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Research Article

Analytical Profiling and Phytochemical Evaluation of Devdarvyadi Dhoomavarti using HPTLC and GCMS

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Abstract

Dhoomapana (medicated smoking) is a fumigation technique mentioned in *Ayurveda* for ENT and respiratory disorders. *Devadarvyadi Dhooma Varti* containing *Devadaru*, *Bala* & *Jatamansi* is one such traditional Ayurvedic formulation mentioned in *Bhavaprakasha* which is used for *Dhoomapana* (medicated smoking) therapy, primarily indicated for disorders of the head, neck & respiratory system. Despite its therapeutic importance, advanced phytochemical characterization of this formulation remains insufficiently explored. As limited analytical studies are available on *Devdarvyadi Dhoomavarti*, establishment of its analytical profile and phytochemical fingerprint becomes important for standardization and quality control. The formulation was prepared following this classical reference using authenticated raw drugs. Gas Chromatography Mass Spectrometry (GCMS) and High Performance Thin Layer Chromatography (HPTLC) of the formulation were done to analyze its phytoconstituents along with volatile oil content and fume carbon content. The GCMS analysis revealed the presence of various bioactive compounds. These include sesquiterpenes, phenolics, and fatty acid derivatives, like ephedrine, sesquiterpenes, valeranone, jatamansone, nardostachone, himachalene & cedrol which have been previously reported in phytochemical literature. HPTLC profiling suggested the presence of cedrol, himachalol, vasicinone, ephedrine, jatamansone, valerenic acid, etc. The combined application of GCMS and HPTLC demonstrates the presence of multiple phytoconstituents useful for analytical profiling, quality control and standardization of Devdarvyadi Dhoomavarti. Fume carbon content and volatile oil content which was calculated reflected the values under acceptable limits.

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Keywords: *Devadarvyadi Dhooma Varti*, Ayurveda, GCMS, HPTLC

Introduction

The eight limbs of *Ayurveda* popularly called as *Ashtanga Ayurveda* (1) contains a distinct branch called as *Urdhwanga Chikitsa*, which means treatment regarding organs of the upper body parts above the clavicle. Various *Karmas* are advised for these body parts which include *Nasya, Anjana*, *Dhoomapana,* etc. *Dhoomapana* is one such method which can be considered as medicated fumigation. In this the fumes emanating from the medicine or *Dhooma* is to be inhaled either from mouth or from nasal route (2). A special *Varti* called as *Dhoomapana Varti* is used for this purpose. One such formulation mentioned in Bhavapraksha Samhita is *Devadarvyadi Dhooma Varti* (3). The ingredients include *Devadaru*, *Bala* and *Jatamansi* in equal proportion. It was prepared and its quality control analysis including HPTLC and GCMS was done to identify the phytochemical constituents present in these in order to use it further for clinical studies. Total volatile oil content and fume carbon content of the *Dhooma Varti* was also done to analyze the oil and carbon proportion after ignition.

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Materials and Methods

The study was conducted in two phases namely pharmaceutical preparation and analytical evaluation.

Pharmaceutical preparation of *Devadarvyadi Dhoomavarti*

The dried rhizomes of *Devadaru (Cedrus deodara)*, *Bala (Sida cordifolia Linn)* and *Jatamansi* (*Nardostachys jatamansi*) were procured from a certified *Ayurvedic* pharmacy. The Post Graduate department of Dravaguna Vigyana & Department of Rasashastra & Bhaishajya Kalpana confirmed the authenticity of the plant materials. Voucher specimens were maintained in the departmental repository for future reference.

All the ingredients were finely powdered and *Kalka* was prepared out of it by adding little bit of water. A wick was prepared out of the mixture of about 8.9 cm in length and 1.92 cm in breadth. This was dried in hot air oven at 45 °C for six hours till it dried completely. This *Varti* was then sent for further analysis. (Refer Fig 1.)

Figure 1: Prepared *Devdarvyadi Dhoomavarti*

Table 1: Organoleptic characteristics of *Devadarvyadi Dhooma Varti*

Color	Light brownish grey
Odor	Aromatic
Consistency	Solid
Shape	Cylindrical
Size	8.9 cm × 1.92 cm

HPTLC Analysis

Sample Preparation

For HPTLC analysis, 1 g of each powder was diluted with methanol in a 1:1 ratio.

