

PHARMACOGNOSTICAL, PHYSICOCHEMICAL AND THIN LAYER CHROMATOGRAPHIC EVALUATION OF RASA MEDAPACHAKA TABLET

Snehal Raskar^{*1}, Darshna H. Pandya², Harisha C. R.³, Arjun Pandya⁴

¹PG Scholar, ²Professor and Head, Department of Rog Nidan Evam Vikriti Vigyan, ITRA, Jamnagar.

³Head of Pharmacognosy Department, ITRA Jamnagar.

⁴PhD Scholar Department of Pharmaceutical Chemistry, ITRA Jamnagar.

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***Corresponding Author: Snehal Raskar**

PG Scholar, Department of Rog Nidan Evam Vikriti Vigyan, ITRA, Jamnagar.

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ABSTRACT

Introduction: Dyslipidaemia is a major metabolic disorder associated with an increased risk of cardiovascular diseases. In Ayurveda, it may be understood in relation to *Medodushti* and *Medovruddhi*, where impairment of *Rasa* and *Meda Dhatu* contributes to disease progression. *Rasa Medapachaka* Tablet is a classical polyherbal formulation traditionally indicated for correcting *Apakva Rasa-Meda* conditions. Establishing quality standards for this formulation is essential because no official monograph is currently available. **Aim:** To establish pharmacognostical, physicochemical and thin layer chromatographic standards for *Rasa Medapachaka* Tablet. **Materials and Methods:** The raw drugs were identified and authenticated using standard pharmacognostical methods. The finished formulation was subjected to organoleptic, microscopic, physicochemical and TLC evaluation using standard analytical procedures. **Results:** Powder microscopy confirmed the presence of characteristic diagnostic features of all constituent drugs, indicating the authenticity of the formulation. Physicochemical evaluation revealed a pH of 6.33 ± 0.29 , hardness 1.60 ± 0.17 kg/cm², average tablet weight 432.63 ± 3.50 mg, disintegration time 28.70 ± 1.81 min, loss on drying $3.42 \pm 0.43\%$ w/w, total ash $4.27 \pm 0.27\%$ w/w, acid-insoluble ash $1.31 \pm 0.22\%$ w/w, water-soluble extractive $10.79 \pm 0.59\%$ w/v, and methanol-soluble extractive $18.70 \pm 0.84\%$ w/v. TLC fingerprinting generated characteristic chromatographic profiles with distinct R_f values under both 254 nm and 366 nm UV wavelengths. **Conclusion:** The present study establishes comprehensive pharmacognostical, physicochemical and chromatographic standards for *Rasa Medapachaka* Tablet. The generated data may serve as a reference for quality control, authentication and future standardization of this formulation.

KEYWORDS: *Rasa-Medapachaka* tablet, TLC, Pharmacognosy, Pharmaceutics.

INTRODUCTION

Dyslipidemia is a risk factor for the development of atherosclerotic cardiovascular diseases (ASCVD), which include coronary artery disease, cerebrovascular disease,

and peripheral artery disease.^[1] This condition is associated with several morbid manifestations. Worldwide, cardiovascular disease is now one of the most common causes of death.^[2] High cholesterol levels

are estimated to cause 18% of stroke, and 56% of ischemic heart disease that accounted to 4.4 million deaths, annually worldwide. An estimated 19.8 million people died from CVDs in 2022, representing approximately 32% of all global deaths. Of these deaths, 85% were due to heart attack and stroke. Over three quarters of CVD deaths take place in low- and middle-income countries. Out of the 18 million premature deaths (under the age of 70) due to noncommunicable diseases in 2021, at least 38% were caused by CVDs.^[3]

Statins are the most preferred agents for the treatment of dyslipidemia but they have side effect such as Nausea or indigestion, headache, constipation or flatulence, diarrhoea etc.^[4]

Dyslipidemia can be correlated with *Medovruddhi/Medodushti* in Ayurveda. Sushruta Samhita explains that *Sthaulya* and *Karshya* depend on *Rasa Dhatu*.^[5] Improper diet and lifestyle lead to *Agni Mandya*, producing *Apakva Ahara Rasa*, which further generates *Apakva Rasa Dhatu*. Since *Rasa* and *Meda* share similar *Panchabhautik Sanghatana*, this defective *Rasa* ultimately leads to *Apakva Meda Dhatu*. In *Medovaha Srotas Dushti Lakshanas* there is mention of *Sthaulya* – representing *Sthanastha Dushti* of *Meda* and *Prameha Purvarupa* – representing *Margastha Dushti*, clinically correlating with dyslipidemia.^[6] Thus, dyslipidemia can be understood as a *Margastha Medodushti* arising from *Apakva Meda Dhatu*.

