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Standardization and Phytochemical Profiling of *Rasnadi Basti* using Physicochemical Parameters and HPTLC Analysis

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Abstract

Rasnadi Basti, a classical Ayurvedic medicated decoction enema indicated in *Prameha* and other metabolic disorders, was analytically evaluated to establish standardized quality control parameters. The formulation was prepared according to classical guidelines using authenticated raw drugs, followed by assessment of organoleptic and physicochemical parameters as per pharmacopoeial standards and HPTLC fingerprinting of the methanolic extract using Toluene:Ethyl acetate: Formic acid (5:4:1 v/v/v) as the mobile phase at 254 and 366 nm. The formulation exhibited brown colour, characteristic odour, and uniform consistency, with specific gravity of 1.0915, total ash 9.41%, acid-insoluble ash 3.20%, pH 4.7, and total solid content 70.78%. HPTLC profiling revealed multiple phytoconstituents, including gallic acid, glycyrrhizin, ellagic acid, berberine-like alkaloids, and piperine. These findings establish a characteristic analytical profile of *Rasnadi Basti* and support its quality, purity, consistency, and standardization.

Key words : Diabetes Mellitus; HPTLC; *Panchakarma*; Phytochemical Analysis; *Prameha; Rasnadi Basti*; Standardization

R*asnadi Basti* is a classical Ayurvedic formulation indicated in conditions such as *Prameha* (diabetes mellitus), *Krimi, Kushtha, and Kapha-Vata* disorders, as described in *Charaka Samhita (Siddhisthana* 3/61–64). In Ayurveda, *Prameha* is considered a *Tridoshaja Vyadhi* with predominance of *Kapha* and *Vata dosha*, requiring therapies that facilitate *Shodhana* and *Dosha Shamana*.[1]

Basti, a principal *Panchakarma* therapy, plays a key role in managing *Vataja* and metabolic disorders by acting on the *Pakwashaya*, the primary seat of *Vata*. As a *Niruha Basti*, *Rasnadi Basti* exhibits *Deepana, Lekhana,* and *Shodhana* actions, helping regulate *Agni*, eliminate vitiated *Doshas*, and restore metabolic homeostasis in conditions such as *Prameha*.[5]

Standardization of Ayurvedic formulations using modern analytical techniques is essential to ensure their quality, safety, and consistency. HPTLC facilitates phytoconstituent identification and development of characteristic fingerprints for quality control. Therefore, the present study aimed to analytically evaluate *Rasnadi Basti* using modern methods, validate its traditional use in *Prameha* (diabetes mellitus), and establish standardized quality parameters, thereby integrating Ayurvedic principles with contemporary scientific validation.

Aim & Objectives

Aim:

- To conduct a comprehensive analytical evaluation of *Rasnadi Basti* using modern techniques to validate its traditional use in *Prameha* (diabetes mellitus) and to establish standardized quality control parameters.

The specific objectives of the study are as follows:

1. To establish the authenticity of *Rasnadi Basti* through organoleptic evaluation and preliminary qualitative phytochemical analysis.
2. To evaluate physicochemical parameters, including specific gravity, ash values, and extractive values, to ensure quality, purity, and consistency across batches.
3. To carry out HPTLC profiling for the identification of key phytoconstituents and to develop a standardized chromatographic fingerprint for quality assurance.

This study integrates traditional Ayurvedic knowledge with modern analytical validation to enhance scientific credibility, ensure quality control, and promote wider acceptance of *Rasnadi Basti*.

Drug review :

Table-1. Ingredients of Rasnadi Basti[1]

Sl.No.	Ingredient	Ingredients	Latin/English Name	Quantity
1	*Saindhava Lavana*	*Saindhava Lavana*	Rock Salt	12 g
2	*Madhu*	Honey	Honey	140 mL
3	*Sneha*	*Murchita Tila Taila*	Medicated *Sesamum indicum* (Sesame oil)	100 mL
4	*Madanphaladi Kalka* (Paste)	*Madanaphala, Sugandhavala, Yashtimadhu, Pippali, Priyangu, Shatapushpa, Rasanjana, Shweta Vacha, Vidanga, Kalinga, Patha, Musta*	*Randia dumetorum, Valeriana wallichii, Glycyrrhiza glabra, Piper longum, Callicarpa macrophylla, Anethum sowa*, etc.	30 g
5	*Rasnadi Kwatha* (Decoction)	*Rasna, Eranda, Guduchi, Nimba, Patola, Patha, Katuki, Kirata, Vidanga, Daruharidra, Saptaparna, Usira, Devadaru, Aragvadha, Mushakakarni, Dashamula, Musta, Trayamana, Shigru, Triphala*	*Pluchea lanceolata, Ricinus communis, Tinospora cordifolia, Azadirachta indica,* etc.	200 mL
6	*Gomutra*	Cow's urine	—	100 mL

Stepwise Detailed Method for the Preparation of Rasnadi Basti :

Collection and Authentication of Raw Drugs :

All raw drugs were procured from a GMP-certified Ayurvedic pharmacy and authenticated as per the standards of the *Ayurvedic Pharmacopoeia of India*.

