FTIR and UV-Visible analysis of *Geodorum densiflorum* (Lam.) Schltr Pseudobulb

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Abstract
The present investigation conducted to produce fourier transform-infrared (FT-IR) and ultraviolet-visible (UV-VIS) spectrum profile of *Geodorum densiflorum*. Pseudobulb extract in petroleum ether was used for spectral analysis. FTIR analysis was used to detect the characteristic peak values and their functional groups. FTIR analysis of pseudobulb powder extract in petroleum ether revealed the presence of alcohols, phenols, alkanes, aliphatic ester, aromatic ring, alkenes, carboxylic acids, ethers, anhydrides and alkyl halides. UV-VIS profile of pseudobulb powder extract in petroleum ether showed the peaks at wavelength 345 nm, 355 nm and 925 nm with the absorption 0.36, 0.57 and 0.16 respectively. So the present investigation provides evidences that pseudobulb of *Geodorum densiflorum* contain bioactive constituents which could be of interest for the development of new drug.

Key Words: FTIR spectrum, UV-Vis, pseudobulb, petroleum ether

1. Introduction
Phytochemicals are biologically active, naturally occurring chemical compounds found in plant, which provide health benefits for humans than those attributed to macronutrients and micronutrients [1]. Ancient Indian literature incorporates a remarkable broad definition of medicinal plants and considers all plant or parts of plants to be potential source of medicinal substances [2]. Recently, extensive attention has been paid to utilize eco-friendly plant based products for the prevention and cure of different human diseases. These plants can be exploited to find out effective alternative to synthetic drugs [3].

Geodorum densiflorum belong into family Orchidaceae. In India, family Orchidaceae is represented by 177 genera with 1,195 species [4] of which 400 species are endemic [5]. *Geodorum densiflorum* is an endangered terrestrial orchid [6]. In India, the genus *Geodorum* is represented by 7 species [7]. Pseudobulb of *Geodorum densiflorum* was used to cure carbuncles [8], used to regularize menstrual cycle [9], on diabetes [10], to treat dysentery [11], increase sperm density [12] and to cure carbuncles [13].

2. Materials and methods
2.1 Collection and extraction of plant material
The fresh pseudobulb material of *Geodorum densiflorum* was collected from Amba Barwa sanctuary, Jalgaon Jamod tehsil, district Buldhana (M.S.). Pseudobulb material was washed thoroughly with tap water, shade dried and homogenized to fine powder and stored in airtight bottles. About 25 gm powdered plant material weighed accurately and extracted in Soxhlet apparatus by using petroleum ether as solvent.

2.2 Spectroscopic analysis
In fourier transform infrared spectroscopy, about 10 mg pure solute obtained after evaporation of solvent was used. The dried 10 mg powdered extract was mixed with KBr salt and encapsulated in 100 mg of KBr pellet, in order to prepare translucent sample discs. The powder sample of each plant specimen was loaded by using a Perkin Elmer Spectrum RX1, FT/IR spectrometer, with wave number from 4400 to 450 cm^{-1} having a nominal resolution of 1 cm^{-1}. For each spectrum 64 runs were collected and averaged. Sample was placed in sample chamber and spectra were taken ATR mode. Results were plotted against wave number verses percent transmittance.
Petroleum ether extracts of *Geodorum densiflorum* was examined under UV and visible light for immediate investigation. The extract of plant sample was centrifuged at 3000 rpm for 10 minutes and filtered through filter paper (Whatman No. 1) under high pressure of vacuum pump. The sample was diluted to 1:10 by using same solvents. The extract was scanned in the wavelength range from 190- 1100 nm using EQUIP- TRONICS (EQ-826) and the peaks were detected.

3. Result and Discussion
The FTIR spectrum was used to identify the functional group of different phytoconstituents based on the peak values in region of infrared radiation (4400- 450 cm^{-1}), present in different extracts of pseudobulb powder.

