Asian Journal of Pharmaceutical Research and Health Care, *Vol 12(4), 162-167, 2020*

ISSN (Online) : 2250-1460
DOI: 10.18311/ajprhc/2020/25653

Gas Chromatography-mass Spectroscopic Investigation of Petroleum Ether Concentrates of Desert Date/Ingudi (*Balanites aegyptiaca Linn. Delile*) w. s. r. Wound Mending

Sanjeev Kumar[1]*, S. Krishnamoorthi[2] and K. N. Dwivedi[1]

[1]Department of Dravyaguna, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, Varanasi – 221005, Uttar Pradesh, India; Kumarsanjeevdg@bhu.ac.in, kndbhu@gmail.com
[2]Department of Chemistry, Institute of Science, Banaras Hindu University, Varanasi – 221005, Uttar Pradesh, India; dr.skmoorthi@gmail.com

Abstract

The idea behind this research work is to investigate the phytochemical constituents from Petroleum ether concentrate of Ingudi (*Balanites aegyptiaca L. Delile*) seeds utilizing GC-MS (Gas chromatography-mass spectroscopy) and to clarify the customary utilization of Ingudi oil as an effective injury mending specialist. A sum of 100 gm Ingudi seeds coarsely powdered, air-dried were macerated and extracted in Petroleum ether (1 Liter) at 60–80^{0}C for 72 hours. The petroleum ether concentrate was exposed to GC-MS investigation. The GC-MS examination of the Petroleum ether concentrates of Ingudi shows presence of seven functional groups which are alcohol, carboxylic corrosive, ester, ether, silyl ether, and phenol. The compounds present are Tetradecamethylcycloheptasiloxane, Feruloyl-caffeoyl-glycerol, Decamethylcyclopentasiloxane, 17-Octadecynoic Acid, 2-Hydroxy Succinic Acid, Dec-4-Anyl Undecyl Ester, Stigmasterol Trimethylsilyl Ether, Succinic corrosive butyl ester 4-hydroxy-12–methyl-tridecyl ester. The extract shows antibacterial, antioxidant, wound recuperating action, antifungal, immunomodulatory, antistatic, emollient, humectants, anti-provocative, hypocholesterolemic, malignancy preventive, hepatoprotective, nematicide, insectifuge, antihistaminic, antieczemic, antiacne, 5-Alpha reductase inhibitor, antiandrogenic, antiarthritic, anticoronary, antipsychotic, insectifuge, antimicrobial movement, larvicidal, thyroid hindering action, and hypoglycemic action. This examination assists to anticipate the equation and structure of dynamic particles which can be utilized as a decent and effective injury recuperating operator. This outcome additionally improves the customary use of Ingudi oil. The medicinal use of this oil was reported in Sanskrit literature (Abhigyan shakuntalam).

Keywords: Abhigyan Shakuntalam, *Balanites aegyptiaca*, Ingudi, Petroleum Ether Extract, Seed, GC-MS

1. Introduction

The current article attempts to investigate the phytochemical constituents from Petroleum ether concentrate of Ingudi seeds utilizing GC-MS (Gas chromatography-mass spectroscopy) and to clarify the customary utilization of Ingudi oil as an effective injury mending specialist. The thought behind this work must began from the sanskrit writing *Abhigyan Shakuntalam*, in which Shakuntala used to dress the injuries of deer by Ingudi oil[1]. Ingudi belongs to the family Zygophyllaceae that grows up to the 12-meter high. It is a semi-evergreen, spiny, extremely variable shrub or small tree. The Desert date contains 50% oil content in the seed kernels[2]. In India,

*Author for correspondence

Ayurveda is the most established framework wherein wound mending methods and wound recuperating specialists were so evolved. These strategies took a shot at the premise of sickness just as patients. Ayurvedic formulations in the form of solid, liquid, powder, tablet, decoction, syrup is used since more than 3000 years, but these medicines are not acceptable throughout the world due to lack of Internationals scenario of medical practices and lack of evidence based scientific proven efficacy of the drug. *Ingudi*/Desert date (*Balanites aegyptiaca L. Delile*) seed oil is a significant medication that is utilized in skin illnesses, consumes, Ulcers and as a desperate specialist[3–5]. The current study aims to evaluate the wound healing property of the *Ingudi* seed extract and provide a scientific experimental basis for traditional uses of the product.

