GCMS STUDIES OF ABRUS PRECATORIUS

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Summary

Medicinal plants play a key role in human health care. About 80 percent of the world populations rely on the use of traditional medicines, which are predominantly based on plant materials. The traditional medicine refers to a broad range of ancient, natural health care practices including folk / tribal practices as well as Ayurveda, Siddha and Unani. These medicinal practices originated from time immemorial and developed gradually, to a large extent, by relying or based on practical experiences without significant references to modern scientific principals.

India is one of the mega biodiversity countries with the Western Ghats, which is extending in Maharashtra and the eastern Himalaya as the important global hotspots[1].The rich biodiversity of our country offers immense opportunity for revenue generation and economic well-being of the people. The plants offer great opportunities to the scientists for searching novel bioactive compounds, as the advantage is based on ethno botanical observations. Since many species are used in the system of traditional medicines mainly in developing countries [2-6].

Keywords: *Abrus precatorius*, ethnomedicinal uses, chemical composition**.**

Introduction

A number of plant species have been tested for fertility regulation beginning about 50 years ago and were subsequently fortified by national and international agencies [7-8].Plants have potential value as sources for new antifertility agents. Historically a number of plants have been used for preventing pregnancies in native medicine. Research on Indian plants with antifertility has been exhaustively reviewed by these scientists[9-11].

*Abrus precatorius Linn***.**

Crab's eye, Indian Liquorice, Jequirity

Title, vernacular names, flowering and fruiting, ecology-

Every plant has its particular name and this is known by different names in different languages. This includes the vernacular name of the drugs.

Title- *Abrus precatorius Linn***.**

Vernacular names-

Sans. - Gunja, **Beng.** - Chun-hali / Kunch, **Guj.**-Chanothi / Gunja , **Hindi**-Ganchi / Gunchi / Rati , **Kan**.- Ganji / Gul-ganju / Guluganji / Madhuka , **Mal**.-Kunni / kunnikuru, **Mar**.- Chanoti / Gunchi / Gunja, **Tam.**- Gundu-mani / Kuntumani, **Tel.-** Guruginia / Guruvenda, **Oriya**- Gunja/ Runji , **Assam**- Liluwani/ Raturmani, **Punjab-** Labrigunchi / Ratak.

Flowering and fruiting-

July - February.

Ecology-

Frequent on the hilly tracts in dense forests.

Classification-

Kingdom – Plantae

Subkingdom – Tracheobionta

Division – Magnoliophyta

Class – Magnoliopsida

Subclass – Rosidae

Order – Fabales

Family – Fabaceae

Subfamily - Faboideae

Genus – Abrus

Species – *Abrus precatorius*

Plant identification characters-

1. A creeping or climbing woody vine with pinnately compound leaves.

2. Twisting shrubs, with 10-20 pairs of oblong leaflets, looking like a delicate feather.

3. Pink or white flowers having 9 stamens. The rose to purple flower is crowded at the end of a stalk. The flowers are in axillary racemes and are red to purple in color.

4. Fruits are short. The fruit is a legume pod, 2 inches (4 cm) long, and produces ovoid seeds that are glossy red with a jet black eye. Some varieties have seeds that are black with a white eye or are white with a black eye.

5. Pods 3 to 5 seeded, inflated pods, splitting open when mature to reveal the round, hard and shiny seeds which are scarlet but black at the base.

6. Precatory bean is a twining, perennial vine, 10 to 20 feet (3 to 6 meters) long, using other plants for support. Lower, older portions of the stem become gray; the younger portions remain green.

Parts Poisonous-

Seeds are considered fatal when consumed in large quantities. The seeds are very poisonous for men and livestock causing death.

Symptoms- Nausea, vomiting, diarrhoea and shock.

Specific Treatment - Fluid imbalance should be corrected.

Drug collection-

The plants were collected in flowering stages.

Authentication-

The plants included in the research work authenticated from Botanical survey of India, Pune.

Ethnomedicinal uses-

1. Roots and seeds are used for preparing tonic. Leaf extract is applied on ringworm and also taken orally against snake-bite.

