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Original Research Article

From Traditional Formulation to Molecular Evidence: GC–MS Characterization of Lavangapattai Kudineer in Anti-Hemorrhoidal Therapeutics

Sathiyaseelan R, *Third Year PG Research Scholar, Department of Pothu Maruthuvam, Government Siddha Medical College Palayamkottai, Tirunelveli affiliated to The Tamilnadu Dr. MGR.Medical University, Chennai*.

Kaviya S, *Third Year PG Research Scholar, Department of Pothu Maruthuvam, Government Siddha Medical College Palayamkottai, Tirunelveli affiliated to The Tamilnadu Dr. MGR.Medical University, Chennai*.

Sathish Kumar P, *Reader, Department of Pothu Maruthuvam, Government Siddha Medical College Palayamkottai, Tirunelveli affiliated to The Tamilnadu Dr. MGR.Medical University, Chennai, Tamilnadu India*.

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Abstract: According to the World Health Organization, nearly 70–80% of populations in several Asian and African countries depend on traditional medicine for their primary health care needs. Among the AYUSH systems of India, Siddha medicine has gained renewed global attention due to its holistic philosophy and therapeutic potential in managing chronic and lifestyle-related disorders. Bleeding hemorrhoids (Raththa Moolam) are a common anorectal condition characterized by painless rectal bleeding, vascular congestion, and inflammation, significantly impairing quality of life. Conventional treatment modalities often provide only symptomatic relief and are associated with recurrence, adverse effects, and financial burden, thereby emphasizing the need for safer and cost-effective alternative therapies. Lavangapattai Kudineer, a classical Siddha formulation indicated for bleeding disorders, has been traditionally prescribed for the management of Raththa Moolam. The present study aimed to scientifically validate this formulation using Gas Chromatography–Mass Spectrometry (GC–MS) analysis to identify its phytochemical constituents and evaluate its therapeutic relevance in bleeding hemorrhoids. GC–MS analysis revealed the presence of diverse bioactive compounds exhibiting anti-inflammatory, antioxidant, hemostatic, membrane-stabilizing, and tissue-protective activities. These pharmacological properties are closely aligned with the pathophysiological mechanisms of bleeding hemorrhoids, including oxidative stress, vascular fragility, venous congestion, and mucosal inflammation. The identified constituents may contribute to reducing inflammatory mediators, strengthening vascular integrity, decreasing capillary permeability, enhancing venous tone, and promoting mucosal healing, thereby controlling bleeding and minimizing recurrence.

Keywords: Lavangapattai Kudineer, Siddha medicine, GC–MS analysis, bleeding hemorrhoids, phytochemical constituents, anti-inflammatory activity, antioxidant activity, vascular protection, traditional medicine validation, Raththa Moolam.

1. Introduction

The World Health Organization states that approximately 70–80% of the population in several Asian and African countries rely on traditional systems of medicine for their primary health care. In recent years, there has been a resurgence of interest in the AYUSH systems of India, especially Siddha medicine, one of the oldest traditional systems originating in South India. This growing interest is mainly due to the increasing prevalence of chronic and lifestyle-related diseases, limitations and adverse effects of modern drugs, high treatment costs, and a global preference for natural and holistic therapies. Siddha medicine has therefore gained importance for its potential role in the safe and effective management of chronic disorders.

The Siddha system is based on principles such as Pancha Bootham (five elements: earth, water, fire, air, and space) and Mukkutram, the three vital humors, Vali, Azhal, and Iyyam, which regulate all physiological functions. Health is maintained by the balance of these humors, while their imbalance leads to disease. Improper diet and lifestyle

result in the formation of "Amam," which disrupts this balance. Hemorrhoids, known as "Moolam" in Siddha medicine, are mainly caused by derangement of Vali and Azhal, resulting in vascular changes, inflammation, and bleeding.