2. Materials and Methods

2.1 Source of the Drug

The medication was gathered from country regions of area Etawah, Western U. P. during March-April months and distinguished by Prof. K. N. Dwivedi of Dravyaguna Department, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, 221005, and given accession number of this plant DG/18-19/194 (dry organic product).

2.2 Method of Preparation

Petroleum ether concentrates (Figure 3) of Ingudi seed was set up by the soxhlet extraction strategy.

2.3 Petroleum-ether Extract of Ingudi Seed

Coarsely powdered (Figure 2) air-dried whole seed (Figure 1) of *Ingudi* (*Balanites aegyptiaca Linn. Delile*) decreased to a fine powder (#40 size work) of *Ingudi* seeds (100gm) was exposed to progressive hot nonstop extraction (soxhlet) with 1 litre of petroleum ether (60–80^{0}C) of the predefined quality in a shut cup for 72 hours a viable extraction the dissolvable was refined and the concentrate was focused on a heated water shower. From that point forward, the level of petroleum ether solvent concentrate was determined regarding the air-dried medication. Its rate was determined regarding air-dried load of Ingudi seed; Colour and consistency of the Ingudi seed extricates were noted.

Figure 1. Whole seed of *Balanites segyptiaca* L. Delile.

Figure 2. Coarse powder of *Balanites segyptiaca* L. Delile seed.

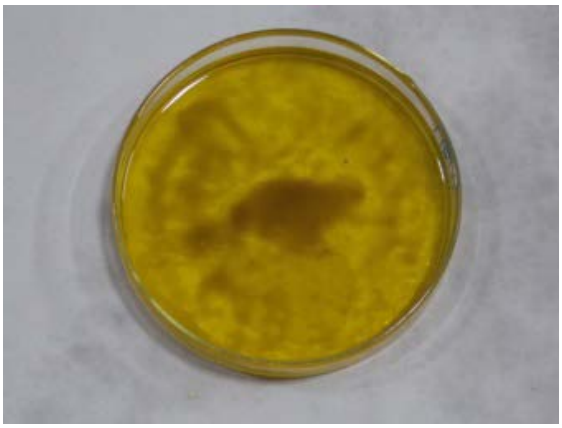

Figure 3. Petroleum ether concentrate of *Balanites segyptiaca* L. Delile seed.

2.4 GC-MS Analysis

GC-MS examination of the Hexane concentrates of Ingudi (*Balanites aegyptiaca Linn. Delile*) was done utilizing a Clarus 680 PerkinElmer (Auto framework XL) Gas chromatograph prepared and coupled to a mass finder SQ8T-PerkinElmer, 30m x 0.25mm x 0.25mm of the slender section. For GC-MS location, an electron ionization framework was worked in electron sway mode with ionization vitality of 70eV. The instrument was set to an underlying temperature of 50^{0}C and kept up at this temperature for 6 min. At that point stove temperature was raised up to 180^{0}C at the pace of an expansion of 100 C/min and kept up for 6 min. Toward the finish of this period, the temperature was raised up to 280^{0}C and kept up for 8min. Helium gas was utilized as bearer gas at a consistent stream pace of 1ml/min and 3 micro liters of Ingudi extricate test was infused utilizing a split mode infusion framework. The injector temperature was kept up at 250^{0}C. Mass spectra were taken at 70eV. The dissolvable postpone was 0 to 3 min. The absolute GC-MS running time was 40 min. The example was infused in split mode. The mass phantom sweep extend was set at 30 to 512 m/z (Figure 4).

