Journal of Experimental Sciences Vol. 2, Issue 6, Pages 04-06 [2011]

JES Physical Sciences

Regular Article

Morphological, micro and macro nutrient analysis of the medicinal plant glory lily (*Gloriosa superba* L.)

S. Ravi[1*], S. Ashokkumar, K. Mallika[1], P. Kabilar, P. Paneerselvam[1], M. Gayathri[2]

[1]Engineering Physics Section, Faculty of Engg. & Tech., Annamalai University, Annamalai Nagar, Tamil Nadu, India – 608 002; [2]Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India – 608 002

Abstract

In this study the three different treated tuber and seed samples of Glory lily were collected from farmer field's of Udayarpalayam and analyzed for the possible presence of colchicines using SEM technique. The results of SEM have shown that the presence of elements Ca and Fe are found only in Organic Manure Treatment. Also the quantitative estimation of EDX spectra observation confirms the percentage of Zn in Organic Manure Treatment (T3) was the highest among all the treatments. In conclusion from the results, Glory Lily may be considered as colchicines sources for the chemical constituents of medicine industry. Further it would be useful of producing high amount of colchicines for pest control based on natural products.

Keywords: Colchicine, Scanning Electron Microscope(SEM), Electron X-Ray Spectra(EDX), Gloriosa superba, Organic Manure Treatment (T_3)

Introduction

Gloriosa superba L. (Glory Lily, Liliaceae) is an endangered, herbaceous, perennial climbing medicinal plant found throughout India. Colchicine is the major compound isolated from the seed and rhizome of this plant [1]. It has abortifacient anti-leprotic properties [2]. *Gloriosa superba* L. a member of the Liliaceae family is a very important medicinal plant due to the presence of alkaloids, mainly colchicines and colchicoside. Poor seed germination, susceptibility towards many pests, and excessive collection in habitats for medicinal purposes have pushed this taxon to endanger [3]. The seeds of this taxon are highly prices in the world market as they are the main source of colchicines and colchicoside [4] of colchicines.

A world wide search for an alternative plant source is being carried out but no suitable raw material has yet found. Among the Indian plants the corns of Colchicun luteum and the seeds of Iphigenia Stellata containing 0.25% and 0.9% of Colchicines respectively [5] are not available insufficient quantities to warrant any commercial utilization. On the other hand the ripe seeds of the plant gave a yield of 0.81% of total alkaloid and 0.60 % of colchicines. The tubers of the plants from which the seeds were obtained, on similar analysis yielded 0.57% of total alkaloids and only 0.05% of Colchicines. Hence the present investigation has been taken up for the possible correlation between different manure treatments and the status.

Materials and Methods

The three different treated samples of tuber and seed [Control (T_1), Chemical Fertilizer (T_2), and Organic Manure (T_3)] of Gloriosa superba were collected from Jothy Herbals, Jeyamkondam, Perambalur district, TamilNadu, India.

The samples were oven dried at 60°C for 1 hour. Then the tubers and seeds were powdered well using an agate mortar. The powdered samples of tuber and seed of Glory Lily were examined using Scanning Electron Microscope (JSM-5160), CISL, Annamalai University] with an acceleration voltage of 20 kV. Before the observation, the samples were mounted on aluminium stumps and coated with gold in a sputtering device under vacuum. The presence of gold at the coated surface under study together with the accelerating voltage of the electron beam results in the production of excellent image of the material. Then the prepared samples are subjected to both the morphological analysis and elemental analysis for the estimating of nutrients through SEM with EDX instrument.

Results and Discussion

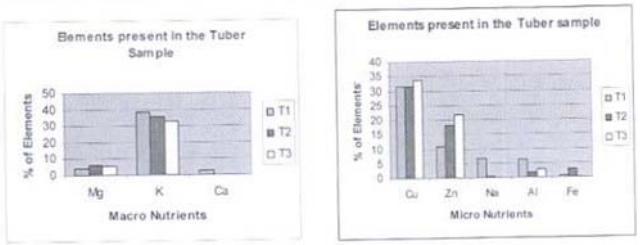
Table 1 shows the elements present in the tuber of Gloriosa superba under Control (T_1), Chemical Fertilizer (T_2), Organic Manure (T_3) treatments.

Table 1: Elements present in the tuber of Gloriosa superba under Control (T_1), Chemical Fertilizer (T_2), Organic Manure (T_3) treatments

Sl. No.	Type of Nutrients	Name of the Elements*	Elements present in (%) in 1mg of tuber sample		
			T_1	T_2	T_3
1.		Mg	3.77	6.17	5.28
2.	Macro Nutrients	K	38.37	35.93	33.16
3.		Ca	2.47	-	-
4.		Cu	31.54	31.41	33.81
5.		Zn	10.85	18.26	21.88
6.	Micro Nutrients	Na	6.79	0.42	-
7.		Al	6.22	1.76	2.9
8.		Fe	0.84	2.97	-

Fig 1 shows the Macro and Micro elements present in the tuber of Glory Lily under Control (T_1), Chemical Fertilizer (T2), Organic Manure (T3) reatments.