Bleeding hemorrhoids are one of the most common anorectal disorders and a major cause of lower gastrointestinal bleeding worldwide. Globally, hemorrhoids affect approximately 4.4% of the population, and about 50% of individuals over 50 years of experience this condition. Bleeding is the most common symptom, occurring in 70–80% of cases. In India, the prevalence ranges between 7–15%, with higher incidence in southern states such as Tamil Nadu, Kerala, Karnataka, and Andhra Pradesh due to dietary habits, constipation, and sedentary lifestyle.

According to Harrison's Principles of Internal Medicine, hemorrhoids develop due to increased venous pressure, vascular congestion, and connective tissue degeneration. The main clinical feature is painless bright red bleeding during defecation, which may lead to anemia and reduced quality of life. Though modern treatments are available, they often provide only symptomatic relief and are associated with recurrence, side effects, and high cost. Siddha formulations offer promising therapeutic potential due to their anti-inflammatory, hemostatic, and healing properties. Lavangapattai Kudineer is a traditional Siddha formulation used in bleeding disorders, but scientific validation is necessary. Therefore, the present study was undertaken to analyze Lavangapattai Kudineer using Gas Chromatography–Mass Spectrometry (GC-MS) to identify its phytochemical constituents and evaluate its potential in managing bleeding hemorrhoids.

2. Materials and Methods

Drug Reference: Sarabendra Vaithiya Muraigal (Soolai,Moola,Kushta,Pitha roga muraigal)

Indication: Raththa Moolam

Drug Ingredients:

Drug Name	Botanical Name	Family	Part used
LAVANGAPATTAI	Cinnamomum veerum	Lauraceae	Bark
MARAMANJAL	Coscinium fenestratum	Menispermaceae	Wood
VILAMICHU VER	Plectranthus vettiveroids	Poaceae	Root

Authentication and purification:

The raw drugs required for the preparation of Lavangapattai Kudineer, namely Lavangapattai, Maramanjal, and Vilamichu Ver, were procured from a recognized country raw drug store in Thuckalay. The collected raw drugs were authenticated by experts in the Department of Gunapadam, Government Siddha Medical College and Hospital, Palayamkottai, Tirunelveli.

Purification of the drugs was carried out as per Siddha classical guidelines. Each of the raw drugs was subjected to mild roasting (Ilam Varuppu) separately to remove moisture and enhance their medicinal quality. The outer cork layer of Maramanjal was removed before processing. All the purified drugs were then dried properly and coarsely powdered to obtain Kudineer Chooranam consistency suitable for decoction preparation.

Method of GC-MS:

Derivatization procedure

For the crude ethanol extracts, a small amount of concentrated sample was taken in a separating funnel and shaken by adding water and ethyl acetate in the ratio of 1:4. The upper layer was collected and concentrated in rotary evaporator to about 1.5 ml. Added 100µl N, O-Bis(trimethylsilyl)trifluoroacetamide and trimethyl chlorosilane (BSTFA+TMCS) and 20µl pyridine and heated at 60°c for 30 minutes.

For the layers which are separated from the crude extracts, a small amount of extract was taken and evaporated out totally. To this added acetonitrile and filtered into a conical flask. To the filtrate added 50µl BSTFA+TMCS and heated at 60°c in a water bath for 30 minutes. Filtered using 0.45µ membrane filter to a vial.