Preparation of Rasnadi Basti[2]

Rasnadi Basti was prepared sequentially as per the classical method (Table-1). Honey and rock salt were mixed first, followed by *Moorchita Tila Taila*, *Madanphaladi Kalka*, and finally *Rasnadi Kashaya*. Each ingredient was thoroughly mixed to obtain a homogeneous formulation.

Quality Control and Testing :

1. *Organoleptic Characteristics :*
   - Colour: Brown
   - Odour: Characteristic
   - Consistency: Liquid
2. *Physico-Chemical Parameters :*

Table-2. Physico-chemical and Pharmacopoeial Parameters of Rasnadi Basti

Sr.No	Parameter	Value
1.	Specific Gravity	1.0915
2.	Total Ash Value (%w/w)	9.41%
3.	P^H Value	4.7
4.	Acid insoluble ash (%w/w)	3.20
5.	Spread ability	Good
6.	Total Solid content (%w/w)	70.78

High performance thin layer chromatography :

The methanolic extract of *Rasnadi Basti* was prepared by sonicating 5 g of sample with 100 mL methanol for 16 hours, followed by filtration through Whatman filter paper and a 0.45 µm membrane filter. The filtrate was applied as 6 mm bands on silica gel 60 F254 TLC plates (10 × 10 cm) using a CAMAG Linomat 5 applicator. Chromatographic development was performed in a pre-saturated twin-trough chamber using Toluene:Ethyl acetate: Formic acid (5:4:1 v/v/v) as the mobile phase, up to 8 cm. The developed plates were air-dried and scanned at 254 and 366 nm using a CAMAG TLC Scanner 3 with winCATS 4 software to obtain the characteristic HPTLC fingerprint profile.

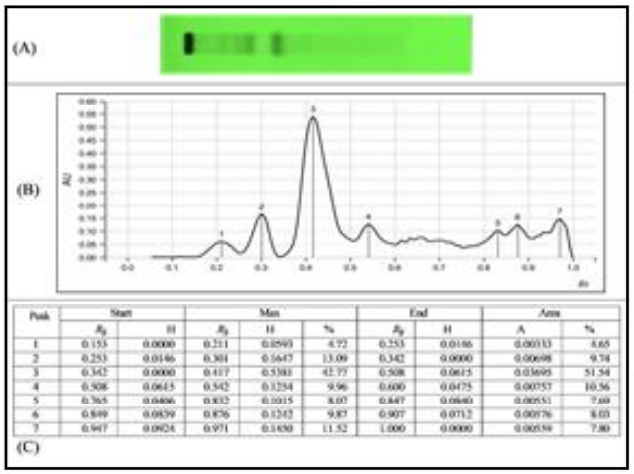

Figure 1. HPTLC Chromatogram of Rasnadi Basti at UV 254 nm (A=Fingerprint, B= Peak height, C= Rf value and area percentage)

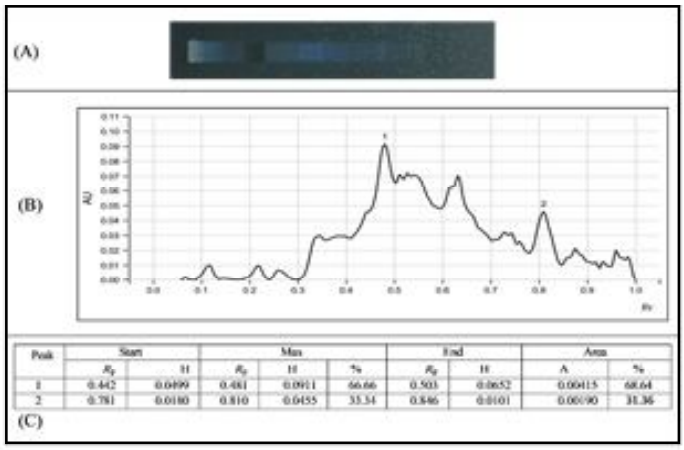

Figure 2. HPTLC Chromatogram of Rasnadi Basti at UV 366 nm (A=Fingerprint, B= Peak height, C= Rf value and area percentage)

Figure 2 depicts the HPTLC chromatograms of the formulation at UV 254 nm and UV 366 nm, respectively, using the specified mobile phase. The corresponding Rf values of the resolved components are also presented.

Outcome :

The organoleptic evaluation of *Rasnadi Basti* showed a brown-coloured liquid with characteristic odour and uniform consistency, indicating proper formulation and homogeneity.