2. Leaves are chewed orally for 2-3 days for early cure of white blinch and red circled blinch.

3. Twig of root is used as tooth-brush in toothache.

4. During field studies it was informed by the tribals that seeds of this plant are used as an antifertility drug both male as well as female. Seed powder is also taken orally in urinary complaints.

5. The seeds of *Abrus precatorius* are purgative, emetic, tonic, antiphylogistic, aphrodisiac and used in nervous disorders; paste as local application in stiffness of shoulder joints, sciatica and paralysis.

6. The fresh leaves are sweet and chewed for treatment of mouth ulcers and throat sore.

7. Pulp of the seeds is given with milk in sexual disability and increase sexual power.

8. Leaf paste is mixed with starch of rice and given orally to cure anthrax.

9. Leaves are grinded with milk of goat and given orally in insect bite.

10. Fresh leaf extract along with boiled water is given orally in retained placenta.

11. Fresh leaves are used as an ingredient in cough mixtures. 2 or 3 teaspoonful leaves juice is taken in the morning and evening for 3 days in cough.

12. The seeds powder along with seeds powder of *Indigofera Cordifolia* or stem powder of *Tinospora Cordifolia* used as an antifertility drug both in male and female.

13. Powder of leaves is used for convulsion and conjunctivitis in children.

14. The criminal tribes viz. Baghri, Kanjan, Sansi etc. use orally seed powder in small quantity as an abortifacient and also apply the paste of seeds on painful swellings. One seed is given by people orally to cure urine obstruction.

15. Taken internally by women, the seed disturbs the uterine functions and prevents conception.

16. The powdered seeds are taken as snuff in cases of violent headache arising from cold [12]**.**

17. The seed causes vomiting, purging, but gives 'muscular strength'. Cure for edema. The leaves and root is a cure for poisoning, bile, eye diseases, produce phlegm and appetite, cure for bile.

18. Roots-Aphrodisiac, tonic, fever, stomachic, head complaints, asthma, thirst, tuberculosis glands, caries of teeth, and rheumatism. Root substitute for *glycyrrhiza*.

19. The leaves are sweet and there is possibility that the constituent may be used as a sweetener.

20. 4-8 seeds were taken orally with water during menstruation to prevent conception for even by the ladies. 2-5 seeds are given to the buffaloes and cows before pregnancy.

As seeds are bright red in colour, they are used as beeds in the necklaces and ear rings. Seeds also find relevant place in songs and proverbs,

"Dekh Charmoi ra roopala veeg, Mangta Jaan gavave."

Which means greedy person pays off his life in the greel of Charmoi (*Abrus Precatorius*) seeds.

Seeds are cytotoxic and anthelmintic, root is antiestrogenic, aerial part of this plant stimulates the cardiovascular system, seeds and root are abortifacient ,anodyne, aphrodisiac, antimicrobial, diuretic, emetic, expectorant, febrifuge, hemostat, laxative, purgative, refrigent, sedative, vermifuge, antifertility activity [13] and antitumor activity.

Chemical composition (amino acids per 16g nitrogen)

Histidine = 3.29gm and Proline = 8.6gm

Constituents-

1. 8% acrid resin;

2. Toxic protein abrine;

3. 1.5% of a substance resembling glycyrrhizin.

Abrin is a toxic protein obtained from the seeds of *Abrus precatorius* (jequirity bean), which is similar in structure and properties to ricin. Abrin is highly toxic, with an estimated human fatal dose of 0.1–1 microgram / kg, and has caused death after accidental and intentional poisoning. Abrin can be extracted from jequirity beans using a relatively simple and cheap procedure. This satisfies one criterion of a potential chemical warfare agent, although the lack of large scale production of jequirity seeds means that quantity is unavailable for ready mass production of abrin for weapons. This contrasts with the huge cultivation of *Ricinus* seeds for castor oil production.

At the cellular level, abrin inhibits protein synthesis, thereby causing cell death. Many of the features observed in abrin poisoning can be explained by abrin-induced endothelial cell damage, which causes an increase in capillary permeability with consequent fluid and protein leakage and tissue oedema (the so-called vascular leak syndrome). Most reported cases of human poisoning involve the ingestion of jequirity beans, which predominantly cause gastrointestinal toxicity. Management is symptomatic and supportive. Experimental studies have shown that vaccination with abrin toxoid may offer some protection against a subsequent abrin challenge, although such an approach is unlikely to be of benefit in a civilian population that in all probability would be unprotected.