GC-MS Procedure

Gas chromatography (GC) analysis was carried out using Agilent 6890N gas chromatography equipped with photon multiplier tube as detector coupled to front injector type 1079. The chromatograph was fitted with HP 5 MS capillary column (30 m ×0.25 mm i.d., film thickness 0.25 _m). The injector temperature was set at 250°C, and the oven temperature was initially at 70 °C hold for 4 mins then programmed to 200°C at the rate of 10°C/min and finally held at 200 °C for 13 min. Helium was used as a carrier gas with the flow rate of 1.5 ml/min. 0.2 microlitre of the Drugs PAS/UAS (diluted with methanol 1:10) were injected in the splitless mode. GC–mass spectrometry (GC–MS) analysis of sample was performed using Agilent gas chromatography equipped with JEOL GC MATE-II HR Mass Spectrometer. GC conditions were the same as reported for GC analysis and the same column was used. The mass spectrometer was operated in the electron impact mode at 70 eV. Ion source and transfer line temperature was kept at 250°C. The mass spectra were obtained by centroid scan of the mass range from 50 to 600 amu. The compounds were identified based on the comparison of their retention indices (RI), retention time (RT), mass spectra of WILEY, NIST library data of the GC-MS system and literature data (Adams, 2009).

3. Results and Discussion

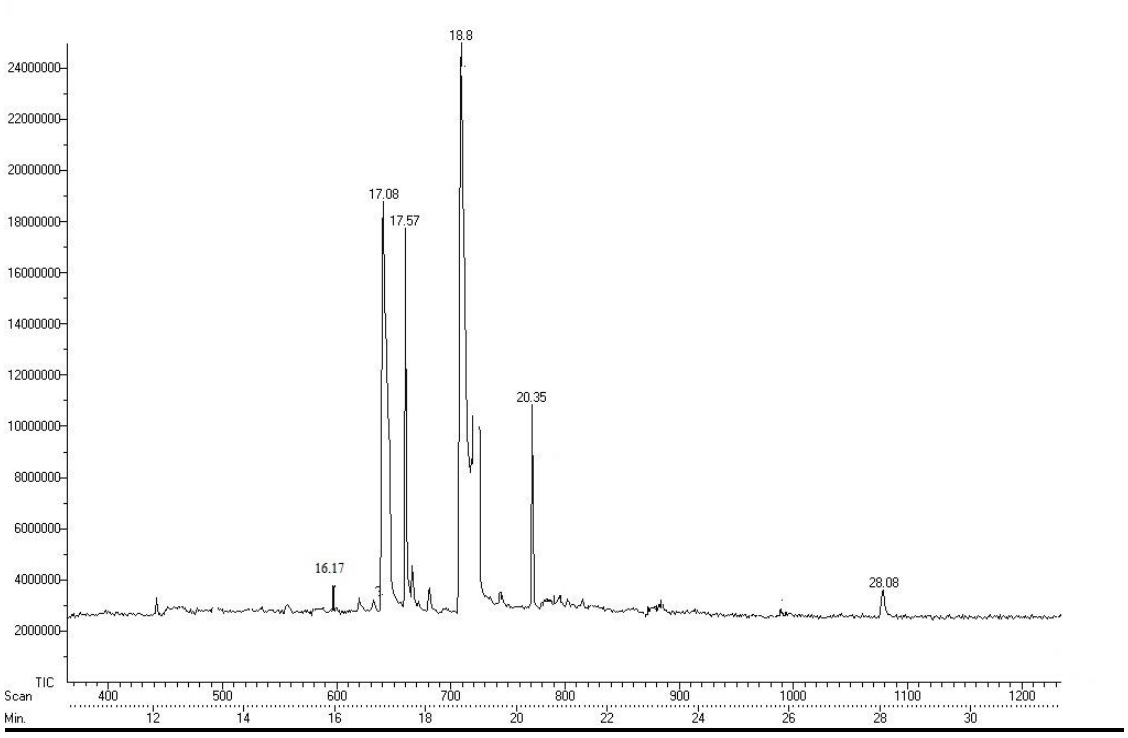

Figure 3.1 GC-MS profile of Lavangapattai Kudineer

Table 3.1 Bio active compounds of Lavangapattai Kudineer

S.NO	Retention time	Molecule identified in NIST Library
1.	16.17	Octacosanol
2.	17.08	Hexadecanoic acid, methyl ester
3.	17.57	2-cyclohex-1-enyl-ethyl-4,6-dimorpholino-1,3,5-triazin-2-yl amine

