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GC-MS Studies of *Crinum defixum Ker-Gawler* Leaves

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A B S T R A C T

The present study was carried out to identify the phytochemical present in the *Crinum defixum* Ker-Gawler leaves. It is an important medicinal plant worldwide trends towards the utilization of natural plant remedies has created an enormous need for the use of medicinal plants. The plant was extracted using n-hexane, chloroform, ethyl acetate, acetone, ethanol, butanol and methanol. The present studies to determine the preliminary phytochemical screening, separation and identification of compounds present in the n-hexane extract of *Crinum defixum* Ker-Gawler plant. The extracts were subjected to GC-MS Analysis and also confirmed by spectral analysis.

Keywords: *Crinum defixum* Ker-Gawler, Phytochemical screening, GC-MS, Spectral analysis.

A R T I C L E I N F O

CONTENTS

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1. Introduction

Medicinal plants are important role in human health; they produce a definite physiological action to the human body. Phytochemicals are bioactive chemicals of plant origin. These bioactive constituents are called secondary metabolites such as alkaloids, tannins, flavonoids, glycosides, carbohydrates and phenolic compounds. They are naturally synthesised in all parts of the plant body; bark, leaves, stem, root, flower, fruit, seeds etc. i.e., the whole plant contains active components[1].The plant extracts and bioactive compound which isolated from medicinal plants are used for antibacterial, antifungal and antiviral therapy[2]. The presence of phytochemicals in the plant

parts may differ from one part to another. The plant derivative drugs have been in practice for a very long time [3]. The plant derivative drugs may be of inhibit to the pharmaceutical industry, researchers and folkhealers in the natural areas [4].The biologically active compounds present in plant material are separated from various suitable solvents are used in the extraction procedure [5]. Therefore the aim is ethno-medical use and subsequently the isolation and characterization of compound which will be added to the potential list of drugs.

Crinum defixum Ker-Gawler (Amaryllidaceae) has abundantly growing on rivers, canals in dry and wet conditions. The *Crinum defixum* have commercial, economical and medicinal importance. The *Crinum defixum* Ker-Gawler is one of the *Crinum* genus [6]. It is commonly known as Bon-naharu (Meaning wild garlic) this plant having number of medicinal activities. The leave extracts are used to treat pimples, itching, body-ache, leprosy, paronychia and otitis. The crushed bulbs are used to treating nauseant, emetic, emollient, diaphoretic, burns, whitlow and carbuncle [7].

The bulbs of this plant is fusiform, flowers are sessile, fragment at night and tinged with red [8]. The *Crinum defixum*is reported to contain the active constituents such as caranine, crinamine, crinine, galanthamine, galanthine, haemanthamine and hippestrine. In recent years the new alkaloid 5 α-hydroxyhomolycorine has also been reported [9]. The ethanol and methanol extracts of the *Crinum defixum* Ker-Gawler have been reported to free radical scavenging activity, antianalgesic activity antigenotoxic properties [10]. The main focus of this study was variety of chemical constituents present in the plant *Crinum defixum* Ker-Gawler leaves was determined by GC-MS studies.

2. Materials and Methods

Collection of plant materials

The leaves of *Crinum defixum* Ker - Gawler was collected from Poondi village, Thanjavur District, Tamilnadu. The botanical identity of the plant of was confirmed by Dr. S. John Britto, Rapinat Herbarium, St. Joseph's College, Tiruchirappalli.

Preparation of Extracts

The fine powder (5 kg) was extracted with 95% ethanol at room temperature for ten days. The extract were filtered and concentrated under reduced pressure in a rotary evaporator and extracted n-hexane solvent after that the extract was taken in a beaker and kept in a water bath and heated at 30-40 ºC till all the solvent got evaporated. The dried extract was subjected to preliminary phytochemicals and GC- MS studies. The n-hexane extract was tested for the presence bioactive compounds by using standard methods.

Phytochemical screening

The preliminary phytochemical analysis of *Crinum defixum* Ker-Gawler plant leaves revealed the following phytochemicals (Table.1).

GC-MS Analysis

Identification of phyto compounds

Interpretation on Mass-Spectrum GC-MS was conducted using the database of National Institute Standard and Technology (NIST) having more 62,000 patterns. The spectrum of the unknown components was compared with the spectrum of known components stored in the NIST library. The name, molecular weight and structure of the components of the test materials were ascertained. In the present study ten chemical constituents have been identified from hexane extract of the *Crinum defixum* Ker-Gawler leaves by GC-MS analysis (Table.2).

