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Phytochemical and GC-MS Studies on Therapeutically Active *Gloriosa superba* Flowers

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ABSTRACT

Gloriosa superba is one of the important medicinal plants and is widely used for several ethno-medicinal purposes by tribal peoples and traditional practitioners. The present study deals with the phytochemical and GC-MS analysis of *G. superba* flowers. Preliminary phytochemical analyses were carried out by standard procedures. The petether, benzene, chloroform and methanol extracts of this plant contain valuable bioactive compounds. The methanol extract of *G. superba* flower was subjected to GC-MS analysis. The GC-MS analysis of *G. superba* indicated the presence of two major compounds viz., Colchicine and Liriodenine.

1. Introduction

Natural products have been, and will continue to be a rich source of new drugs against many diseases. The depth and breadth of therapeutic agents that have their origins in the secondary metabolites produced by living organisms cannot be compared with any other source of therapeutic agents [1]. Moreover, medicinal plants have been used as sources of medicine in virtually all cultures. In recent years, there has been a gradual revival of interest in the use of medicinal plants in developing countries because herbal medicines have been reported safe and without any adverse side effect especially when compared with synthetic drugs. Thus a search for new drugs with better and cheaper substitutes from plant origin is a natural choice. The medicinal values of these plants lie in some chemical substances that produce a definite physiological action on human body [2-3].

Gloriosa superba is an important medicinal plant belonging to the family Colchicaceae. The generic name Gloriosa means 'full of glory' and superb means 'superb', alluding to the striking red and yellow flowers [4]. Quite a lot of parts of *G. superba* have wide variety of uses especially in traditional system of medicine. The roots and leaves used as an antidote for snake bite, as a laxative, and to induce abortion. It has proven useful in the treatment of chronic ulcers, arthritis, cholera, colic, kidney problems and typhus [5]. The flower has analgesic, anti- inflammatory, antimicrobial, larvicidal, antipoxviral, antithrombotic, antitumor properties and also used for the treatment of snake bite, skin disease and respiratory disorders [6-8]. The tuber is used for the treatment of bruises and sprains, colic, chronic ulcers, haemorrhoids, cancer, impotence, nocturnal seminal emission, and leprosy [9]. Root paste is effective against paralysis, rheumatism, snake bite and insect bites [10]. Because of the highly medicinal properties, the demand of this plant is increasing day by day. Although certain pharmacological studies have been carried out on this plant, to the best of our knowledge, there is no report on phytochemical and GC-MS analysis of *G. superba* flowers. In this present work we have report the preliminary phytochemical and GC-MS studies on traditional medicinal plant *G. superba* flowers.

2. Experimental

2.1 Collection of Plant Materials

The flowers of *G. superba* (Fig. 1) was collected in field of Alwarkurichi area, Tirunelveli District, TN, India during the month of December 2012.

Fig. 1 Flower of *Gloriosa superba*

2.2 Extraction of Flower of G. superba

The flowers of *G. superba* were cut into small species and were exhaustively extracted with different solvents *viz* petether, benzene, chloroform and methanol under reflux condition for about six hours. The extract was filtered and the solvent was removed *in vacuo* to get crude extract. Then this pasty mass was washed with hexane to remove chlorophylls. After the removal of chlorophylls, the resulting pasty mass was subjected to preliminary phytochemical analysis.

2.3 Investigation of the Extracts

The crude extracts were viscous greenish pasty mass and was soluble in chloroform, acetone and ethanol. It was found to be heterogeneous on TLC, and the following color reactions were carried out in order to find out the nature of compounds present in the crude extracts.

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2.4 Phytochemical Analysis

Phytochemical screening were performed to assess the qualitative chemical composition of different samples of crude extracts using commonly employed precipitation and coloration reactions to identify the major secondary metabolites like alkaloids, flavonoids, glycosides, proteins, phenolic compounds, saponins, starch, steroids, tannins and terpenoids. The phytochemical analyses were carried out using standard procedures [11].

