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FTIR spectroscoptc study and antifungal activity of the medicinal plant glory lily (*Gloriosa superba*)

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Abstract

In this present study, the presence of the phyto compound (i.e.) Colchicine and other chemical constituents present in three different treated tuber and seed samples of Glory Lily (*Gloriosa superbd*) was confirmed using FTIR. An attempt has been made to correlate the extinction coefficient (K) values of all the samples. And also the samples were extensively studied for their antifungal activity against *Pseudomonas aeruginosa, Klebsiella phemoniae,* and *Salmonella typhi.* The results indicated that the Organic Manure treated samples were highly active against the three fungi.

Keywords: FTIR (Fourier Transform Infrared Spectrometer), Antifungal activity, *Pseudomonas aeruginosa*, *Klebsiella phemoniae* and *Salmonella typhi*

Introduction

Glory Lily (*Gloriosa superba* L) belongs to the family Liliaceae. It is an ancient medicinal plant in India. India was the first to use Ayurveda medicine, later as source colchicines and colchicoside [1]. Colchicine the main alkaloid of Gloriosa species [2], are a useful agent in the treatment of acute attacks of gout [3]. Traditionally, colchicine was used for its antimitotic properties [4] and treatment of familial Mediterranean fever [5].

The toxins of Gloriosa superba have an inhibitory action on cellular division resulting in diarrhea, depresent action on the bone marrow and alopecia. The technique based on Fourier Transform Infrared (FTIR) spectrometry was used to detect the presence of colchicines in tubers and seeds.

Thus the aim of this study was to confirm the presence of colchicines in Glory Lily by using FTIR technique and to investigate the anti-fungal activity against some selected fungi. And also an attempt has been to correlate the extinction coefficient (K) values of all the samples.

Materials and Methods

The three different treated samples of tuber and seed (Control (T_1), Chemical Fertilizer (T2), and Organic Manure (T3)) of Glory Lily (Gloriosa superba) were collected from Jothy herbals, Jayamkondam, Perambalur District, TamilNadu.

The infrared spectra of these samples were recorded using FTIR in the range of 400-4000 cm- by the KBr pellet technique. It was carried out by the Instrumentation lab of Chemistry Department, Annamalai University. Anti-fungal activity of tuber and seed samples of Glory lily *{Gloriosa superba)* was evaluated against *Pseudomonus aernginosa, Klebsiella pneumoriiae, Salmonella typhi.* The micro organisms were maintained on agar slants made of antibiotic assay medium A (Hi-Media Mumbai, India) making monthly transfers. Antifungal activity was evaluated by paper disc diffusion method. [6] It was carried out by RMMC & H, Annamalai University, Annamalai Nagar.

Results and Discussion

FT-IR Spectrum analysis

Fig 1 shows that the FTIR spectra of different treated tuber and seed samples of Glory Lily.

Fig 1: FT-IR spectra of different treated Tuber samples of Glory Lily under (a) Control (b) Chemical Fertilizer and (c) Organic Manure Treatment

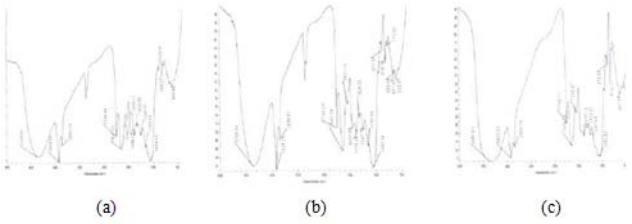
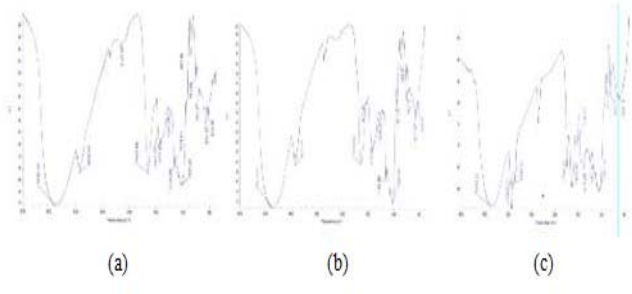


Fig 2: FT-IR spectra of different treated Seed samples of Glory Lily under (a) Control (b) Chemical Fertilizer and (c) Organic Manure Treatment



The functional groups present in the samples were determined by FT-IR spectroscopy. The FT-IR spectrum confirmed the presence of colchicines in Glory Lily, Significant peaks were found at: 2926) cm^{-1} corresponding to CH_2 group, [7] (1646) cm* attributed to Carbonyl

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groups [8], and (1539) cm^{-1} corresponding to amino acid groups [9], all of which confirms the presence of colchicines.