3. Results and Discussion

The present study is carried out for phytochemical screening of *Crinum defixum* Ker-Gawler leaves. Alkaloids, flavonoids, terpenoids, saponins, amino acids and phenolic compounds are qualitatively analysed and the results are listed in table -1. GC-MS studies were reported that the n-hexane extract of the *Crinum defixum* Ker-Gawler leaves. Many phytocomponents are appearance in the plant. The presences of phytocomponents are listed in the table -2.

1. The peak at RT 15.07 with a peak area of 74% is tridecanoic acid, 12-methyl-, methyl ester. This compound is a Fatty acid methyl ester with molecular formula of $C_{15}H_{30}O_2$ and molecular weight of 242.3975. Tridecanoic acid, 12-methyl-methyl ester is found to show Antifungal, Antibacterial activities.
2. Responding the peak at RT 16.03 and peak area 49.9 % is tetradecanoic acid, 12-methyl-, methyl ester. This compound is a Fatty acid methyl ester with a molecular formula and molecular weight of this compound is $C_{19}H_{26}O_2$ and 256.4241 respectively. This Fatty acid methyl ester has an Antifungal, Antibacterial activities.
3. Pentadecanoic acid, 14-methyl-, methyl ester is found to be responsible for the peak at RT 17.22 with a peak area of 100 %. This Palmitic acid methyl ester has the molecular formula of $C_{17}H_{34}O_2$ and molecular weight is 270.4507.This compound has a biological activity like Antioxidant, Antifungal, Antimicrobial activities.
4. The Estra-1,3,5(10)-trien-17a'-ol is found to be responsible for the peak at RT 17.97 with a peak area of 55.7 %. This compound is a Steroid with a molecular formula of $C_{19}H_{26}O_2$ and molecular weight is 286.4085. This compound is found to show medicinal activity like Androgenic alopecia (hair loss).
5. 10-Octadecenoic acid, methyl ester is found to be the cause of the peak at RT 18.93 with a peak area of 100 %. This compound is a Fatty acid ester has the molecular formula of $C_{19}H_{36}O_2$ and molecular weight is 296.4879. This compound shows Antioxidant, Antimicrobial activities.
6. The peak at RT 19.18 with a peak area of 84.3% is Hepta decanoic acid, 16-methyl-, methyl ester. This compound is a Stearic acid with molecular formula of $C_{19}H_{38}O_2$ and molecular weight of 298.5038. Heptadecanoic acid, 16-methyl-, methyl ester is used against skin cancer protein.

7. Responding the peak at RT 19.92 and and peak area 33.1% is Octadec-9-enoic acid. This compound is a Oleic acid with a molecular formula and molecular weight of this compound is $C_{18}H_{34}O_2$ and 282.46136 respectively. This compound is known to be antimicrobial, anti-oxidant, Cancer preventive, Anemiagenic, Antiandrogenic, activities.
8. 11-Eicosenoic acid, methyl ester is found to be responsible for the peak at RT 20.72 with a peak area of 65.9 %. This Fatty acid methyl ester has the molecular formula of $C_{21}H_{40}O_2$ and molecular weight is 324.5411.This compound has a biological activity like Antioxidant, Pesticide, Nematicide.
9. The Eicosanoic acid, methyl ester is found to be responsible for the peak at RT 20.93 with a peak area of 74 %. This compound is an Arachidic acid with a molecular formula of $C_{21}H_{42}O_2$ and molecular weight is 326.5570.This compound is known to be Alpha-glucosidase inhibitors.
10. Docosanoic acid, methyl ester is found to be the cause of the peak at RT 23 with a peak area of 57 %. This compound is a fatty acid has the molecular formula of $C_{23}H_{46}O_2$ and molecular weight is 354.6101.This compound shows Therapeutic, Diagnostic activities.

