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The GC MS Analysis of a Rare Medicinal Plant *Aloe barbadensis*

S. Jayakumari[1], Prabhu K[2], Mudiganti Ram Krishna Rao [3], Bhupesh [4], D.Kumaran[5], Aishwariya Ramesh[5]

[1] *Assistant Professor, Department of Anatomy, Sree Balaji Medical College & Hospital (SBMCH), Bharath University, BIHER, Chrompet, Chennai-600044, Tamil Nadu, India.*

[2] *Associate Professor, Department of Anatomy, Sree Balaji Medical College & Hospital (SBMCH), Bharath University, BIHER, Chrompet, Chennai-600044, Tamil Nadu, India.*

[3] *Professor, Department of Industrial Biotechnology, Bharath University, Selaiyur, Chennai-600044, Tamil Nadu, India.*

[4] *Senior Scientist, Central Research Lab., Sree Balaji Medical College & Hospital (SBMCH), Bharath University, BIHER, Chrompet, Chennai-600044, Tamil Nadu, India.*

[5] *Student, Sree Balaji Medical College & Hospital (SBMCH), Bharath University, BIHER, Chrompet, Chennai-600044, Tamil Nadu, India*

Abstract

The present study deals with the GC MS analysis of Ethyl acetate extract of the plant *Aloe barbadensis.* The plant was collected from Moonaru hills, Kerala. Its color was red and the jelly inside also was blood red in color. The difference of this plant from the common *Aloe vera* has prompted us to go for the GC MS analysis to find whether any major difference exits among them. It is interesting to find that the results are different from already existing reports on *Aloe vera*. Some important constituents such as Idazoxan, Dextroamphetamine, 1-ethylpropylamine, Resepridone, P-methyl benzoic acid, 2-Thiophene carboxylic acid, Dimethyl 4-Chlorophenyl thiophosphate, Benzphetamine, Picloram and Jasmonoyl acid, Glyphosate, Mepyarmine, Physostigmine, Methylphosphonic acid, Selagiline, 2,4- Dicholorophenol were shown in the GC MS analysis results. These differences could be due to the geographical and microclimatic conditions or this species of *Aloe* could be a different from the others. further studies to identify the reasons for these differences are under progress.

Key Words *Aloe barbadensis*, GC MS, Idazoxan, Reserpridone, 2-Thoiphene carboxylic acid, Selagiline

INTRODUCTION

Aloe barbadensis is a rare species of *Aloe* genus which has medicinal value similar to *Aloe vera*. The present study deals with the GC MS analysis of Ethyl acetate extract of the plant to understand the bio molecules present in it. This plant is different than the *Aloe vera* plants in having red color and with the jelly inside is also blood red in color. It was collected from Moonaru hills, Kerala and the plant material was subjected to GC MS analysis after processing it suitably. The difference of this plant from the common *Aloe vera* has prompted us to go for this test to find there is any major difference. It is interesting to find that the results are different from already existing reports on *Aloe vera* [1-7]. These differences could be due to the geographical and microclimatic conditions or this species of *Aloe* could be a different from the others. Further studies to identify the reasons for these differences are under progress. The present study is a part of our aim towards herbal standardization process. (8-27)

MATERIALS AND METHODS

Preparation of plant extract

Fresh leaves of *Aloe barbadensis* were collected from Moonaru hills, Kerala and the pulp material were extracted with 90% ethanol using a continuous hot percolation method in a Soxhlet apparatus for 18 hrs. The extract was concentrated in a rotary evaporator to yield a semi solid mass. Then it was kept at -20°C in deep freezer. Further the extract was lyophilized using alpha Christ lyophilizer. The powder contents were stored at 4°C in refrigerator until use.

Gas Chromatography Mass Spectroscopy

The Gas Chromatography and Mass Spectroscopy (GC MS) examination was done by using Perkin – Gas Chromatogram coupled to a mass identifier, Turbo mass gold – Perkin Elmer Turbomass spectrometer with an Elite - (100% Dimethyl poly siloxane), P - 265, 30m x 0.25 mm ID x 0.25µm of fine column. Injection temperature was kept up at 250°C, Helium stream rate as 1.5 ml/min and particle source temperature at 290°C. Infusion was performed in the split less mode and the volume was 1 µL. The instrument was set to an underlying temperature of 70°C, and kept up at this temperature for 3 min. Towards the end of this period, the temperature was emerged up to 300°C, at the rate of an expansion of temperature 10°C/min. The mass spectra of were attained by electron ionization (EI) at 70 eV, and the indicator worked in sweep mode from 40 – 700 m/z. The MS begin time was 3 min end time was 35 min with dissolvable cut time was around 3 min. The fundamental compound constituents were distinguished by coordinating mass spectra with spectra of reference masses in the library of the National Institute of Standards and Innovation (NIST 11). The retention values and probable type of molecules were presented.