Table land Table 2 shows the Extinction Coefficient (K) values of tuber and seed samples of Glory Lily.

Absorption Band	Tentative Assignments	Extinction coefficient (K) cm^2 / mg					
		T_1 treatment		T_2 treatment		T_3 treatment	
		Sandy Soil	Red Soil	Sandy Soil	Red Soil	Sandy Soil	Red Soil
2922	C-H (sym./asym) Vinyl ether	0.04552	0.06840	0.06216	0.09182	0.12056	0.18376
1646	C=C (stret.) / Vinyl (ether)	0.04552	0.06840	0.06216	0.09182	0.12056	0.18376
1457	N=N-O (antisym.-stret.)	0.09808	0.18003	0.14242	0.14963	0.02889	0.31722
1412	C-N (stret.) / Amino acid III	0.01303	0.02436	0.02165	0.02393	0.05749	0.17219
845	CH_2 out of plane deformation	0.02259	0.01949	0.02200	0.02624	0.02843	0.17219
2925	C-H (sym. / asym) / Vinyl ether	0.03373	0.08825	0.05907	0.06586	0.06812	0.45513
1646	C=C (stret.) / Vinyl ether	0.05023	0.08725	0.05933	0.06434	0.08222	0.36568
1539	N=N-O (antisym.-stret.)	0.01188	0.02236	0.016518	0.04339	0.019627	0.05695
1375	CH_3 deformation	0.00739	0.01239	0.01287	0.01687	0.01082	0.06841
871	CH_2 out of plane deformation	0.01162	0.2819	0.00988	0.00934	0.00802	0.05568

From the investigation it is seen that the cochicines level is the maximum in seed compared to the tubers of Glory Lily. In seed the extinction Coefficient (K) value is 0.45513 Cm^2 / mg and in tuber 0.18376Cm^2/mg.

Fig 2: Antifungal activity of Glory lily samples against *Pseudomonas aeruginosa, Klebsiella pneumoniae, Salmonella typhi*

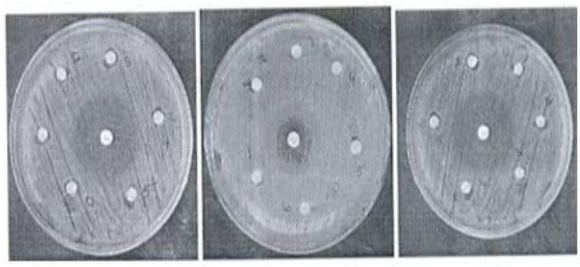

Table 3 shows that the anti fungal activity of Glory Lily samples

Table 3: The Anti-fungal activity of Glory Lily (G. Superba) samples

Sl. No.	Fungus Name	Tuber			Seed		
		T_1	T_2	T_3	T_1	T_2	T_3
1.	Pseudomonas aeruginosa	++	+	+++	++	+++	+++
2.	Klebsiella pneumoniae	++	+++	+++	+	+++	+++
3.	Salmonella typhi	+	++	+++	++	+++	+++

\+ Low (3.0-3.5 mm)
++ Medium (4.5.5.5 mm)
+++ High (6.5.-7.5.mm)

The extracts of different treated tuber and seed samples of Glory Lily showed **antifungal** activity against Pseudomonas aeruginosa, Klebsiella pneumoniae, Salmonella typhi as determined by agar well and disc diffusion techniques. The results from the above studies may justify the use of plant in the treatment of certain skin diseases, infected wounds and also abscess [10, 11]. Many of the currently used anti-infective and anti neo plastic agents are natural products, initially isolated from plants. [12, 13]. Colchicine has abortifacient, anti-pyretic, anti-inflammatory and anti-leprotic properties [14]. On the basis of the present investigation it can be concluded that the root and seed of the Glory lily plant may be used as an anti-microbial agent. This may be due to the presence of highly active alkaloid compound, Colchicines and its derivatives.

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