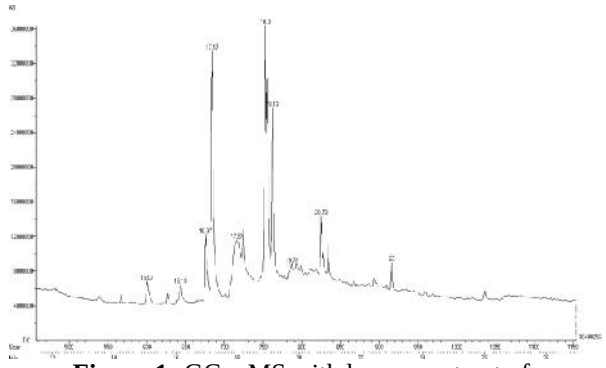

Figure 1: GC – MS with hexane extract of *Crinum defixum* Ker – Gawler leaves.

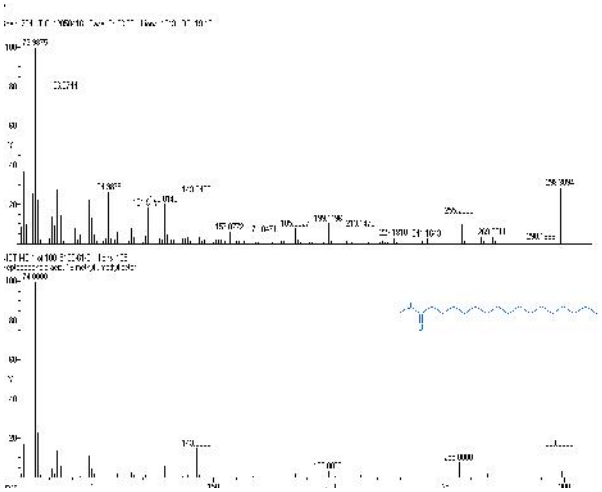

Figure 2: Mass spectrum of Heptadecanoic acid, 16-methyl- methyl ester.