4.	18.8	9,12-octadecadienoic acid (Z,Z)
5.	20.35	Elaidic acid isopropyl ester
6.	28.08	propanoic acid, 2-(3-acetoxy-4,4,14-trimethyl androst-8-en-17-yl)

From the fig 3.2, Octacosanol has anti-inflammatory, antioxidant, and membrane-stabilizing properties that are beneficial in bleeding hemorrhoids, where inflammation and increased venous pressure cause dilation and rupture of rectal veins. It helps reduce bleeding by decreasing inflammatory mediators, protecting vascular endothelial cells from oxidative damage, and improving the strength and integrity of blood vessel walls, thereby reducing capillary fragility and permeability. Additionally, it promotes tissue repair and healing of damaged mucosa, supports venous tone, and prevents further rupture of hemorrhoidal veins, ultimately controlling bleeding and aiding recovery.

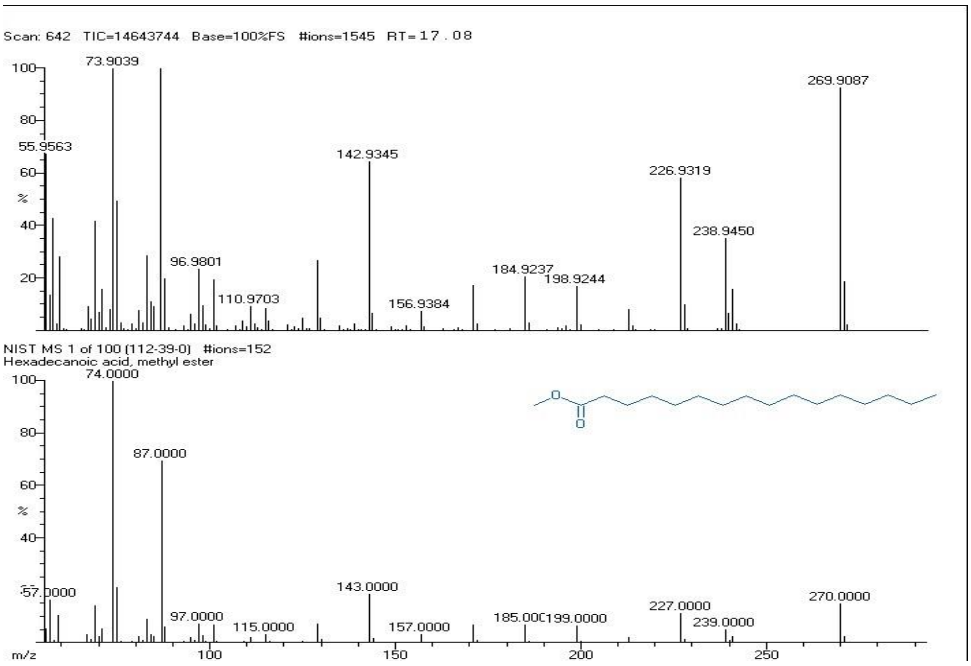