HPTLC Procedure (4)

High-Performance Thin Layer Chromatography (HPTLC) analysis was conducted using a CAMAG HPTLC system, which included an automatic sample applicator (Linomat 5), a developing chamber (ADC 2), a TLC Scanner 4, and Vision CATS software for data analysis. The stationary phase comprised HPTLC Silica gel 60 F254 plates (Merck), while the mobile phase consisted of a mixture of Toluene : Ethyl acetate : Glacial acetic acid (7:3:1, v/v/v) ratio. Sample application was performed by applying 5.0 µL, 10.0 µL, 15.0 µL, 20.0 µL of the extract of *Dhoomavarti* as 8 mm bands on the plates. Following development, the plates were analyzed using a TLC Scanner 4 at detection wavelengths of 254 nm and 366 nm. Software called Vision CATS was used to process the resultant chromatograms, making it easier to record and interpret peak regions and retention factor (Rf) data.

Observation & Results

Peaks corresponding to phytoconstituents mentioned in literature such as himachalol, deodarone and jatamansone were presumptively assigned based on Rf values and published literature comparisons.

1. 7 to 9 peaks were observed at 254 nm and 4 to 6 peaks which were more distinct at 366 nm.
2. At 254 nm, major peaks were observed at Rf value ranging from 0.42–0.53, showing significant contribution (up to 31% of peak area)
3. Dominant bands appeared at **Rf** value ranging from **0.43–0.55**, contributing the highest peak areas (30–46%). Additional peaks at lower Rf values (0.13–0.21) and higher Rf (0.70–0.89) were observed in smaller proportions.
4. Peaks at Rf value ranging from 0.42–0.55 appear to be marker compounds, as they dominate in both 254 and 366 nm scans.
5. The dominant zone at Rf 0.42–0.55 was common across both wavelengths and volumes, possibly indicating contribution from sesquiterpene-rich fractions reported in Devdaru and Jatamansi.
6. *Bala's* alkaloids were represented by smaller peaks at lower Rf values (0.20–0.32), reflecting their presence in minor but significant amounts.
7. The fluorescent peaks at higher Rf (0.70–0.89) further suggest the presence of volatile sesquiterpenes from *Jatamansi*.

Table 2: Consolidated table for HPTLC interpretation - Reference standards for individual phytoconstituents were not employed in the present study. Hence, compound identification was done on a presumptive basis using Rf values, fluorescence characteristics and available literature reports.

Rf Value	Observation	Compounds	Plant source
0.20–0.32	Small peaks (2–8% area) at 254 nm	Alkaloidal compounds corresponding to literature reports.	*Bala*
0.42–0.55	Dominant peaks at both 254 & 366 nm (25–46% area)	Sesquiterpene compounds corresponding to literature reports	*Devdaru* & *Jatamansi*
0.64–0.70	Moderate peaks at 254 nm	Resinous lignans/ terpenoids	*Devdaru*
0.70–0.89	Fluorescent peaks at 366 nm (10–14% area)	Sesquiterpene-like compounds corresponding to literature reports	*Jatamansi*
0.13–0.21	Minor peaks at 366 nm	Phenolics, Coumarin derivatives	*Jatamansi, Bala*

GCMS Analysis

Sample Preparation

Approximately 50 mg of powdered formulation was dissolved in 1 mL of HPLC-grade methanol and sonicated for 10 minutes. The solution was then filtered through a 0.22 µm membrane filter and transferred to a GC vial for analysis.

GCMS Procedure (5)

Previously published methods were adopted for GCMS analysis. The instrument used for the present study was Gas Chromatography and mass spectrometry (GCMS) with make of Perkin Elmer and model of Autosystem XL with Turbo mass. The column employed was Elite-5MS with dimensions as 30 meters × 0.250mm × 0.250um. Using injection in the volume of two microliters while keeping the temperature of injector at 260°C, Helium was employed as the carrier gas at an ongoing rate of flow of 1 mL/min. The oven was set to increase 10°C/min from 75°C

(for 5 minutes) to 280°C, then descend for ten minutes while maintaining that level of temperature. The instrument was operated for forty-five minutes, collecting mass spectra at a scan range of 20 to 610 amu.

