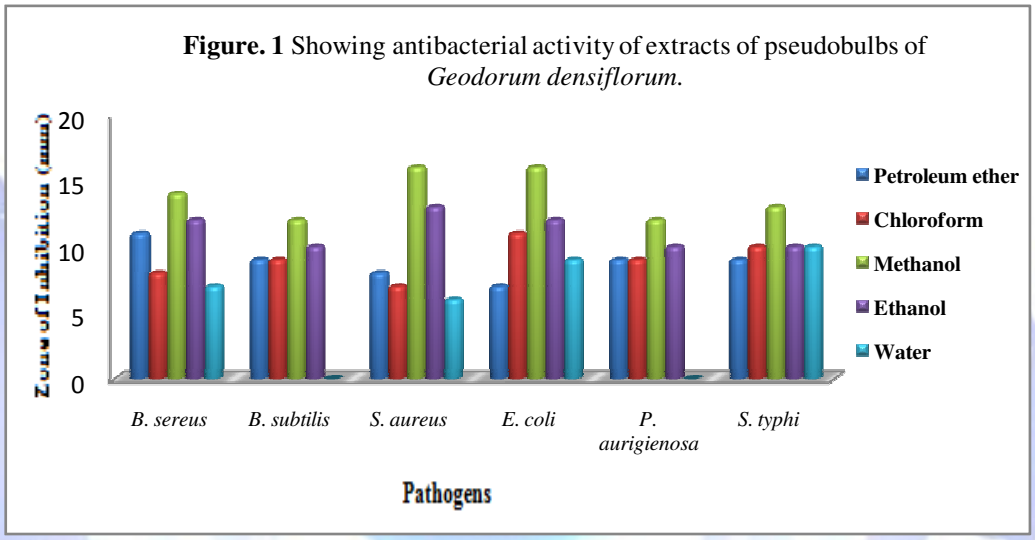

Figure. 1 Showing antibacterial activity of extracts of pseudobulbs of *Geodorum densiflorum*.

Figure. 2- Pseudobulbs of *Geodorum densiflorum*

Conclusion:

The extracts of the plant part produced good inhibition zones against the test organisms. So it is expected that they could be used to treat infections and diseases caused by these organisms and if the active ingredients of the extracts are isolated and possibly crystallized, therapeutic antibiotics could be produced from these compounds. The inhibitions of growth of the test organisms that are known to

cause infections justify the continued use of these plants in traditional system of medical practice.

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