Peak value (in cm^{-1})	Functional group	Bond	Group frequency (in cm^{-1})
3415,66	Hydrogen bonded alcohols, phenols	O-H stretching	3600- 3200
2922,57	Alkanes	C-H stretch	2970- 2850
1737,70	Aliphatic Esters	C=O stretch	1750-1730
1616,70	Alkenes	C=C stretch	1680- 1600
1493,71	Aromatic ring	C=C Ring stretch	1600- 1450
1464,69	Alkanes	C-H bend	1475- 1365
1377,70	Aliphatic compounds	CH3 sym deformation	1475- 1365
1160,68	Alcohols, carboxylic acid, esters, ethers	C-O stretch	1300- 1000
1051,67	Anhydrides	C-O stretch	1300- 900
518,72	Bromides	C-Br	650- 510

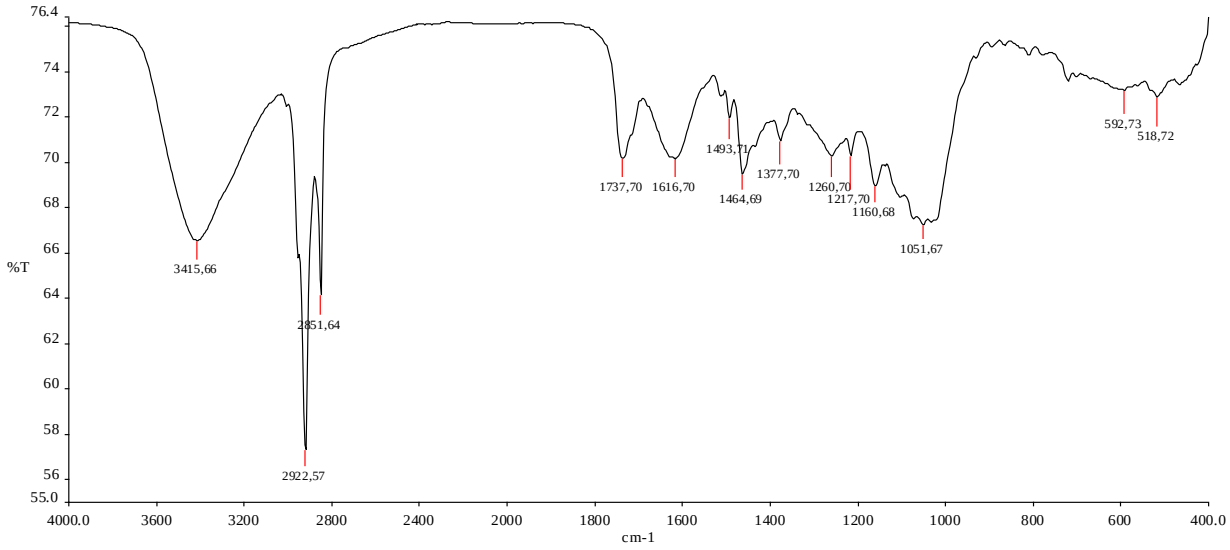

Fig 1: FTIR spectrum of petroleum ether extract of pseudobulb.

FTIR analysis was used to detect the characteristic peak values and their functional groups. FTIR spectrum of pseudobulb represented in fig. (1) and peak value and functional group in table (1). FTIR analysis of pseudobulb powder extract revealed the presence of alcohols, phenols, alkanes, aliphatic ester, aromatic ring, alkenes, carboxylic acids, ethers, anhydrides and alkyl halides.

Phenols are of immense significance as they protect the human body from the oxidative stress [14]. The alkanes protect the plant against water loss, avoid the leaching of important mineral by rain and protect against microorganism and harmful insects [15]. Foods with plant stanol or sterol esters lower serum cholesterol level [16], thereby most likely reducing the possibility of coronary heart disease [17]. Alkenes (Ethylene) were used for artificial ripening of fruits [18].

Amides have various defensive functions against herbivores [19] and antimicrobial activity [20]. The carboxylic acid is a functional group plays a cardinal role in living system as well as in drug design (pharmacophore) [21]. Halide group compounds function within the plant cell to generate chlorinated tryptophan, which is then shuttled into monoterpene indole alkaloid metabolism to yield chlorinated alkaloids [22].