The physicochemical parameters (Table-2) were found to be within acceptable limits as per the standards of the Ayurvedic Pharmacopoeia of India. The specific gravity was 1.0915, indicating suitable density for administration. The total ash value (9.41%) and acid-insoluble ash (3.20%) suggested the presence of inorganic constituents with minimal contamination. The pH value (4.7) indicated a mildly acidic nature, while the total solid content (70.78%) reflected a high concentration of dissolved constituents. The formulation also exhibited good spread ability, indicating appropriate consistency.

Table-3. Phytoconstituents Identified via HPTLC (Based on Rf values) and Their Plant Sources

Rf Value (Approx.)	Probable Phytochemicals	Probable Plant Sources (from formulation)	Probable Pharmaco-logical Activities
0.211	Gallic acid	*Pluchea lanceolata* (DC.) Clarke (Rasna)	Antioxidant, antidiabetic, anti-inflammatory
0.301	Glycyrrhizin[6]	*Glycyrrhiza glabra* L. (Yashtimadhu)	Anti-inflammatory, hepatoprotective, immunomodulatory
0.417	Ellagic acid[9]	*Pluchea lanceolata* (DC.) Clarke (Rasna)	Antioxidant, antidiabetic, anticancer

0.542	Berberine[3]	*Berberis aristata* DC. (Daruharidra)	Antidiabetic, antimicrobial, anti-inflammatory
0.832	Piperine[7]	*Piper longum* L. (Pippali)	Bioavailability enhancer, anti-inflammatory, digestive stimulant
0.481	Phenolic compounds[4]	*Tinospora cordifolia*, (Thunb.) Miers *Azadirachta indica*, A. Juss *Pluchea lanceolata* (DC.) Clarke (Rasna)	Antioxidant, anti-inflammatory, immunomodulatory
0.810	Piperine[8]	*Piper longum* L. (*Pippali*)	Bioenhancer, analgesic, anti-inflammatory

HPTLC profiling (Table IVIVII) revealed multiple distinct spots at different Rf values under UV 254 nm and 366 nm. The detected phytoconstituents included gallic acid, glycyrrhizin, ellagic acid, berberine-like alkaloids, piperine, and other phenolic compounds, confirming the presence of diverse bioactive constituents in the formulation. These findings establish a characteristic chromatographic fingerprint for *Rasnadi Basti*.

The findings demonstrate that *Rasnadi Basti* possesses satisfactory organoleptic and physicochemical properties, complying with pharmacopoeial standards and indicating good quality and consistency. HPTLC profiling showed multiple well-resolved peaks at 254 and 366 nm, confirming the presence of diverse phytoconstituents, including gallic acid, glycyrrhizin, ellagic acid, berberine-like alkaloids, and piperine. These compounds exhibit antioxidant, anti-inflammatory, insulin-sensitizing, and bioavailability-enhancing activities, potentially contributing to the formulation's antidiabetic effects. *Rasna* (*Pluchea lanceolata*) further contributes anti-inflammatory and *Vatahara* properties.

From an Ayurvedic perspective, *Rasnadi Basti*, as a *Niruha Basti*, may exert *Deepana, Lekhana,* and *Shodhana* actions, aiding in the regulation of *Agni*, reduction of *Kleda*, and elimination of vitiated *Doshas*. The combined physicochemical and HPTLC findings establish a reproducible quality profile and provide analytical support for the therapeutic potential of *Rasnadi Basti* in *Prameha*.

Inference :

The study establishes a comprehensive analytical profile of *Rasnadi Basti* through organoleptic, physicochemical, and HPTLC evaluation, confirming its quality, purity, and consistency as per pharmacopoeial standards. The presence of bioactive phytoconstituents supports its traditional use in *Prameha* (diabetes mellitus). The developed chromatographic fingerprint aids standardization, while integration of Ayurvedic principles with modern techniques enhances scientific credibility and

promotes wider acceptance in contemporary healthcare.

Abbreviations:

HPTLC : High-Performance Thin-Layer Chromatography**; Rf:** Retardation factor**; UV:** Ultraviolet**; nm:** Nanometer**; g:** Gram**; mL:** Milliliter**; pH:** Potential of Hydrogen**; w/w:** Weight by weight**; GMP:** Good Manufacturing Practice**; AMPK:** AMP-activated protein kinase**; API:** Ayurvedic Pharmacopoeia of India**. v/v/v**: Volume by volume by volume; **CAMAG:** Company for Analytical Measuring Systems (Chromatography equipment manufacturer).

Declaration of generative AI in scientific writing :

The authors utilized ChatGPT for language editing assistance. After use of AI, they thoroughly reviewed and refined the content, taking full responsibility for the final publication.

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