Methods

Gas Chromatography Mass Spectrometry Analysis-

Gas Chromatography electron ionization mass spectrometry (GC-MS) was performed on Shimadzu QP 2010 system.GC parameters were as follows: initial temperature was set at 50ºC, temperature ramp was 15ºC/Min to 250ºC (25 min hold) inlet was split (1:40 ml / min).Separation was carried out using R_{xi}^{TM}-5 $_{ms}$ capillary column (30 meter, 0.25mm ID, 0.25µm df) with helium as a carrier gas. Spectra were obtained over m/z 100-800. Oil extract was injected. System Control and data evaluation was done on the Lab solutions software package.

Esterification of oil extract is done with the help of methanol and potassium hydroxide for the GCMS analysis.

Result and Discussions

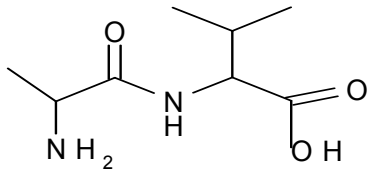
Abrus precatorius

In the GCMS of oil extract of *Abrus precatorius*, we got 22 peaks.

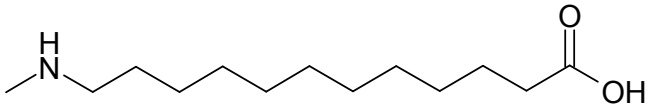
In the chromatogram of this we got different type of structures on different peaks, some of the structures are shown below in different categories.

Amino acid or derivatives of amino acids-

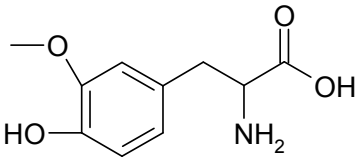
On mass peak 16, the compound **dl-Alanyl-dl-Valine** ($C_8H_{16}N_2O_3$) is present.



Another amino acid derivative **12-Methylaminolauric acid** ($C_{13}H_{27}NO_2$) is present.

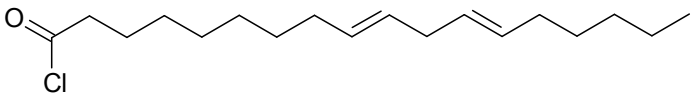


On mass peak 12, the compound **3-Methoxytyrosine** ($C_{10}H_{13}NO_4$) is present.



Fatty acid derivative-

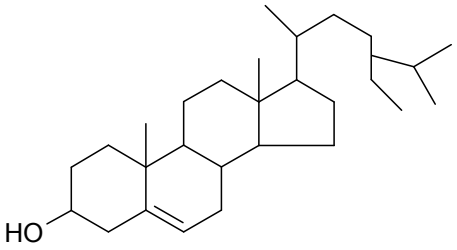
Than fatty acid derivative is also present on mass peak 58, the compound name is **9**, **12-Octadecadienoyl chloride** (Z, Z).



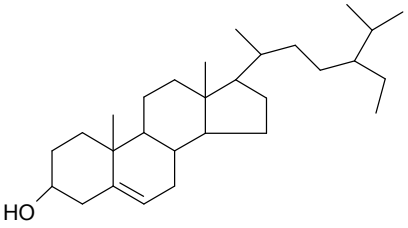
Steroids-

On mass peak 71, all the steroids are present.

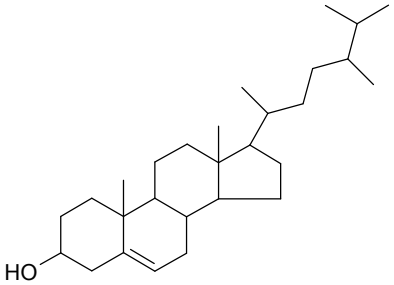
Compound name-**gamma-Sitosterol** ($C_{29}H_{50}O$)-