2.5 GC-MS Analysis

GC-MS analysis was carried out on a Perkin Elmer Turbo Mass Spectrophotometer (Norwalk, CTO6859, and USA) which includes a Perkin Elmer Auto sampler XLGC. The column used was Perkin Elmer Elite - 5 capillary column measuring 30 m × 0.25 mm with a film thickness of 0.25 mm composed of 95% dimethyl polysiloxane. The carrier gas used was helium at a flow rate of 0.5 mL/min. The 1µL sample injection volume was utilized. The inlet temperature was maintained as 250 °C. The oven temperature was programmed initially at 110 °C for 4 min, then an increase to 240 °C. And then programmed to increase to 280 °C at a rate of 20 °C ending with a 5 min. Total run time was 90 min. The MS transfer line was maintained at a temperature of 200 °C. The source temperature was maintained at 180 °C. GCMS was analyzed using electron impact ionization at 70 eV and data was evaluated using total ion count (TIC) for compound identification and quantification. The spectrums of the components were compared with the database of spectrum of known components stored in the GC-MS library. Measurement of peak areas and data processing were carried out by Turbo-Mass-OCPTVS-Demo SPL software. Compound identification was obtained by comparing the retention times with those of authentic compounds and the spectral data obtained from library data of the corresponding compounds.

3. Results and Discussion

3.1 Phytochemical Analysis

The study was designed to evaluate the phytochemicals and GC-MS analysis of the crude extracts of *G. superba* flower. The preliminary tests and the TLC analysis of the methanol extract of *G. superba* flowers show the presence of interesting phytochemicals. The results of primary phytochemical analysis of *G. superba* flower are presented in Table 1. Steroids and alkaloids are present only in methanol extract, whereas the phenolic compounds, terpenoids and reducing sugars are present in almost all the extracts; and the flavonoids are present in methanol and chloroform extracts. Henceforth, the methanol extract was subjected to GC-MS analysis.

Table 1 Primary phytochemical analysis of *G. superba* flowers

S.No.	Compound	Petether extract	Benzene extract	Chloroform extract	Methanol extract
1	Steorids	-	-	-	+
2	Triterpenoids	+	+	+	+
3	Reducing sugar	+	+	+	+
4	Alkaloids	-	-	-	+
5	Phenolic compounds	+	+	+	+
6	Saponin	-	-	-	-
7	Xanthoproteins	-	-	-	-
8	Tannins	-	+	-	+
9	Flavonoids	-	+	-	+
10	Aromatic acids	-	-	-	-

Note: + = present, - = absent

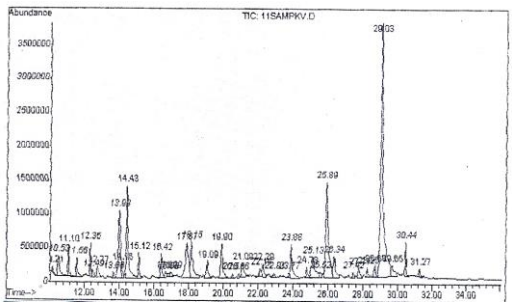

Fig. 2 GC-MS spectra of methanol extract of *G. superba*

3.2 GC-MS Analysis

The compound present in the methanol extract of *G. superba* were identified by GC-MS analysis presented in Fig. 2-4. From the retention time and peak area we have recognized more than ten compounds are present in the methanol extract of *G. superba* flower, however two major compounds identified was Colchicine and Liriodenine. Identification of these compounds were done by comparing the retention time of the library standard obtained NIST.

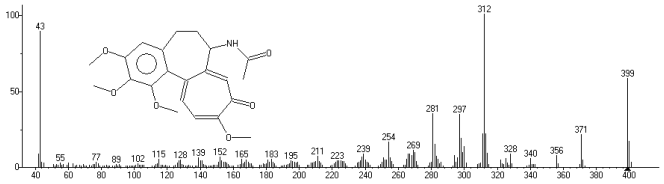

Fig. 3 GC-MS spectra of Colchicine

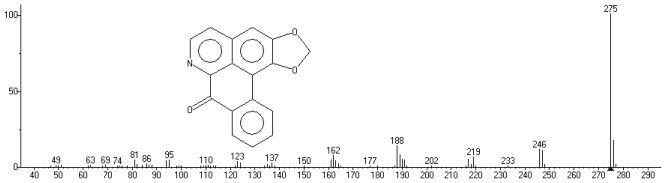

Fig. 4 GC-MS spectra of Liriodenine

4. Conclusion

The phytochemical analysis revealed the presence of different types of phytoconstituents. The results obtained from the present study clearly stated that the presence of steroids, triterpenoids, reducing sugar, alkaloids, phenolic compound, tannin and flavonoids in flower of *G. superba*. The GC-MS analysis of *G. superba* indicated the presence of two major compounds viz., Colchicine and Liriodenine. Identification of Colchicine and Liriodenine were done by comparing the retention time of the library standard obtained NIST. Colchicine has the high market value and consistent demand in the field of medicine. Considering its significance this study will help in cultivation of *G. superba* for commercial extraction of colchicine.

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