Fig 3.3 Hexadecanoic acid, methyl ester

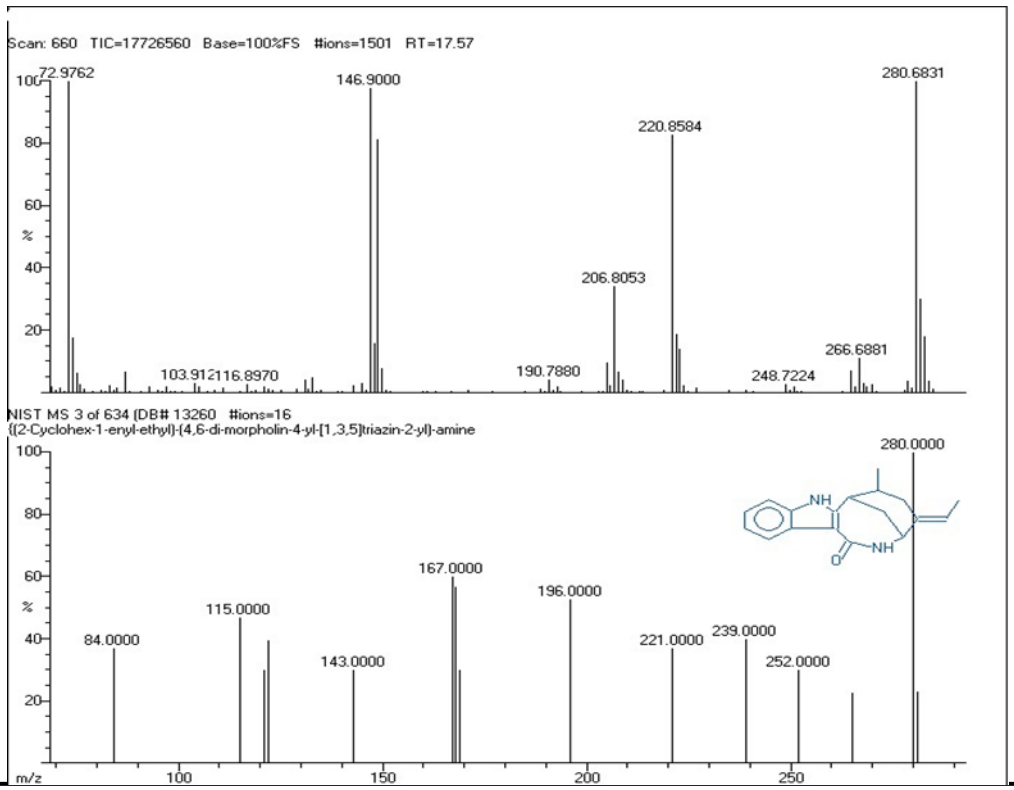

Fig 3.4 2-cyclohex-1-enyl-ethyl-4,6-dimorpholino-1,3,5-triazin-2-yl amine

above fig 3.4 indicate the presence of 2-cyclohex-1-enyl-ethyl-4,6-dimorpholino-1,3,5-triazin-2-yl amine, a nitrogen-containing heterocyclic compound. This compound may offer therapeutic potential in the management of bleeding hemorrhoids owing to its anti-inflammatory and tissue-protective properties. By suppressing the production and release of inflammatory mediators, it may reduce edema and venous swelling, thereby alleviating venous congestion and lowering intrarectal vascular pressure, which helps in controlling bleeding. In addition, its probable antioxidant activity may safeguard vascular endothelial cells against oxidative damage and facilitate repair of the affected mucosal tissue.