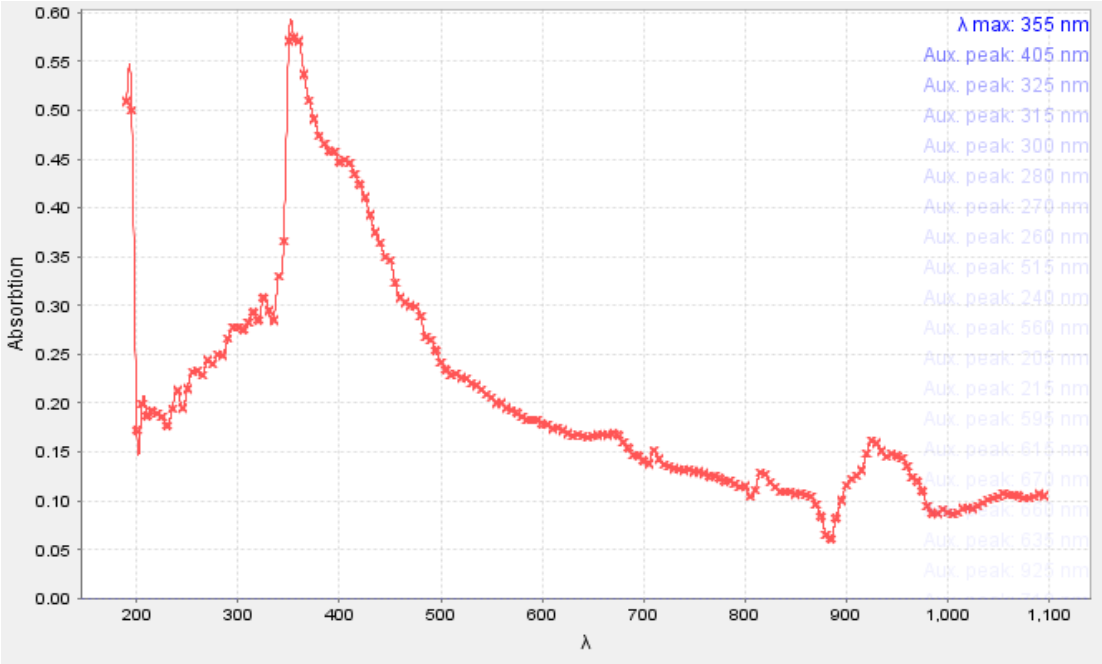

Fig 2: UV-VIS spectrum of petroleum ether extract of pseudobulb

The qualitative UV-VIS spectrum profile of *Geodorum densiflorum* pseudobulb in petroleum ether was selected at wavelength from 190 to 1100 nm due to sharpness of the peak and proper baseline. The peaks were obtained in the range of 300- 1000 nm wavelength. The profile showed peak at 345 nm, 355 nm and 925 nm with absorption at 0.366, 0.574 and 0.162 respectively.

Table 2: UV-VIS spectrum profile of *Geodorum densiflorum* pseudobulb extract in petroleum ether.

Wavelength (λ) in nm	345	355	925
Absorbtion	0.366	0.574	0.16

4. Conclusion

The results of the present study showed that *Geodorum densiflorum* pseudobulb displayed novel phytochemical markers which can be isolated and to check their quality and identity. Hence, further advanced analytical techniques are needed for the structural elucidation and identification of compounds.