3. Results

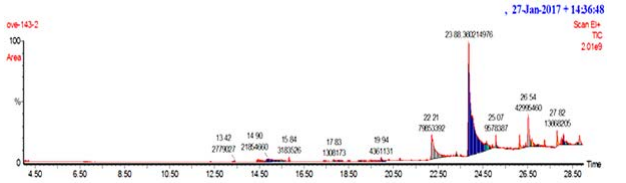

Figure 4. GC-MS total ionic Chromatogram (TIC) of Petroleum ether extract of Ingudi.

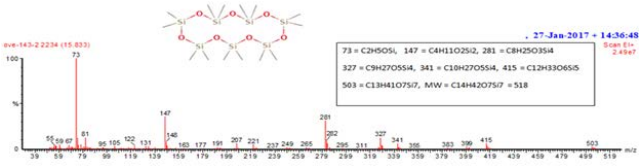

Figure 5. MS of Tetradecamethylcycloheptasiloxane.

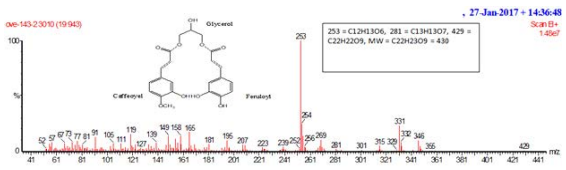

Figure 6. MS of Feruloyel-caffeol-glycerol.

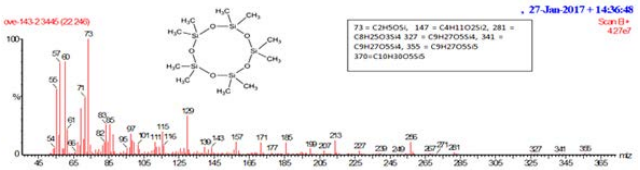

Figure 7. MS of Decamethylcyclopentasiloxane.

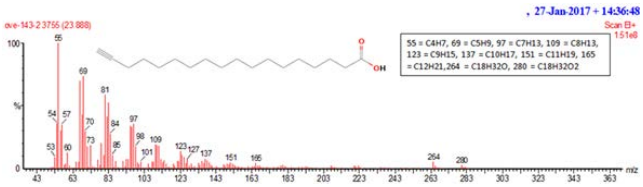

Figure 8. MS of 17-Octadecynoic Acid.

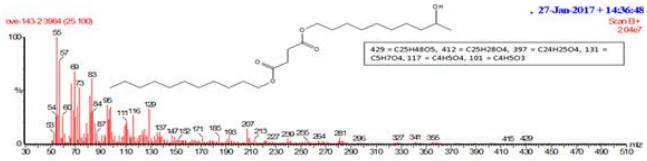

Figure 9. MS of 2-HydroxySuccinic acid, Dec-4-Anyl Undecyl Ester.

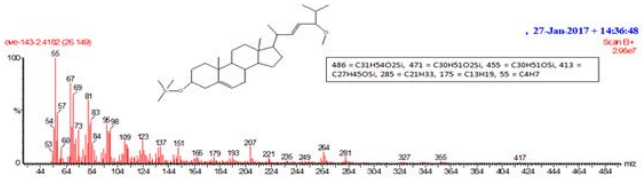

Figure 10. MS of Stigmasterol Trimethylsilyl Ether.

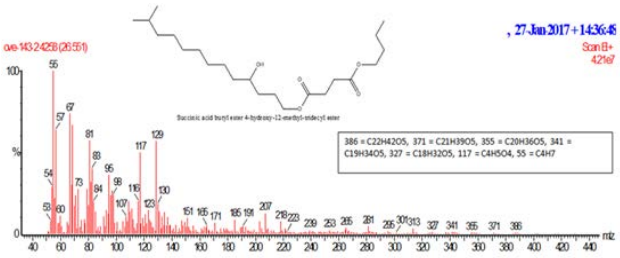

Figure 11. MS of Succinic acid butyl ester 4-hydroxy-12-methyl-tridecyl ester.