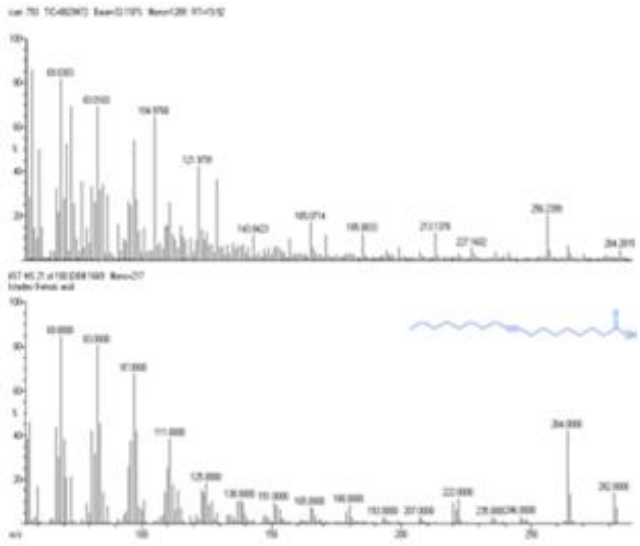

Figure 3: Mass spectrum of Octadec-9-enoic acid

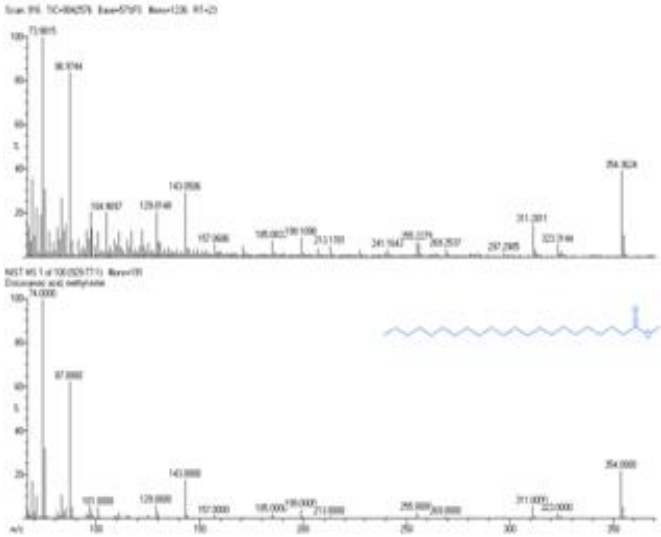

Figure 4: Mass spectrum of Docosanoic acid, methyl ester

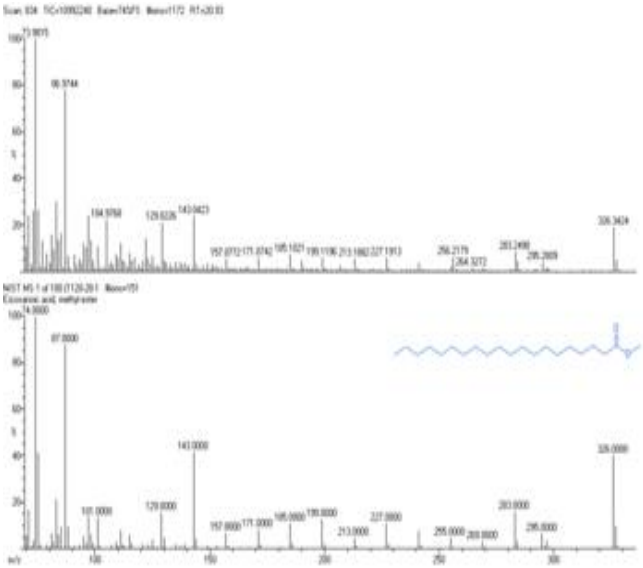

Figure 5: Mass spectrum of Eicosanoic acid, methyl ester

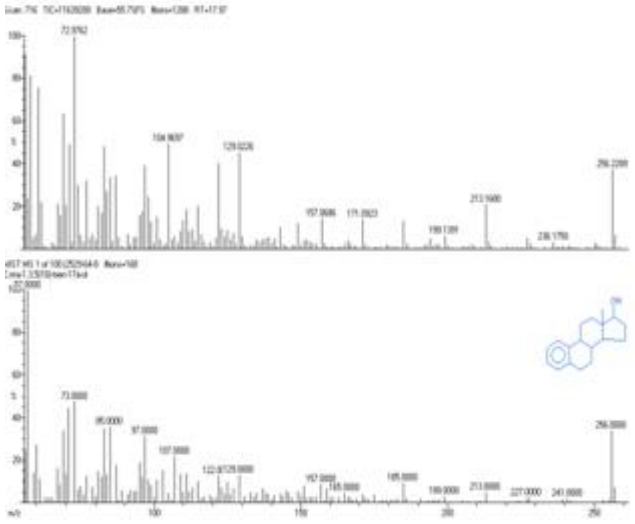

Figure 6: Mass spectrum of Estra- 1,3,5(10)-tien-17a-ol

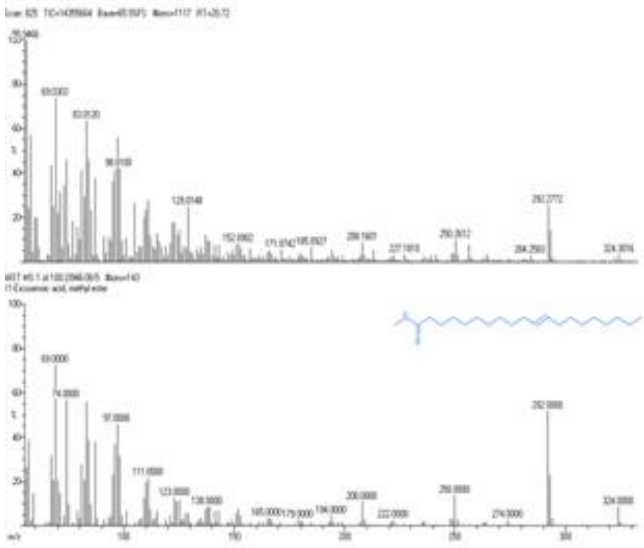

Figure 7: Mass spectrum of 11-Eicosenoic acid, methyl ester

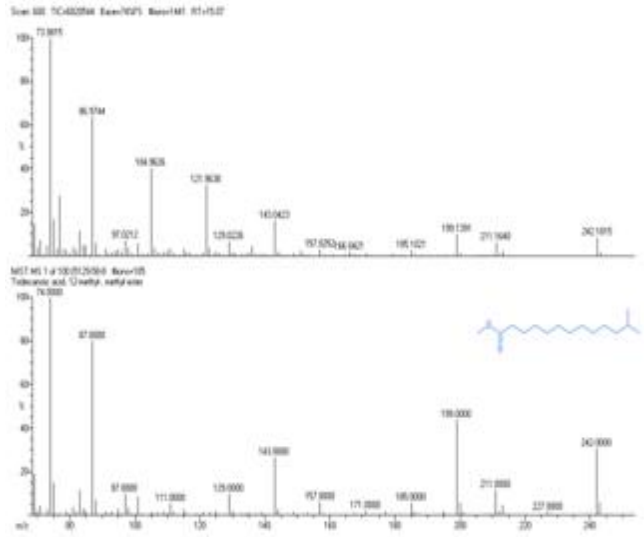