Acharya Charaka advises *Dhatugata Jwara Chikitsa* with *Dhatu Pachaka Kashaya*.^[7] The herbs categorized under *Rasa Medapachaka Tablet* possess proven anti-dyslipidemic activity. Hence, in dyslipidemia caused by *Apakva Rasa-Meda*, *Rasa Medapachaka Tablet Kashaya* tablet can serve as an effective alternative, especially considering the known side effects of atorvastatin.

All ingredients of *Rasa Medapachaka Tablet* have anti-dyslipidemic properties.

- 1) *Holarrhena antidysenterica* - Showed improved liver and muscle glycogen and normalized serum lipid profile (↓TC, TG, LDL, VLDL; ↑HDL).^[8]

- 2) *Trichosanthes dioica* - The methanol extract of *T. dioica* has the hypolipidemic effect, which showed a decrease in Cholesterol, Triglycerides, VLDL, and LDL levels and an increase in HDL level in Wistar rats. It also has antioxidant properties.^[9]
- 3) *Picrorhiza kurroa* - *Picrorhiza kurroa* reduces serum cholesterol, triglycerides and lipid peroxidation, and improves lipid metabolism in high-fat diet and diabetic models.^[10]
- 4) *Swertia chirata* - Found useful in reduction of plasma level of LDL and VLDL as well as increase in level of HDL in experimental study.^[11]
- 5) *Tinospora cordifolia* - ↓ Total Cholesterol, LDL, VLDL and *Guduchi* downregulates hepatic HMG-CoA reductase (HMGCR) — the enzyme responsible for cholesterol synthesis→ Similar mechanism to statins.^[12]
- 6) *Santalum album* - Hypolipidemic activity of *Santalum album* as- Antioxidant Action, Improves Glucose Control, Increases HDL Levels, Reduces Hepatic Lipogenesis.^[13]
- 7) *Zingiber officinale* - Inhibition of Cholesterol Biosynthesis, Enhancement of LDL Clearance, Promotion of Reverse Cholesterol Transport, Reduction of Lipid Accumulation, Antioxidant and Anti-inflammatory Effects on Lipid Metabolism.^[14]

MATERIALS AND METHODS

Collection of Raw drugs

Raw drug of *Patola*, *Kutki*, *Kiratatikta*, *Amruta*, *Chandana* and *Shunthi* were procured from Pharmacy of I.T.R.A. Jamnagar. *Indrayava* was purchased from local market. All the raw drugs were identified and authenticated in Pharmacognosy laboratory of the institute. Drug was subjected to morphological, organoleptic study and powder microscopy as per the standard procedures.^[15]

Microscopic studies with and without stain to find out the lignified materials along with other cellular constituents was done. The microphotographs were taken under Carl Zeiss Trinocular microscope attached with camera. The ingredients and parts used in the preparation of the final products are listed in (Table no.1).

Table no. 1: Ingredients of *Rasa Medapachaka Tablet* Tablet.

No.	Drug	Latin Name	Part used	Quantity
1	<i>Indrayava</i>	<i>Holarrhena antidysenterica</i> (L.) Wall. ex A. DC.	Seed	1 part
2	<i>Patola</i>	<i>Trichosanthes dioica</i> Roxb.	Leaves	1 part
3	<i>Kutki</i>	<i>Picrorhiza kurroa</i> Royle ex. Benth.	Root	1 part
4	<i>Kiratatikta</i>	<i>Swertia chirata</i> Buch Ham.	Whole plant	1 part
5	<i>Guduchi</i>	<i>Tinospora cordifolia</i> (Thunb.) Miers	Stem	1 part
6	<i>Chandana</i>	<i>Santalum album</i> Linn	Heartwood	1 part
7	<i>Sunthi</i>	<i>Zingiber officinale</i> Roscoe.	Rhizome	1 part

PHARMACOGNOSTICAL EVALUATION

Raw drug was identified and verified with API, and was identified and authenticated by the pharmacognosy lab, ITRA, Jamnagar. The identification was carried out based on organoleptic features and microscopy. For

pharmacognostical evaluation, drugs studied under the Carl Zeiss Trinocular microscope with staining. The microphotographs were also taken under the microscope.^[16]

ORGANOLEPTIC STUDY

Rasa Medapachaka Tablet tablet was evaluated for organoleptic characters i.e., colour, odour, touch and taste as below. (Table no.2)