Table 1. Showing compound identified in Petroleum ether extract of (*Balanites aegyptiaca* L. Delile)

Peak No	Fatty acids	Molecular formula	Molecular weight	Base peak	Characteristics of ions	Reported Bioactivity
1	Tetradecamethylcycloheptasiloxane (macrocyclic organosiloxane composed from seven units of dimethylsiloxane) (Figure 5)	$C_{14}H_{42}O_7Si_7$	518	73	73, 147, 281, 327, 341, 415, 503	Accelerated healing and production of tissue with complete re-pithelization[6].
2	Feruloyl-caffeoyl-glycerol (polyphenol metabolite detected in biological fluids) (Figure 6)	$C_{22}H_{23}O_9$	430	253	253, 281, 429	Antioxidant activity[7].
3	Decamethylcyclopentasiloxane (colourless volatile liquid used in cosmetic and personal products as a skin emollient) (Figure 7)	$C_{10}H_{30}O_5Si_5$	370	73	73, 147, 281, 327, 341, 355	Acceleratedhealing and production of tissue with complete re-pithelization[6].
4	17-Octadecynoic Acid (Figure 8)	$C_{18}H_{32}O_2$	280	55	55, 69, 97, 109, 123, 137, 151, 165, 264	Antimicrobial activity[8].
5	2-HydroxySuccinic Acid, Dec-4-Anyl Undecyl Ester (Figure 9)	$C_{25}H_{48}O_5$	429	131	101, 117, 131, 397, 412	Antibacterial activity[9].
6	Stigmasterol Trimethylsilyl Ether (Figure 10)	$C_{31}H_{54}O_2Si$	486	55	55, 175, 285, 413, 455,471	Antioxidant, Antimicrobial, Lubricant, Anti-eczemic[9].
7	Succinic acid butyl ester 4-hydroxy-12 – methyl-tridecyl ester ester (Figure 11)	$C_{22}H_{42}O_5$	386	55	55, 117, 327, 341, 355, 371	Antibacterial capacity[9].

5. Discussion

The unsaturated fats acquired from the GC-MS pieces are given in table 1 contains alcohol, carboxylic corrosive, Eester, ether, silyl ether and phenol utilitarian gatherings.

Tetradecamethylcycloheptasiloxane/organosiloxane is a macrocyclic organosiloxane made out of seven units of dimethylsiloxane. It has the recipe ($C_{14}H_{44}O_7Si_7$). It has a job as a marine xenobiotic metabolite (NIH). Tetradecamethylcycloheptasiloxane showed antibacterial and antioxidant movement[10], Tetradecamethylcyclo heptasiloxane likewise displays great antioxidant action[11], Cycloheptasiloxane show antibacterial, antifungal, antifouling, and and antitumor action[12]. Cyclohep tasiloxane is a superb anti-inflammatory emollient and very good skin conditioning agent[13]. It is generally utilized as restorative purposes, can have a wide range of capacities in corrective items including antistatic, emollient, humectants, dissolvable, consistency controlling, and hair molding. Polyurethane/Siloxane are utilized for twisted dressing to give ideal conditions to cell action at harmed tissue[6]. Feruloyl-caffeoyl-glycerol shows powerful cancer prevention agent movement[7] and has a sub-atomic equation ($C_{22}H_{23}O_9$). Decamethylcyclopentasiloxane is an organosilicon aggravate that is a dreary and scentless fluid that is marginally unstable (Database of the Institute for Occupational Safety and Health; 2015) and exceptionally lipophilic[14]. It has a sub-atomic recipe ($C_{10}H_{30}O_5Si_5$). Octadecanoic corrosive shows anti-provocative, hypocholesterolemic, cancer preventive, hepatoprotective, nematicide, insectifuge, antihistaminic, antieczemic, and antiacne, 5-Alpha reductase inhibitor, antiandrogenic, antiarthritic, anticoronary, antipsychotic and insectifuge[15]. It has an atomic equation ($C_{18}H_{32}O_2$). Octadecanoic corrosive shows antimicrobial movement[16]. 2-Hydroxy Succinic Acid, Dec-4-Anyl Undecyl ester is a subsidiary of succinic corrosive that is dynamic against pathogenic microscopic organisms and larval settlement[17]. It has an atomic equation ($C_{25}H_{48}O_5$). Stigmasterol Trimethylsilyl Ether goes about as an antioxidant, hypoglycemic, and thyroid restraining properties, antecedent of progesterone, antimicrobial, anticancer, anti-joint, anti-asthma, anti-provocative, and diuretic[9]. It has the sub-atomic equation ($C_{31}H_{54}O_2Si$), Stigmasterol shows thyroid inhibitory, antiperoxidative, and hypoglycemic impacts[18].