Fig 1: The (a)Macro and (b) Micro elements present in the tuber of Glory Lily under Control (T_1), Chemical Fertilizer (T_2), Organic Manure (T_3) treatments



** Corresponding Author*

ISSN: 2218-1768

In tuber the elements K, Cu, Zn, Al and Mg are commonly present in all the three treatments. Concentration of K, Cu, and Zn were found to be much higher in the three treatments. Among the treatments, T_2 showed less Al contents than T_3 and T_1. T_1 showed highest concentration of K followed by T_2 and T_3. Even though potassium is not a constituent of important Organic compound in the cells, it is essential for the process of respiration and photosynthesis. T_3 showed highest concentration of Cu and Zn followed by T_2 and *Tl.* Among the three treatments, T_3 shows the highest amount of Cu and Zn than T_2 and T_1. Cu found in roots. It is necessary for nitrogen metabolism. It is bound tightly on Organic matter. Zn is involved in the functional part of enzymes including carbohydrate metabolism, auxin (growth hormones), protein synthesis and stem grow Zinc deficiency may leads to iron deficiency. [6]

Table 2 shows the elements present in the seed of Gloriosa superba under Control (T_1), Chemical Fertilizer (T_2), Organic Manure (T_3) treatments.

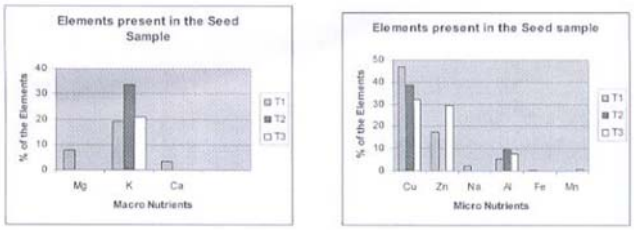
Table 2: Elements present in the seed of Gloriosa superba under Control (T|), Chemical Fertilizer (T_2), Organic Manure (T_3) treatments

Sl. No.	Type of Nutrients	Name of the Elements*	Elements present in (%) in 1mg of Seed sample		
			T_1	T_2	T_3
1.		Mg	7.87	0.11	-
2.	Macro Nutrients	K	19.2	33.76	20.95
3.		Ca	3.42	-	-
4.		Cu	46.71	38.62	32.15
5.		Zn	17.36	-	29.54
6.	Micro Nutrients	Na	2.51	-	-
7.		Al	5.44	9.78	7.58
8.		Fe	0.31	-	-
9.		Mn	-	-	0.90

* K MAD- 10 Feldspar 1 Jun-1999 12:00 AM, Ca- Wollastonite 1-Jun-1999 12:00 AM, Mg Mgo 1-Jun-1999 12:00 AM, Cu Cu l-Jun-1999 12:00 AM, Zn Zn l-Jun-1999 12:00 AM, Na Albite 1-Jun-I999 12:00 AM, Al- AI2 03 l-Jun-1999 12:00 AM.

Fig.2 show that the Macro and Micro elements present in the seed of Gloriosa superba under Control (T_1), Chemical Fertilizer (T_2), Organic Manure (T_3) treatments.

Fig 2: The (a) Macro and (b) Micro elements present in the seed of Gloriosa superba under Control (T_1), Chemical Fertilizer (T_2), Organic Manure (T_3) treatments



In Seed the elements Cu, K and Al are commonly present in all the three treatments. The concentration of Cu and K were found to be much higher in the three treatments. Among the treatments T_1 showed highest concentration of Cu followed by T_2 and T_3. T_2 showed highest concentration of Al followed by T_1 and T_3. T_3 showed highest concentration of Zn followed by T_1 and T_2.

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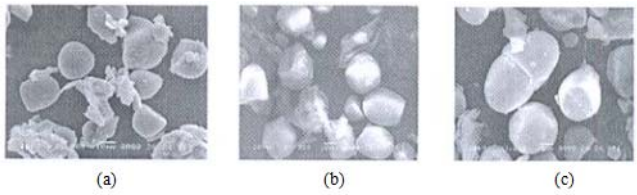
Morphological studies

Fig 3 shows the morphological structure of tubers of Glory Lily under Control, Chemical Fertilizer and Organic Manure Treatment

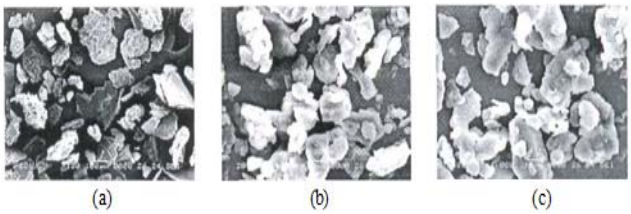
Fig 3 : Morphological structure of tubers of Glory Lily photographed at 20 kV under 1K magnification under (a) Control, (b) Chemical Fertilizer and (c) Organic Manure Treatment



SEM revealed significant variations in shape and size of tuber of Glory Lily *(Gloriosa superba).* The hemi-sphere shaped small-sized granules were more in numbers. The tuber showed the presence of fissures on the surface.

Fig 4 shows the morphological structure of tubers of Glory Lily under Control, Chemical Fertilizer and Organic Manure Treatment.

Fig 4: Morphological structure of tubers of Glory Lily photographed at 20 kV under IK magnification under (a) Control, (b) Chemical Fertilizer and (c) Organic Manure Treatment



SEM showed that Glory Lily seed granules were predominantly irregular or cuboidal and polygonal with visible thickness and varying granule size. Fissures on the surface of Glory Lily seed has been speculated clearly more than tubers.

In conclusion, from the SEM-EDX studies of three different samples, T_3 exhibited increase to Colchicine alkaloid than T_2 and T_1 treated samples. Organic Manure Treated (T3) Glory lily having high colchicines content may be considered as colchicines sources for the Chemical constituents of medicine industry. Further it would be useful of producing high amount of colchicines for pest control based on natural products.

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