5. Reference

1. Hasler CM, Blumberg JB. Symposium on phytochemicals: Biochemistry and physiology. Journal of Nutrition. 1999; 129(3):756S-757S.
2. Thomas S, Patil DA, Patil AG, Chandra N. Pharmacognostic evaluation and physico-chemical analysis of *Averrhoa carambola* L. fruit. Journal of Herbal Medicine and Toxicology. 2008; 2(2):51-54.
3. Biswal B, Saha D, Beura S, Jana SB, Koley A, Sur D, Mohanty JC. Pharmacognostic studies of leaves of *Derris indica*. International Journal of Research in Pharmaceutical and Biomedical Sciences. 2011; 2(1):294-296.
4. Singh KP, Phukan S, Bujarbarua P. Orchidaceae. In N. P. Singh and D. K. Singh (eds.). Floristic diversity and conservation strategies in India. Botanical survey of India, Kolkata. 2001; 4:1735-1846.
5. Misra S. *Orchids of India*: A glimpse. Bishen Singh Mahendra Pal Singh, Dehra Dun, 2007, 402.
6. Sheelavantmath SS, Murthy HN, Pyati AN, HG A Kumar, Ravishankar BV. *In vitro* propagation of the endangered orchid *Geodorum densiflorum* (Lam.) Schltr. through rhizome section culture. Plant Cell, Tissue and Organ Culture. 2000; 60(2):151-154.
7. Barbhuiya HA, Datta BK, Das A Kr, Baishya AK. Recollection of *Geodorum appendiculatum* (Orchidaceae) from Assam, India and its conservation status. The MIOS Journal. 2014; 15(5):10-13.
8. Dash PK, Sahoo S, Bal S. Ethnobotanical Studies on Orchids of Niyamgiri Hill Ranges Orissa, India. Ethnobotanical leaflets. 2008; 12:70-78.
9. Nath M, Dutta BK, Hajara PK. Medicinal plants in major diseases by Dimasa tribes of Barak valley. Assam University Journal of Science and Technology: Biological and Environmental Sciences. 2011; 7:18-26.
10. Patil MV, Patil DA. Ethnomedicinal practices of Nasik district, Maharashtra. Indian journal of traditional knowledge. 2005; 4(3):287-290.
11. Harshitha Kumari, R Pushpan, Nishteshwar K. Multi-faceted actions of orchids in ethnomedicine-An appraisal. International Journal of Pharmaceutical and Biological Archives. 2012; 3(4):996-1002.
12. Mohammed R, Md Azam NK, Md Mollik AH, Md Hasan M, Hassan AI, Jahan R *et al*. Medicinal plants used by the Kavirajes of Daulatdia Ghat, Kustia district, Bangladesh. American- Eurasian Journal of Sustainable Agriculture. 2010; 4(2):219-229.
13. Nath M, Datta BK, Hajra PK. Medicinal plant used in major diseases by Dimasa tribes of Barak valley. Assam University Journal of Sciences and Technology: Biological and Environmental Sciences. 2011; 7(1):18-26.
14. Robards K, Prenzler PD, Tucker G. Swatsitang P, Glover W. Phenolic compounds and their role in oxidative processes in fruits. Food Chemistry. 1999; 66(4):401-436.
15. Riederer M, Markstadter C. Cuticular waxes: a critical assessment of current knowledge. In: Kerstiens G, ed., Plant cuticles: an integrated functional approach. Oxford: BIO Scientific publishers, 1996, 189-200.
16. Katan MB, Grundy SM, Jones P, Law M, Miettinen T, Paoletti R. Efficacy and safety of plant stanols and sterols in the management of blood cholesterol levels. Mayo Clinic Proceedings. 2003; 78(8):965-978.
17. Fransen HP, Jong ND, Wolfs M, Verhagen H, Monique Verschuren WM, Lutjohann D *et al*. Customary use of plant sterol and stanol enriched margarine is associated with changes in serum plant sterol and stenol concentrations in humans. The Journal of Nutrition. 2007; 137(5):1301-1306.
18. Bleecker AB, Kende H. Ethylene: A gaseous signal molecule in plants. Annual Review of Cell and Developmental Biology. 2000; 16:1-18.
19. Dyer LA, Dodson CD, Stireman JO III, Tobler MA, Smilanich AM, Fincher RM, Letourneau DK. Synergistic effects of three Piper amides on generalist and specialist herbivores. Journal of Chemical Ecology. 2003; 29(11):2499- 2514.
20. Jagessar RC, Gomathinayagam S. Antimicrobial activity of amide, N^4- Benzoylcytosine. Journal of Pharmacy and Clinical Sciences. 2011; 1:12- 19.
21. Ballatore C, Huryn DM, Smith AB III. Carboxylic acid (Bio) isosteres in drug design. Chem Med Chem. 2013; 8(3):385-395.
22. Janakiraman N, Satish SS, Johnson M. UV-VIS and FTIR spectroscopic studies on Peristrophe bicalyculata (Retz.) Nees. Asian Journal of Pharmacy and Clinical Research. 2011; 4(4):125-129.