Compound name-**beta-Sitosterol** ($C_{29}H_{50}O$)-

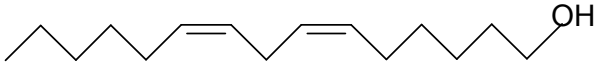


Compound name-**Ergost-5-en-3-ol** ($C_{28}H_{48}O$)-

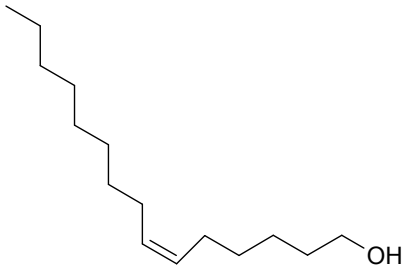


Terpenoid compounds-

On mass peak 58, the compound **(Z) 6, (Z) 9-Pentadecadien-1-ol** ($C_{15}H_{28}O$) is present.

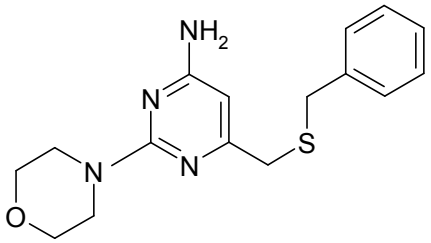


On mass peak 32, the compound (**Z) 6-Pentadecen-1-ol** ($C_{15}H_{30}O$) is present.



Alkaloid-

One alkaloid, **2-Amino-4-benzylthiomethyl-6-morpholino-1, 3, 5-triazine** ($C_{15}H_{19}N_5O_5$) is also present on mass peak 11.

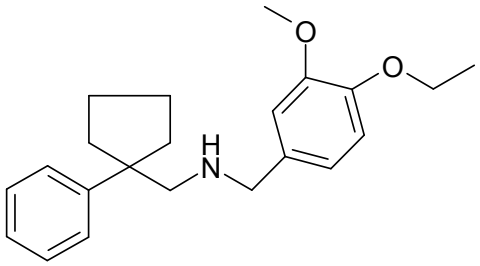


In this way some another type of compounds like Thio,amine,alcohol,ester etc.are also present in the chromatogram of oil extract of *Abrus precatorius*.

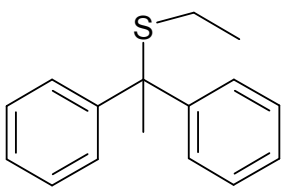
According to the similarity with **nonoxynol-9**, **octoxynol-9, sodium docusate, chlorhexidine, menfegol, benzalkonium chlorides, Propranolol, chlorpromazine, phenoxybenzamin** - in this chromatogram primary alcohol ,secondary alcohol, nitrogen, sulphar, chlorine, amino, carbonyl, ether etc. are present.

On the mass peak - 11,

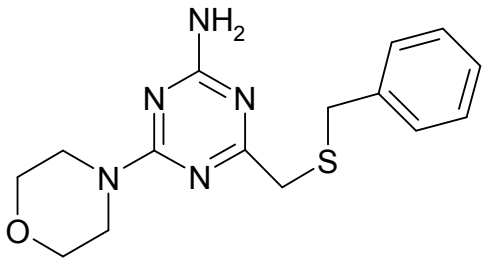
Compound-(4-ethoxy-3-methoxy-benzyl)-(1-phenyl-cyclopentylmethyl)-amine**,** ($C_{22}H_{29}NO_2$)



Compound- Benzene, 1, 11-(1-(ethylthio) propylidene) bis, ($C_{17}H_{20}S$)

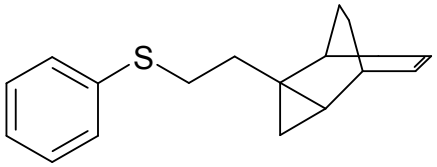


Compound- 2-Amino-4-benzylthiomethyl-6-morpholino-1, 3, 5-triazine, ($C_{15}H_{19}N_5O_5$)