This concentrate can be utilized as a cost effective material for twisted mending later on because of the presence of compounds showing antimicrobial, anti-provocative, anti-oxidant, antieczemic, emollient, antiseptic action. Past examinations revealed that medications containing antimicrobial, anti-fiery movement advanced the injury recuperating process through the quickened rebuilding of harmed tissue[19], antioxidant action improves the mending of contaminated and non-tainted injuries by decreasing the harm brought about by free radicals[20]. Emollients are re-lubing the skin while purifying, as opposed to de-lubing it; they are additionally cradled so they maintain the ordinary surface pH[21]. The essential intension of utilizing any effective antiseptic is to decrease the germs forestalls disease, and diminish the heap of biofilm[22].

The study of extract containing several compounds which was proved by GC-MS examination provides a generally excellent insight for future scientist for further clinical assessment. The study will help to upgrades the conventional use of *Ingudi* oil which contains various dynamic mixes.

6. Conclusion

GC-MS analysis is one of the most reasonable strategies to distinguish several compounds in oil-containing drugs. The compounds distinguished in the petroleum ether concentrate of *Ingudi* can be taken into account as an injury recuperating operator because of their revealed cell reinforcement, antimicrobial, anti-inflammatory, hypoglycemic properties and furthermore they can be utilized as a decent injury mending material.

7. Acknowledgement

The author wish to acknowledge the contribution of Mr. Tulli Meena, Department of Chemistry, Indian Institute of Technology, Roorkee, Uttarakhand, and contribution of research Scholar Mr. Rudramani Tiwari, Department of Chemistry, Institute of Science, Banaras Hindu University.