Figure 8: Mass spectrum of Tridecanoic acid, 12-methyl- , methyl ester

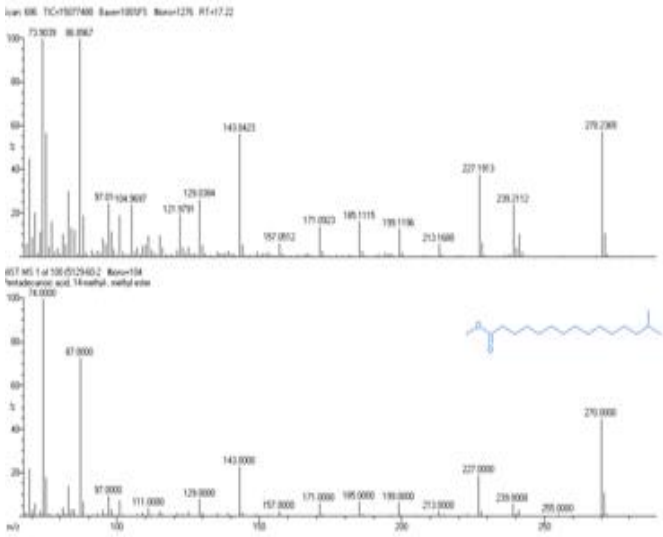

Figure 9: Mass spectrum of Pentadecanoic acid, 14-methyl-methyl ester

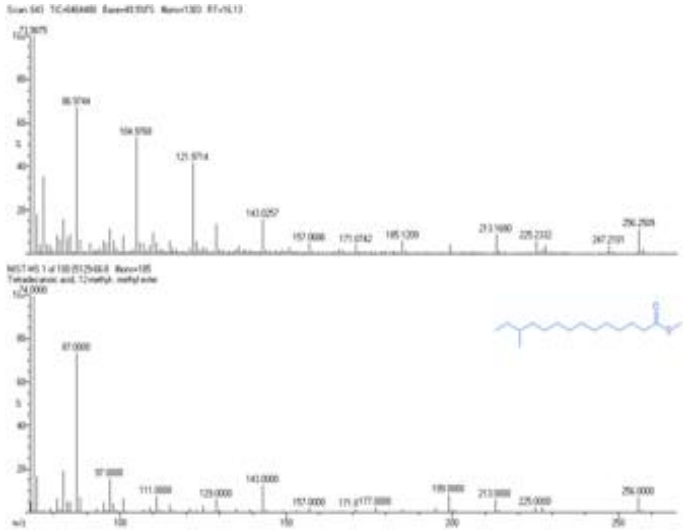

Figure 10: Mass spectrum of Tetradecanoic acid,14-methyl-methyl ester

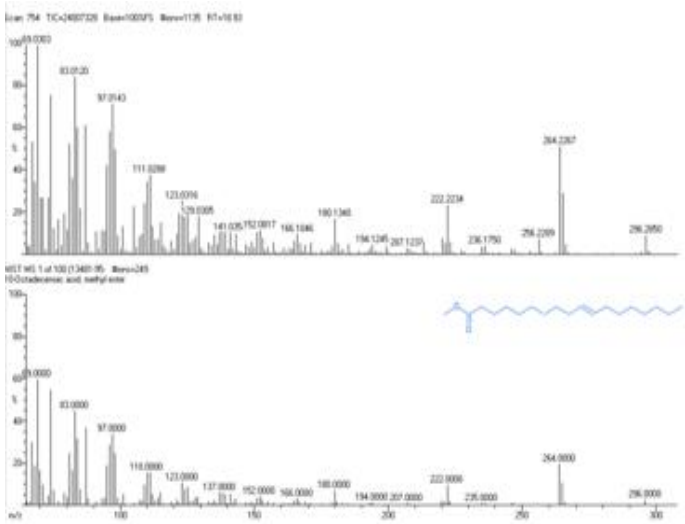

Figure 11: Mass spectrum of 10-Octadecenoic acid, methyl ester

Table 1: Preliminary phytochemical constituents of *Crinum defixum Ker* – Gawler leaves.