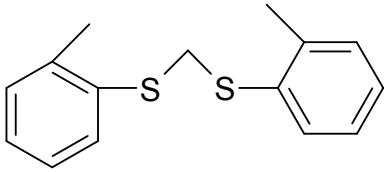


On the mass peak-12,

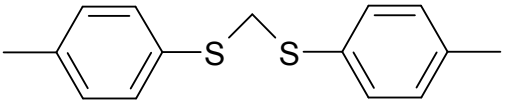
Compound-Tricyclo (3.2.1.0(2, 4) oct-6-ene, 2-(2-(phenylthio) ethyl), ($C_{16}H_{18}S$)



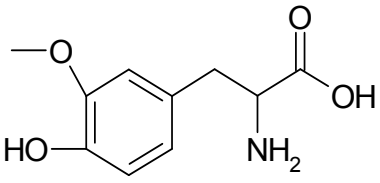
Compound-Bis (2-methylphenylthio)-methane, ($C_{15}H_{16}S_2$)



Compound-Bis (4-methylphenylthio)-methane, ($C_{15}H_{16}S_2$)

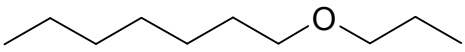


Compound-3- methoxytyrosine, ($C_{10}H_{13}NO_4$)

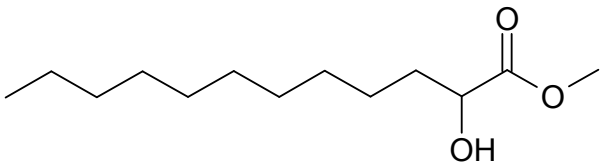


On the mass peak 13,

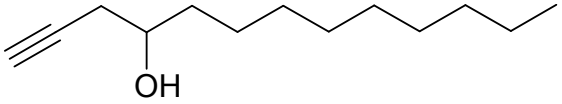
Compound - Propyl heptyl ether, ($C_{10}H_{22}O$)



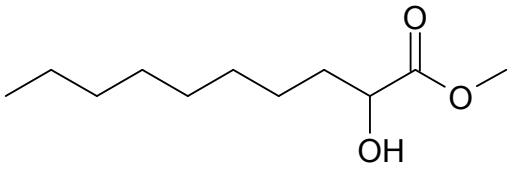
Compound-Methyl-2-hdroxydodecanoate, ($C_{13}H_{26}O_3$)



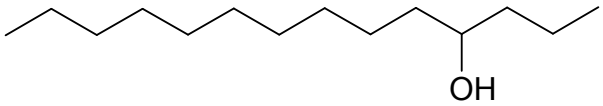
Compound-1-Tridecyn-4-ol, ($C_{13}H_{24}O$)



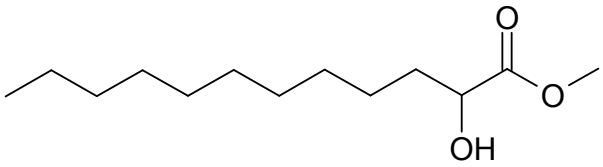
Compound- Methyl-2-hydroxydecanoate, ($C_{11}H_{22}O_3$)



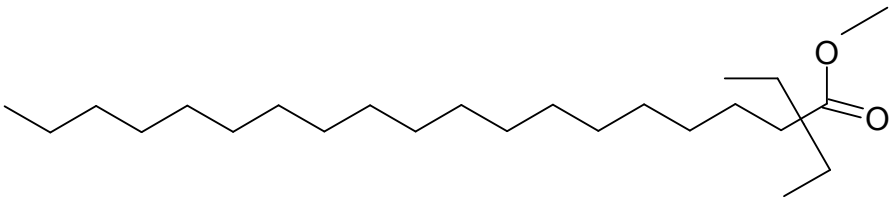
Compound- 4-Tetradecanol, ($C_{14}H_{30}O$)



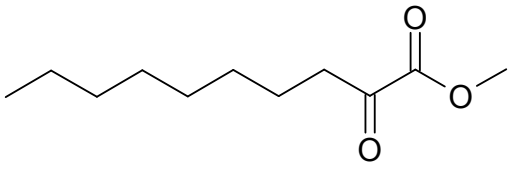
Compound- Methyl-2-hydroxydodecanoate, ($C_{13}H_{26}O_3$)