Fig. 2 HPTLC chromatogram at 254 nm (5 µL)

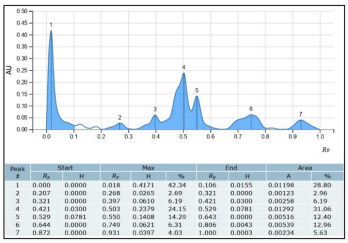


Fig. 3 HPTLC chromatogram at 254 nm (10 µL)

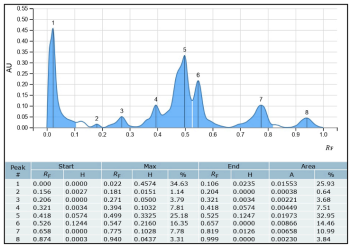


Fig. 4 HPTLC chromatogram at 254 nm (15 µL)

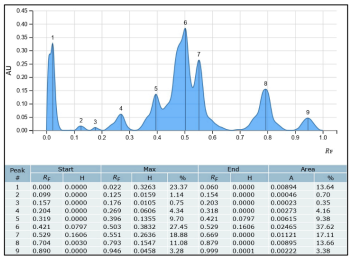


Fig. 5 HPTLC chromatogram at 254 nm (20 µL)

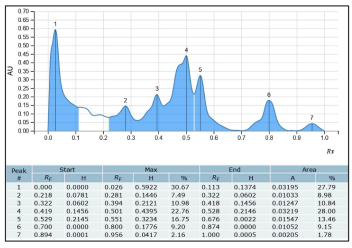


Fig. 6 HPTLC chromatogram at 366 nm (5 µL)

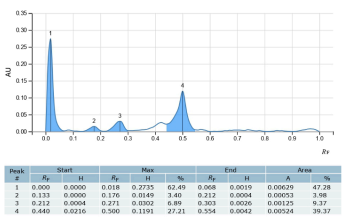


Fig. 7 HPTLC chromatogram at 366 nm (10 µL)

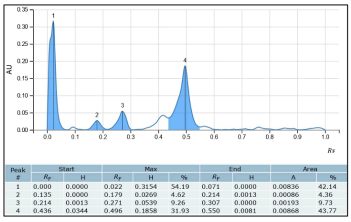


Fig. 8 HPTLC chromatogram at 366 nm (15 µL)

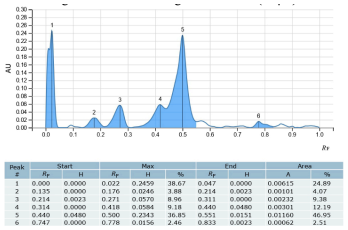
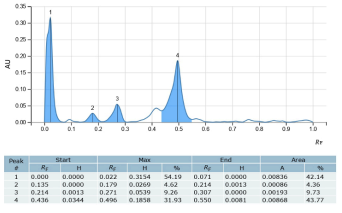


Fig. 9 HPTLC chromatogram at 366 nm (20 µL)



Observation & Results

Tentative compound identification was performed by comparing mass spectra with available literature and spectral libraries.

1. Peak at 23.13–25.64 may correspond to compounds reported in literature like Jatamansone or Valeranone which is present in *Jatamansi*.
2. Peak at 1.63 min may correspond to the presence of low molecular weight compound like ephedrine present in *Bala*.
3. Peak at 28.49 min may correspond to presence of Himachalene or Cedrol present in *Devdaru*
4. Peak at 18.92 min may correspond to lighter sesquiterpenes or aromatic terpenes also present in *Devdaru*.

Figure 10: GCMS Chart of *Devadarvyadi Dhoomavarti*

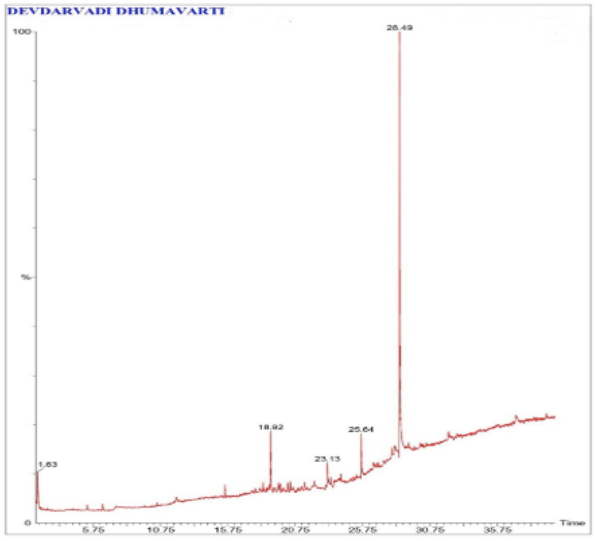


Table 3: Consolidated table for GCMS interpretation

Retention Time	Possible	Likely Source Herb
1.63	Ephedrine / light	*Bala*
18.92	Aromatic terpene /	*Devdaru or*
23.13	Valeranone or	*Jatamansi*
25.64	Jatamansone or	*Jatamansi*
28.49	Himachalene /	*Devdaru*