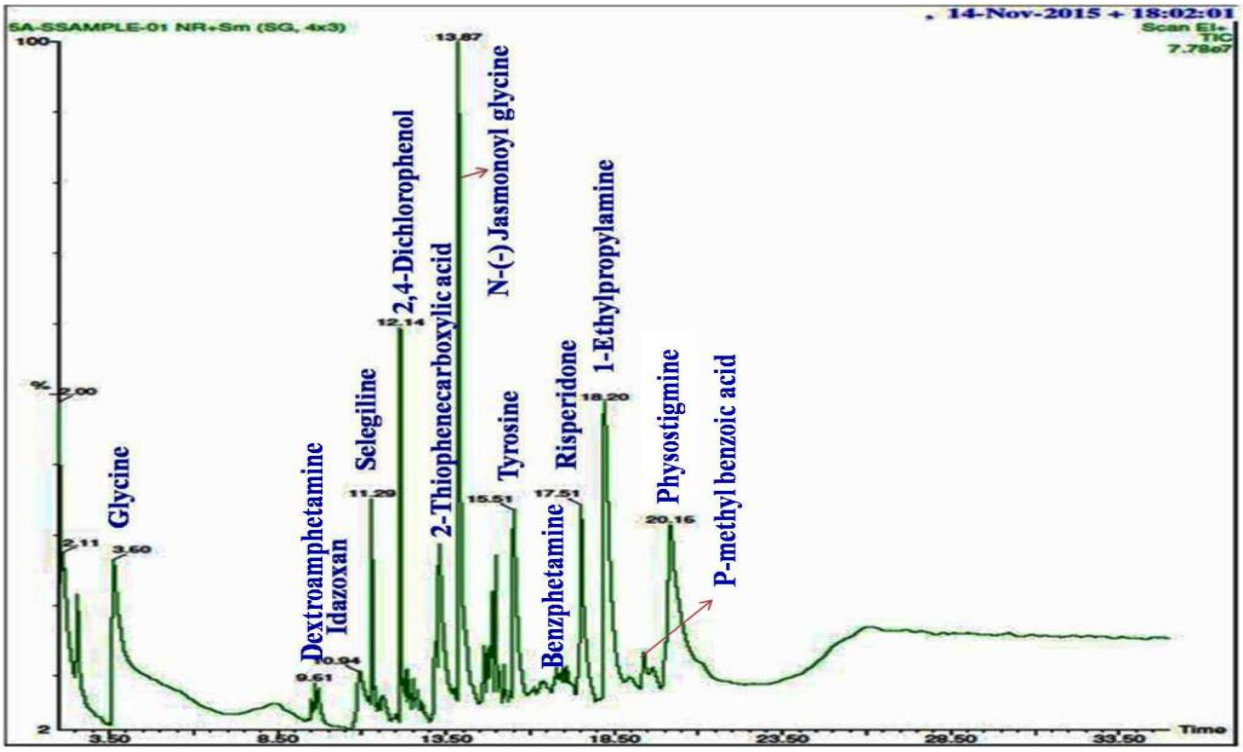

Figure 1. GC MS profile of Aloe barbadensis (Red veriety).

RESULTS AND DISCUSSION

Figure-1 indicated the identification of bioactive compounds present in the ethyl acetate extract of *Aloe barbadensis.* The extract was subjected to the Gas Chromatography Mass Spectroscopy. The GC MS spectrum was identified and elucidated for the presence of bioactive compounds from the NIST library. The Bioactive compounds are listed in Table 1. Some important constituents such as Idazoxan, Dextroamphetamine,1-ethylpropylamine, Resepridone, P-methyl benzoic acid, 2-Thiophene carboxylic acid, Dimethyl 4-Chlorophenyl thiophosphate, Benzphetamine, Picloram and Jasmonoyl acid, Glyphosate, Mepyarmine, Physostigmine, Methylphosphonic acid, Selagiline, 2,4- Dicholorophenol was found. The medicinal roles of some of the important bioactive components is mentioned below.

1. Idazoxan

This chemical is a α_2 adrenoceptor antagonist and has been extensively used for preclinical study to support the "α_2/D_2 receptor hypothesis" for atypical antipsychotic effects. [28-31]

2. Dextroamphetamine

This molecule is sold in the brand names of *Adderall, Adderall XR* and used for treating attention deficit hyperactivity and narcolepsy. This stimulates the brain by increasing the level of neurotransmitters like dopamine and norepinephrine.

3. 1-ethylpropylamine.

This bioactive compound and its derivatives are known as corticotrophin releasing factor 1 receptor antagonists.

4. Resepridone

This compound is used mainly for the treatment of schizophrenia, bipolar disorder and irritability in people with autism. It is taken either orally or by injection into a muscle. The injectable version is long acting and lasts for about two weeks.