8. References

1. Viraj AS. Delhi. Rajpal and sons. 2020; p. 66–67
2. Chapagain B, Wiesman Z. Variation in diosgenin level in seed kernels among different provenances of Balanites aegyptiaca Del (Zygophyllaceae) and its correlation with oil content. African Journal of Biotechnology. 2005; 4(11): 6170EF211704.
3. Rao KP, Sreeramulu SH. Ethnobotany of selected medicinal plants of Srikakulam district, Andhra Pradesh. Ancient Science of Life. 1985 Apr; 4(4): 238-244.
4. Bhatnagar LS, Singh VK, Pandey G. Medico-botanical studies on the flora of Ghatigaon forests, Gwalior, Madhya Pradesh. J Res Indian Med. 1973; 8(2):67-100.
5. Shah GL, Menon AR, Gopal GV. An account of the Ethnobotany of Saurashtra in Gujarat state (India). Journal of Economic and Taxonomic Botany. 1981; 2:173–82. https://doi.org/10.18178/ijch.2016.2.4.059
6. Rezapour-Lactoee A, Yeganeh H, Ostad SN, Gharibi R, Mazaheri Z, Ai J. Thermoresponsive polyurethane/siloxane membrane for wound dressing and cell sheet transplantation: In-vitro and in-vivo studies. Materials Science and Engineering: C. 2016 Dec 1; 69:804–14. https://doi.org/10.1016/j.msec.2016.07.067. PMid:27612775
7. Compton DL, Laszlo JA, Evans KO. Antioxidant properties of feruloyl glycerol derivatives. Industrial Crops and Products. 2012 Mar 1; 36(1):217–21. https://doi.org/10.1016/j.indcrop.2011.09.009
8. Saad AM. Determination of secondary metabolites products by Trichoderma horzianum and evaluate antimicobial activity. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2016; 7(3):105–22.
9. Tyagi T, Agarwal M. Phytochemical screening and GC-MS analysis of bioactive constituents in the ethanolic extract of Pistia stratiotes L. and Eichhorniacrassipes (Mart.) solms. Journal of Pharmacognosy and Phytochemistry. 2017; 6(1):195–206.
10. Bechkri S, Berrehal D, Semra Z, Bachari K, Kabouche A, Kabouche Z. Composition and biological activities of seeds oils of two Crataegus species growing in Algeria. Journal of Materials and Environmental Sciences. 2017; 8(5):1526–30.
11. Mahmud PI, Yaacob W, Ibrahim N, Bakar MA. Antibacterial activity and major constituents of polyalthiacinnamomea basic fraction. Sains Malaysiana. 2018 Sep 1; 47(9):2063–71. https://doi.org/10.17576/jsm-2018-4709-14
12. Patil A, Jadhov V. GC-MS analysis of bioactive components from methanol leaf extract of Toddaliaasiatica (L.). International Journal of Pharmaceutical Sciences Review and Research. 2014; 29(1):18–20.
13. Cycloheptasiloxane, 107-50-6 [Internet]. [cited 2020 Aug 24]. Available from: http://www.thegoodscentscompany.com/data/rw1331301.html
14. Dekant W, Klaunig JE. Toxicology of decamethylcyclopentasiloxane (D5). Regulatory Toxicology and Pharmacology. 2016 Feb 1; 74:S67–76. https://doi.org/10.1016/j.yrtph.2015.06.011. PMid:26111607

15. Dandekar R, Fegade B, Bhaskar VH. GC-MS analysis of phytoconstituents in alcohol extract of Epiphyllum oxypetalum leaves. Journal of Pharmacognosy and Phytochemistry. 2015 May 1; 4(1): 148-154.
16. Rahuman AA, Gopalakrishnan G, Ghouse BS, Arumugam S, Himalayan B. Effect of Feronia limonia on mosquito larvae. Fitoterapia. 2000 Sep 1; 71(5):553–5. https://doi.org/10.1016/S0367-326X(00)00164-7
17. Yang LH. Antifouling compounds from the marine sponge Acanthella cavernosa and its associated microbes [Internet] (Doctoral Dissertation). Available from: http://hdl.handle.net/1783.1/2775
18. Panda S, Jafri M, Kar A, Meheta BK. Thyroid inhibitory, antiperoxidative and hypoglycemic effects of stigmasterol isolated from Butea monosperma. Fitoterapia. 2009 Mar 1; 80(2):123–6. https://doi.org/10.1016/j.fitote.2008.12.002. PMid:19105977
19. Dev SK, Choudhury PK, Srivastava R, Sharma M. Antimicrobial, anti-inflammatory and wound healing activity of polyherbal formulation. Biomedicine and Pharmacotherapy. 2019 Mar 1; 111:555–67. https://doi.org/10.1016/j.biopha.2018.12.075. PMid:30597309
20. Süntar I, Akkol EK, Nahar L, Sarker SD. Wound healing and antioxidant properties: Do they coexist in plants?. Free Radicals and Antioxidants. 2012 Apr 1; 2(2):1–7. https://doi.org/10.5530/ax.2012.2.2.1
21. Moncrieff G, van Onselen J, Young T. The role of emollients in maintaining skin integrity. Wounds UK. 2015 Mar 1; 11(1).
22. Daeschlein G. Antimicrobial and antiseptic strategies in wound management. International Wound Journal. 2013 Dec; 10(s1):9–14. https://doi.org/10.1111/iwj.12175. PMid:24251838