S.No	Phytochemicals	Hexane Extract	Chloroform Extract	Ethyl acetate Extract	Acetone Extract	Ethanol Extract	Butanol Extract	Methanol Extract
1.	Alkaloids	-	Present	Present	Present	Present	-	-
2.	Flavonoids	Present	Present	Present	Present	Present	Present	Present
3.	Terpenoids	Present	Present	Present	-	-	-	-
4.	Glycosides	-	-	-	-	-	-	-
5.	Saponins	-	Present	Present	Present	Present	-	-
6.	Steroids	-	-	-	-	-	-	-
7.	Carbohydrates	-	-	-	-	-	-	-
8.	Phenolic compounds	Present	Present	Present	Present	Present	Present	-
9.	Tannins	-	-	-	-	-	-	-
10.	Amino acids	Present	-	-	Present	Present	Present	Present

Table 2: Phytochemical components identified for Sample *Crinum defixum* Ker - Gawler (GC-MS Study)

S.N	RT	Name of the compound	Molecular Formula	Molecular Weight	Peak Area	Compound Nature	Activity
1.	15.07	Tridecanoic acid, 12-methyl-, methyl ester	$C_{15}H_{30}O_2$	242.3975	74	Fatty acid methyl ester	Antifungal, Antibacterial.
2.	16.03	Tetradecanoic acid,12-methyl-, methyl ester	$C_{16}H_{32}O_2$	256.4241	49.9	Fatty acid methyl ester	Not reported
3.	17.22	Pentadecanoic acid,14-methyl-, methyl ester	$C_{17}H_{34}O_2$	270.4507	100	Palmitic acid methyl ester	Antioxidant,Antifungal, Antimicrobial activities.
4.	17.97	Estra-1,3,5(10)-trien-17a'-ol	$C_{19}H_{26}O_2$	286.4085	55.7	Steroid	Androgenic alopecia (hair loss)
5.	18.93	10-Octadecenoic acid, methyl ester	$C_{19}H_{36}O_2$	296.4879	100	Fatty acid ester	Antioxidant, Antimicrobial.
6.	19.18	Heptadecanoic acid, 16-methyl-, methyl ester	$C_{19}H_{38}O_2$	298.5038	84.3	Stearic acid	Used against skin cancer protein
7.	19.92	Octadec-9-enoic acid	$C_{18}H_{34}O_2$	282.46136	33.1	Oleic acid	Antimicrobial, anti-oxidant, Cancer preventive, Anemiagenic, Antiandrogenic.
8.	20.72	11-Eicosenoic acid, methyl ester	$C_{21}H_{40}O_2$	324.5411	65.9	Fatty acid	Antioxidant, Pesticide, Nematicide.
9.	20.93	Eicosanoic acid, methyl ester	$C_{21}H_{42}O_2$	326.5570	74	Arachidic acid	Alpha-glucosidase inhibitors
10.	23	Docosanoic acid, methyl ester	$C_{23}H_{46}O_2$	354.6101	57	fatty acid	Therapeutic, Diagnostic.

4. Conclusion

The preliminary phytochemical analysis of *Crinum defixum* Ker-Gawler leaves contains many bioactive chemicals like alkaloids, flavonoids, saponins, terpenoids, amino acids and phenolic compounds. The GC- MS studies of *Crinum defixum* Ker-Gawler leaves clearly indicate that the major compounds are the Tridecanoic acid,12-methyl-, methyl ester, Tetradecanoic acid,12-methyl-, methyl ester, Pentadecanoic acid,14-methyl-, methyl ester, Estra-1,3,5(10)-trien-17a'-ol, 10-Octadecenoic acid, methyl ester, Heptadecanoic acid, 16-methyl-, methyl ester, Octadec-9-enoic acid, 11-Eicosenoic acid, methyl ester, Eicosanoic acid, methyl ester, Docosanoic acid, methyl ester which contribute the activities like Antioxidant, Antimicrobial, Cancer preventive, Anemiagenic, Antiandrogenic, Therapeutic, Diagnostic and Androgenic alopecia (hair loss) activities. Hence the plant *Crinum defixum* Ker-Gawler has a potential source of biologically important drug candidates.

5. Acknowledgement

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