Total Volatile Oil & Fume Carbon Content

1. Volatile Oil Content Procedure (6)

50g of the sample was weighed and was added in 500ml rounded bottom flask. This flask was then connected to a Clevenger type apparatus and hydrodistillation was performed for 6 hrs. The oil was separated in connected arm of the apparatus. Its volume (V) was measured in ml. Finally, the volume of volatile oil obtained was calculated by the formula,

$$\text{Total Volatile Oil (\% w/w)} = \frac{\text{Volume of Oil (in ml) V} \times 100}{\text{Weight of sample (in g)}}$$

2. Fume Carbon Content Procedure (7)

A uniform piece of approximately 2g were cut from the *Dhooma Varti* to ensure uniform distribution of the composition. The initial weight (W_1) of the sample was measured carefully. The *Dhooma Varti* was burnt for a few seconds and a clean glass side was kept approximately 2 to 3 cm above the burning tip to collect the soot. The process was continued for one minute till the surface of the glass slide was uniformly coated with the soot. After the flame extinguishes the slide was allowed to cool and the weight of the soot was taken (W_2). It was calculated by the formula

$$\text{Total fume content (\% w/w)} = \frac{\text{Weight of residue}}{\text{Weight of sample}} \times 100$$

Observation & Results

1. Volatile Oil Content

$$\text{Total Volatile Oil (\% w/w)} = \frac{\text{Volume of Oil (in ml) V}}{\text{Weight of sample (in g) W}} \times 100$$

Here, V = 2.31ml, W =50g,

$$\text{Total Volatile Oil (\% w/w)} = \frac{2.31}{50} \times 100$$

$$= 4.62\%$$

2. Fume Carbon Content

$$\text{Total fume content (\% w/w)} = \frac{\text{Weight of residue/Soot}}{\text{Weight of sample}} \times 100$$

Here $W_1 = 2g$, $W_2 = 0.043$ g

$$\text{Total fume content (\% w/w)} = \frac{0.043}{2} \times 100$$

$$= 2.15\%$$

Table 4: Volatile oil and carbon content in *Devdarvyadi Dhoomavarti*

Parameters	Results
1. Total volatile oil	4.62%
2. Fume carbon content	2.15%

Discussion

The HPTLC analysis of *Devadarvyadi Dhoom Varti* revealed a characteristic chromatographic pattern indicating the polyherbal nature of the formulation. Dominant peaks observed within the Rf range of 0.42–0.55 were consistently present across different application volumes and wavelengths, suggesting presence of major sesquiterpene - rich fractions. Similar chromatographic patterns have been reported in previous phytochemical studies of *Devdar* (8) *Jatamansi* (9), and *Bala* (10). The observed fluorescent bands at higher Rf values may indicate volatile aromatic constituents contributing to the formulation profile.

The GC–MS analysis of *Devdarvyadi Dhoomavarti* demonstrated the presence of multiple volatile and semi-volatile phytoconstituents in the formulation. Peaks observed at different retention times indicated the presence of sesquiterpenes, aromatic compounds and alkaloidal constituents reported in the individual ingredients of the formulation. The peak observed at retention time 1.63 min may correspond to alkaloidal constituents reported in *Bala* (11). Similarly, peaks detected at retention times 23.13 min and 25.64 min may be attributed to sesquiterpene constituents such as valeranone and jatamansone, which have previously been reported in phytochemical studies of *Jatamansi* (12). A prominent peak observed at 28.49 min may correspond to cedrol or himachalene-type sesquiterpenes associated with *Devdaru* (13). The chromatographic profile obtained in the present study may therefore serve as a preliminary analytical fingerprint for *Devdarvyadi Dhoomavarti* and can be utilized for future standardization and quality control studies. However, the identification of compounds in the present study was tentative and based on retention behavior and literature comparison. Further confirmatory studies using reference standards and spectral validation are required for definitive characterization. The fume carbon content of 2.15% suggests the combustion quality of the *Dhoomapana Varti*. The relatively lower values of carbon content suggest good burning with minimum residue suggesting comparatively cleaner combustion with lower soot residue.