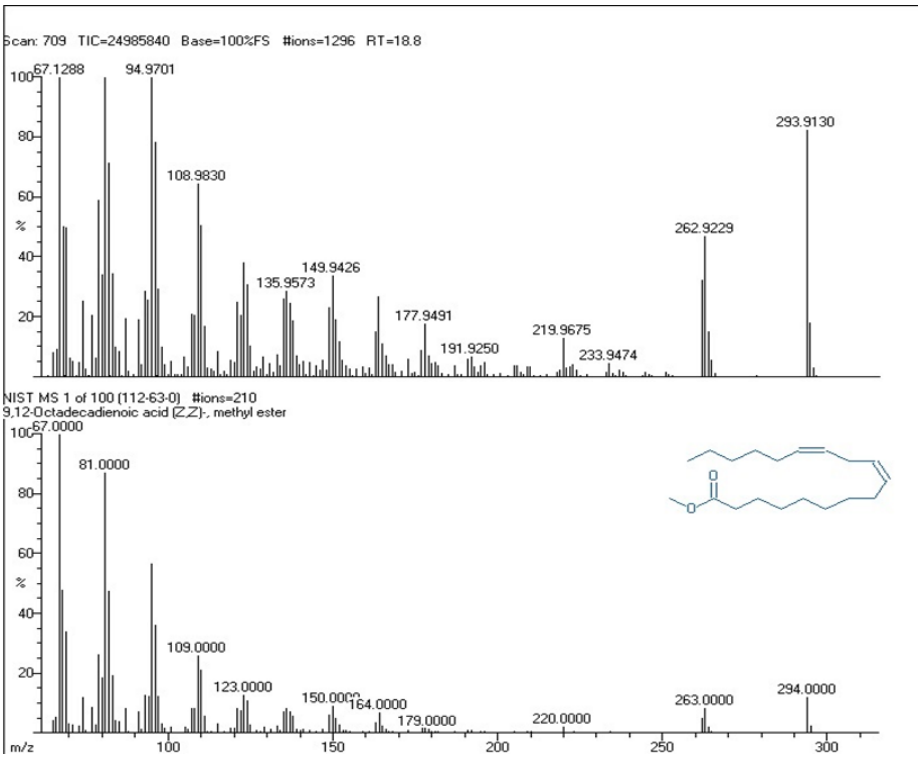

Fig 3.5 9,12-octadecadienoic acid (Z,Z)

The GC–MS analysis fig 3.5 showed the presence of 9,12-octadecadienoic acid (Z,Z), methyl ester (methyl linoleate), which is an unsaturated fatty acid methyl ester with molecular ion peak at m/z 294. This compound helps in bleeding hemorrhoids mainly by reducing inflammation and promoting healing. It also strengthens blood vessel walls and improves capillary stability, thereby reducing bleeding. In addition, it promotes repair of damaged tissues and supports faster healing of the affected area. Thus, this compound contributes to the anti-hemorrhoidal activity by anti-inflammatory, vascular protective, and wound healing actions.