5. P-methyl benzoic acid

This molecule, which is also present in *Aloe vera,* has been shown to have antibacterial and antioxidant activities.

6. **2-Thiophenecarboxylic acid**.

Mishra *et al*, 2011 have reviewed the medicinal role of this compound and its derivatives.[37] The derivatives of this compound are reported to be antiallergic (Gillespie *et al,* 1985), antibacterial (Elslager *et al,* 1972), analgesic and anti-inflammatory (Santagati *et al,* 1994

7. Dimethyl 4-Chlorophenyl thiophosphate

This compound is a know antifungal.[41]

8. **Benzphetamine**

This compound is used for reduction of appetite in obesity management. [42

9. **Picloram and Jasmonoyl acid derivatives**

These compounds are used in tissue culture for better callus growth. [43]

10. Glyphosate

This is a pesticide and can cause various diseases in humans and animals. The possible presence of this compound could reflect the use of more chemical as fertilizers where from this plant was collected.

11. Mepyarmine is an antidepresent and antihistaminic. [44]

12. Physostigmine

Physostigmine acts by interfering with the metabolism of acetylcholine. It is a covalent (reversible - bond hydrolyzed and released) inhibitor of acetylcholinesterase, the enzyme responsible for the breakdown of acetylcholine in the synaptic cleft of the neuromuscular junction. [45] Physostigmine is used to treat glaucoma, Alzheimer's disease, and delayed gastric emptying. It has been shown to improve short term memory.

13. Methylphosphonic acid

Aminophosphonic acid is reported to have an number of biological activities. [46-49] These compounds are defined as amino acid derivatives, in which the carboxylic acid group [–C(=O)OH] is replaced by the phosphonic acid moiety [$–P(=O)(OH)_2$] [50]. Such modification inhibits the activity of certain enzymes by effective competition for the active site of the enzyme and by forming strong electrostatic binding [51]. Thus, the aminophosphonic acids found application as enzyme inhibitors [52, 53].

14. Selagiline

Selegiline is a monoamine oxidase inhibitor (MAOI). It works by prolonging the anti-Parkinson activity of levodopa, which may help to slow the progression of Parkinson disease. Selegiline has no anti-Parkinson effects of its own and must always be given in combination with levodopa/carbidopa. [54]

15. 2, 4- Dicholorophenol

2, 4-Dichlorophenol (2, 4-DCP) is a chlorinated derivative of phenol with the molecular formula $C_6H_4Cl_2O$. 2, 4-DCP is used primarily as an intermediate in the preparation of the herbicide 2,4-dichlorophenoxyacetic acid (2,4-D).

The plants of *Aloe* genus are grown widely all over the world for their ornamental as well as medicinal values. The jelly of *Aloe* is used mostly in skin care industries which is claimed to cause smoothness and healthy skin. Domestically the jelly is used for skin care, hair care and also as a coolant. The juice is taken in the early hours as it is supposed to stimulate good health. Although some reports on the various health benefits of *Aloe* are there, it is a long way to go to establish these claims at standardized level. The present work is one step in this direction.

CONCLUSION

From the above discussion it could be concluded that *Aloe barbadensis* contain some very important bio-molecules which have significant medicinal properties. Further work to understand the molecular mechanism of their action is under progress.

Table 1. The table indicates the GC MS results of *Aloe barbadensis* showing Retention time and possible types of compounds.

Sl. No	Retention Time (Min)	Type of Possible compound/s as Per NIST
1.	3.614	Glycine, Bromophenol. Gly-Gly
2	4.209	1-Ethylpropylamine, Pro-Tyr, L-Pro-L-Ser, Phosphoric acid, monododecyl ester, Dextroamphetamine, methylphosphonic acid pos 45 d[M+H]+ 15
3	4.429	Dextroamphetamine, Benzphetamine
4	4.820	1-Ethylpropylamine, Pro-Tyr, L-Pro-L-Ser, 3-Bromophenol
5	5.630	1-Ethylpropylamine, Picloram, Glyphosate, free acid, Mepyramine, Physostigmine
6	10.967	Idazoxan, Pro-Tyr
7	11.292	Methadone, L-Deprenyl, Dextroamphetamine, Selegiline
8	12.137	2,4-Dichlorophenol
9	13.303	Idazoxan, 2-Thiophenecarboxylic acid
10	13.863	Risperidone, p-Methylbenzoic acid, Aspartic acid, N-(-)-Jasmonoyl glycine
11	15.514	Pro-Tyr, Idazoxan, 2-Thiophenecarboxylic acid
11	17.510	Idazoxan, 2-Thiophenecarboxylic acid, Dimethyl 4-chlorophenyl thiophosphate
12	18.200	1-Ethylpropylamine, Pro-Tyr, Oxalic acid, Alanine
13	20.146	1,3-Butadiene, 2,3-dimethyl-,Cyclohexene, 1,4-Hexadiene Cyclopentane, methylene

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