PHARMACEUTICAL EVALUATION

A. PHYSICO-CHEMICAL ANALYSIS

Physicochemical parameters of *Rasa Medapachaka Tablet* tablet like hardness test, weight variation test, loss on drying, water-soluble extract, methanol soluble extract, total ash, acid insoluble ash value, pH were determined in triplicate. *Rasa Medapachaka Tablet* tablet was further subjected to thin layer chromatography (TLC) study.^[1]

a) Hardness test

The hardness of *Rasa Medapachaka Tablet* tablets was determined using a Monsanto hardness tester. Randomly selected tablets were placed individually in the tester, and the force required to break each tablet was recorded. The average hardness was calculated and expressed in kg/cm².^[1]

b) Weight variation test

Twenty tablets of *Rasa Medapachaka Tablet* tablets were selected randomly and weighed individually using a digital analytical balance. The average weight was calculated, and the individual weights were compared with the average weight to determine the weight variation.^[2]

c) Loss on drying

Loss on drying was determined by accurately weighing the powdered samples of *Rasa Medapachaka Tablet* tablets and drying it in hot air oven at 105 °C until constant weight was obtained.^[3]

d) Water-soluble extractive value

Take about 5 gm of powdered drug was macerated with adding 100 ml of distilled water for 24 hours with occasional shaking during first six hours. Then filtered and 25 ml of filtrate was evaporated in previously weighed dish. The percentage of water-soluble extractive value was calculated.^[4]

e) Alcohol-soluble extractive value

In 100 ml alcohol 5 gm powdered drug was added and macerated for 24 hours with occasional shaking during first six hours. Then filtered and 25 ml of filtrate was evaporated and dried. The percentage of alcohol-soluble extractive value was calculated.^[5]

f) Total ash

Accurately weighed powdered sample of *Rasa Medapachaka Tablet* tablets was taken in previously weighed crucible then placed in muffle furnace for ignition at 450 °C until carbon free ash was obtained.^[6]

g) Acid insoluble ash

The total ash obtained was boiled with 6N hydrochloric acid, filtered and washed with distilled water until becomes chloride free using ashless filter paper. The residue was incinerated, cooled and weighed.^[7]

h) pH

10% aqueous solution of the powdered drug was prepared then pH was measured at room temperature by using a calibrated digital pH meter.^[8]

i) Disintegration time

The disintegration time of *Rasa Medapachaka Tablet* tablets was determined using a USP disintegration test apparatus. Six tablets were placed individually in the tubes of the apparatus containing distilled water maintained at 37 ± 2 °C. The apparatus was operated according to the specified procedure, and the time required for complete disintegration of each tablet, with no palpable core remaining, was recorded. The average disintegration time was calculated and expressed in minutes.^[9]

B. Thin Layer Chromatography (TLC)

10 µL of extract was applied on an aluminium plate pre-coated with silica gel 60 F254 (0.2 mm thickness). The plate was developed in a solvent system Toluene: Ethyl acetate: Methanol: Formic acid (6: 3: 1: 0.1) using a glass TLC chamber previously saturated with the mobile phase. After development, the plate was air-dried and observed under UV light at 254 nm and 366 nm for spot detection.

RESULTS AND DISCUSSION

1. PHARMACOGNOSTICAL EVALUATION

Microscopic study: Diagnostic microscopic characters of ingredients of *Rasa Medapachaka Tablet* tablet showed the Collenchyma cells of *Guduchi*, Pollen grain of *Kiratatikta*, Brown content of *Katuki*, Oleoresin of *Shunti*, Fibre of *Indrayava*, Brown content of *Indrayava*, Cork cells of *Guduchi*, Septate fibres of *Patola*, Crystal of *Katuki*, Prismatic crystal of *Chandana*, Simple trichome of *Patola*, Border-pitted vessel of *Chandana*, Border-pitted vessel of *Guduchi*, Scalariform vessel of *Shunti*, Oil globules of *Indrayava*, Vessels of *Katuki*, Lignified fibres of *Chandana*, Starch grains of *Shunti*, Spiral vessels of *Patola*, Starch grain of *Indrayava*, Starch grains of *Guduchi*, Spiral vessels of *Kiratatikta*, Trichome of *Kiratatikta*.

2. PHYSICOCHEMICAL TESTS

The physicochemical evaluation demonstrated satisfactory quality characteristics of *Rasa Medapachaka Tablet*. The formulation exhibited a nearly neutral pH (6.33 ± 0.29) with an average hardness of 1.60 ± 0.17 kg/cm², indicating adequate mechanical strength. The average tablet weight was 432.63 ± 3.50 mg, suggesting good weight uniformity among batches. The average disintegration time was 28.70 ± 1.81 minutes, which was within acceptable limits for tablet formulations. Moisture

content, represented by loss on drying, was $3.42 \pm 0.43\%$ w/w. Total ash and acid-insoluble ash were $4.27 \pm 0.27\%$ w/w and $1.31 \pm 0.22\%$ w/w, respectively, indicating minimal inorganic contamination. Water-soluble and methanol-soluble extractive values were $10.79 \pm 0.59\%$ w/v and $18.70 \pm 0.84\%$ w/v, respectively, demonstrating the presence of appreciable extractable phytoconstituents.