Limitations of the study

The present study was limited to preliminary analytical profiling of the formulation. Confirmatory identification using authenticated reference standards was not performed. Further pharmacological and clinical studies are necessary to establish therapeutic efficacy and safety of the formulation.

Conclusion

The present study establishes primary analytical standards and characteristic chromatographic fingerprinting of *Devdarvyadi Dhoomavarti* using HPTLC and GC–MS techniques. This formulation demonstrates the presence of multiple phytoconstituents corresponding to its polyherbal composition. These findings may serve as a reference for quality control, standardization and future pharmacological or clinical evaluation of *Devadarvyadi Dhoomavarti*.

Conflict of interest: None.

References

1. Vagbhaṭa. Aṣṭāṅga Hṛidaya. Balkrishna A, commentator. 1st ed. Haridwar: Divya Prakashan; 2014. Chapter 1, Verse 5, p. 5.
2. Vagbhaṭa. Aṣṭāṅga Hṛidaya. Balkrishna A, commentator. 1st ed. Haridwar: Divya Prakashan; 2014. Chapter 19, Verse 1, p. 421.
3. Murthy KRS. Bhava Prakasha Samhita. Vol. 2. Varanasi: Chaukhambha Krishnadas Academy; 2009. Shwasa Chikitsa 14/33, p. 716.
4. Jain A, Parashar A, Nema R, Narsinghani T. High-performance thin layer chromatography (HPTLC): A modern analytical tool for chemical analysis. Curr Res Pharm Sci. 2014;4:8-14.
5. Gas chromatography-mass spectrometry (GC-MS)-based phytochemical analysis and potential therapeutic evaluation of Vajra Guggulu in diabetic neuropathy. Afr J Biomed Res. 2025;28(1S):1323-1334. doi:10.53555/AJBR.v28i1S.6422.
6. Clevenger JF. Apparatus for the determination of volatile oil. J Am Pharm Assoc. 1928;17(4):345-349. doi:10.1002/jps.3080170407.
7. Characterization of emissions from burning incense [Internet]. Available from: https://www.researchgate.net/publication/11201840_Characterization_of_emissions_from_burning_incense. Accessed on: 25 May 2026 at 11:45 AM IST.
8. Sachin BS, Koul M, Zutshi A, Singh SK, Tikoo AK, Tikoo MK, et al. Simultaneous high-performance liquid chromatographic determination of Cedrus deodara active constituents and their pharmacokinetic profile in mice. J Chromatogr B Analyt Technol Biomed Life Sci. 2008;862(1-2):237-241. doi:10.1016/j.jchromb.2007.12.015.
9. Sushma, Kumar G, Kumar A, Behera B. Pharmacognostic standardization and HPTLC fingerprint profiling of Nardostachys jatamansi DC rhizome with comparative phytochemical analysis of extracts. J Adv Med Med Res. 2026;38(5):1-11. Available from: https://journaljammr.com/index.php/JAMMR/article/view/6130. Accessed on: 25 May 2026.
10. Khatoon S, Srivastava M, Rawat AKS, Mehrotra S. HPTLC method for chemical standardization of Sida species and estimation of the alkaloid ephedrine. J Planar Chromatogr Mod TLC. 2005;18:364-367. doi:10.1556/JPC.18.2005.5.5.

11. Sudhan A, Prabhu K, Jones S, Janaki CS, Sheriff D, Rao MR, et al. GC-MS analysis of the Ayurvedic oil Balaswagandhadi Tailam. *J Pharm Bioallied Sci.* 2024;16(Suppl 5):S4717-S4722. doi:10.4103/jpbs.jpbs_839_24.
12. Nadig MR, Arbar AI, Veena K, Bammagol AN, Prakash S, Yarazarvimath T. Pharmaceutical analysis and gas chromatography-mass spectrometry (GC-MS) profiling of phytoconstituents in Jatamansyadi Taila for potential use in neurobehavioral and neurodevelopmental conditions. J Ayurveda Holist Med. 2025;13(10):26-39. doi:10.70066/jahm.v13i10.2082.
13. Kumar S, Mitra B, Kashyap S, Kumar S. Physicochemical Properties, GC-MS
14. Analysis and Impact of Different Material Size on Yield of Himalayan C. deodara Essential Oil. Pharmacog Res. 2022;14(2):181-7.

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