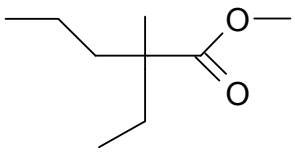
Compound- Eicosanoic acid, 2-ethyl-2-methyl-, methyl ester, ($C_{24}H_{48}O_2$)



Compound- Decanoic acid, 2-oxo-, methyl ester, ($C_{11}H_{20}O_3$)

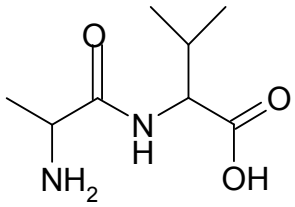


Compound-Pentanoic acid, 2-ethyl-2-methyl-, methyl ester, ($C_9H_{18}O_2$)

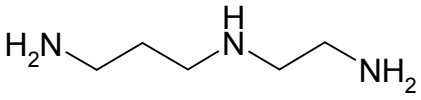


On the mass peak 16,

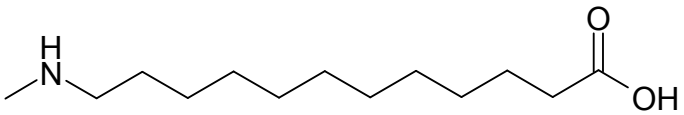
Compound- dl-Alanyl-dl-Valine, ($C_8H_{16}N_2O_3$)



Compound-1, 3-Propanediamine, N-(2-aminoethyl), ($C_5H_{15}N_3$)

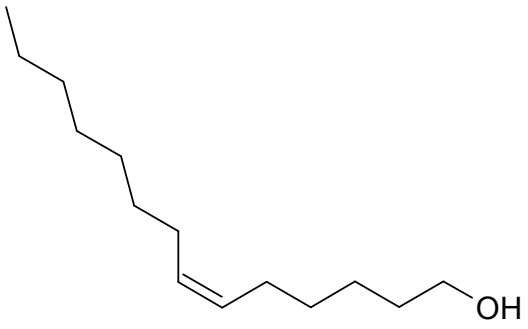


Compound-12-Methylaminolauric acid, ($C_{13}H_{27}NO_2$)

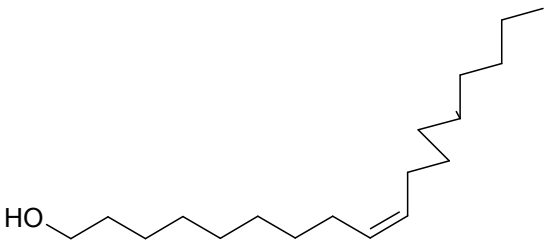


On the mass peak 32,

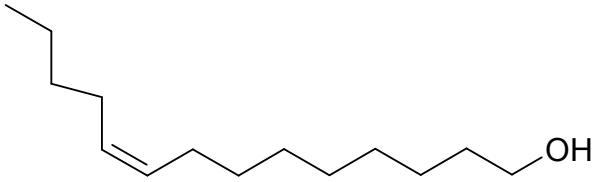
Compound - (Z) 6-Pentadecen-1-ol, ($C_{15}H_{30}O$)



Compound - Oleyl alcohol, ($C_{18}H_{36}O$)

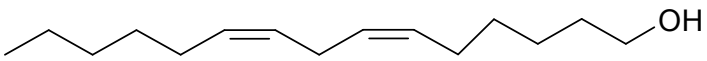


Compound - Cis-9-tetradecen-1-ol, ($C_{14}H_{28}O$)

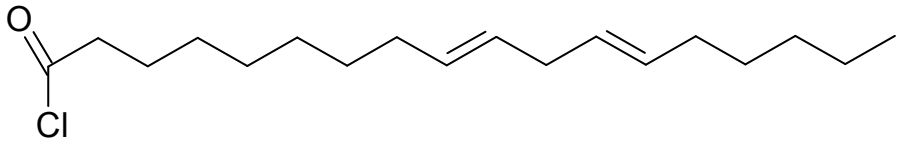


On the mass peak 58,

Compound - (Z) 6, (Z) 9-Pentadecadiene-1-ol, ($C_{15}H_{28}O$)



Compound- 9, 12-octadecadienoyl chloride, (Z, Z), ($C_{18}H_{31}ClO$)



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