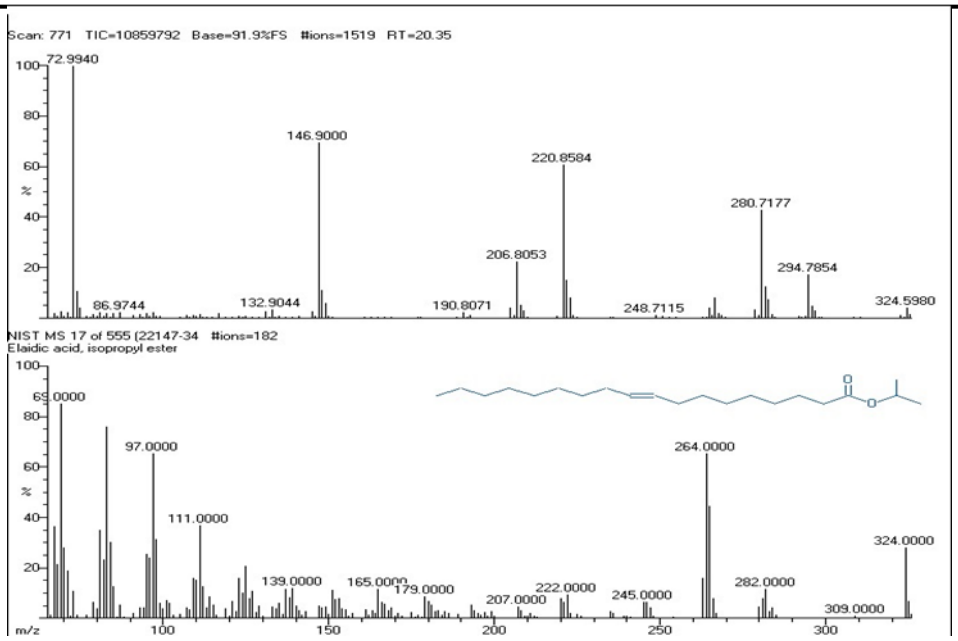

Fig 3.6 Elaidic acid isopropyl ester

The fig 3.6 indicating the presence of Elaidic acid isopropyl ester, a fatty acid ester. This compound is reported to exhibit anti-inflammatory, antioxidant, and membrane-stabilizing properties, which are particularly beneficial in the management of bleeding hemorrhoids. In hemorrhoidal pathology, inflammation and venous congestion lead to dilation, increased capillary fragility, and rupture of anorectal veins. Elaidic acid isopropyl ester may contribute to hemostatic control by suppressing inflammatory mediators, reducing oxidative stress–induced endothelial damage, and stabilizing cellular membranes, thereby decreasing vascular permeability and capillary fragility. Furthermore, it may enhance venous wall integrity, alleviate edema, and facilitate repair of damaged anorectal tissues, ultimately helping to prevent recurrent vascular rupture and promote healing.

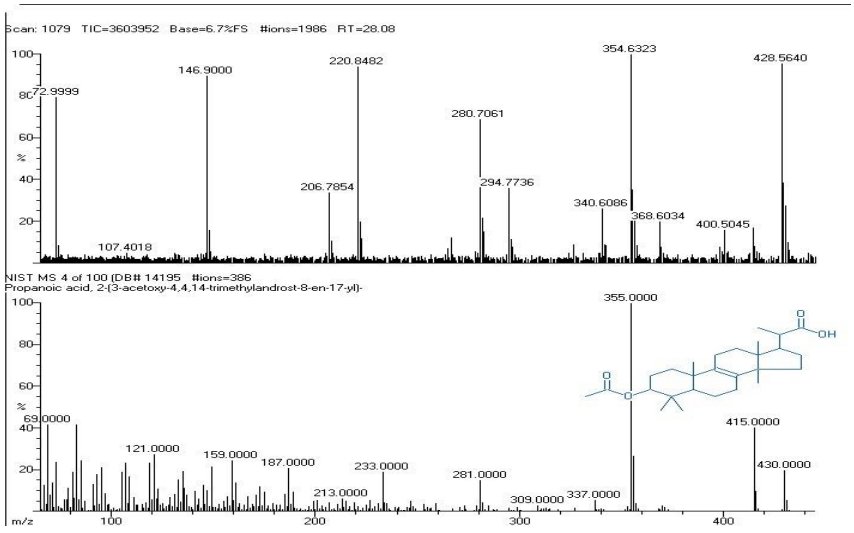

Fig 3.7 propanoic acid, 2-(3-acetoxy-4,4,14-trimethyl androst-8-en-17-yl)

The fig 3.7 indicating the presence of propanoic acid, 2-(3-acetoxy-4,4,14-trimethyl androst-8-en-17-yl), a steroidal derivative. Steroid-like compounds are widely recognized for their potent anti-inflammatory and membrane-stabilizing activities, which are particularly advantageous in the management of bleeding hemorrhoids. Additionally, it may facilitate tissue repair, improve venous tone, and protect the integrity of anorectal vasculature, ultimately preventing further vascular rupture and promoting healing of hemorrhoidal lesions.

4.Conclusion

The comprehensive phytochemical investigation of Lavangapattai Kudineer through GC–MS analysis revealed the presence of diverse bioactive constituents that possess significant anti-inflammatory, antioxidant, membrane-stabilizing, and tissue-protective properties. These pharmacological activities are highly relevant to the pathogenesis of bleeding haemorrhoids, which involves inflammation, oxidative stress, venous congestion, and vascular fragility. The identified compounds may contribute to reducing inflammatory mediators, protecting vascular endothelial integrity, decreasing capillary permeability, enhancing venous tone, and promoting mucosal healing, thereby controlling bleeding and preventing further vascular damage. Thus, the present findings provide scientific support for the traditional therapeutic use of Lavangapattai Kudineer in bleeding haemorrhoids and offer a strong basis for further experimental and clinical validation of its efficacy and safety.

5.References

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