3. TLC STUDY RESULTS

Thin layer chromatographic analysis produced reproducible fingerprint profiles under both 254 nm and

366 nm UV wavelengths. Three distinct spots were observed at each wavelength showed in table no.4, providing a characteristic chromatographic profile that may be utilized as a qualitative reference for authentication and batch-to-batch quality assessment of the formulation.

Table no. 2: Organoleptic Characters of Rasa Medapachaka Tablet Tablet.

S.NO.	Characters	Result
1.	Appearance	Round solid tablet
2.	Shape	Circular
3.	Colour	Brownish colour
4.	Odour	Characteristic
5.	Texture	Hard and compact
6.	Surface	Smooth and uniform
7.	Taste	Bitter

Table no. 3: Physico-Chemical Parameters of Rasa Medapachaka Tablet Tablet.

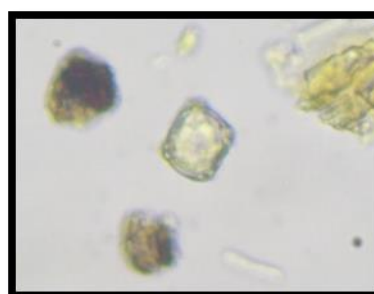
S. No.	Parameter	Mean $\pm$ SD
1	pH	6.33 ± 0.29
2	Average hardness (kg/cm ²)	1.60 ± 0.17
3	Average weight of tablet (mg)	432.63 ± 3.50
4	Disintegration time (min)	28.70 ± 1.81
5	Loss on drying (% w/w)	3.42 ± 0.43
6	Ash value (% w/w)	4.27 ± 0.27
7	Water-soluble extractive (% w/v)	10.79 ± 0.59
8	Methanol-soluble extractive (% w/v)	18.70 ± 0.84
9	Acid insoluble ash (% w/w)	1.31 ± 0.22

Table no. 4: TLC profile / Rf values of Rasa Medapachaka Tablet tablet.

Extract	Solvent system	Wave length	No. of spots	Rf value
Methanolic extract of <i>Rasa Medapachaka Tablet tablet</i>	Toluene: Ethyl acetate: Methanol: Formic acid (6: 3: 1: 0.1)	254 nm	3	0.62, 0.65, 0.70
		366 nm	3	0.56, 0.82, 0.87



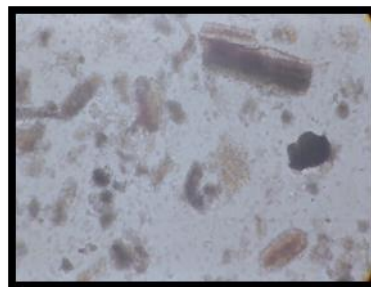
Collenchyma cells of Guduchi



Pollen grain of Kiratatikta



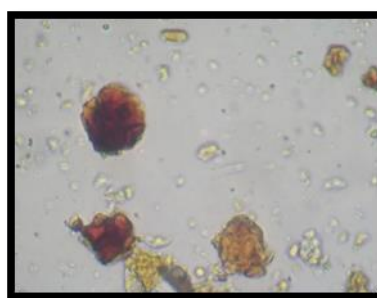
Brown content of *Katuki*



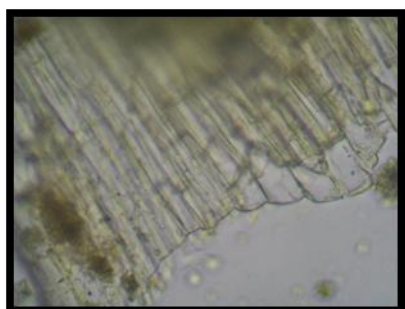
Olioresine of *Shunthi*



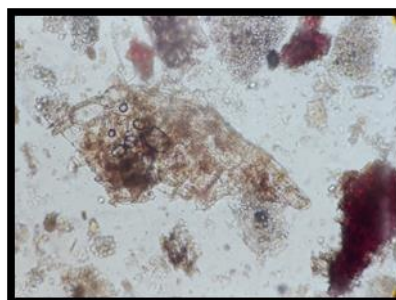
Fibre of *Indrayava*



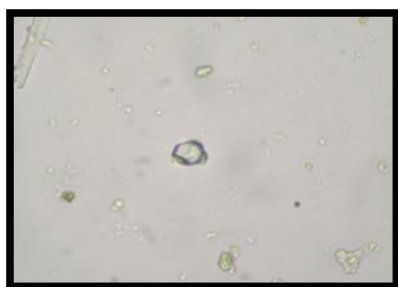
Brown content of *Indrayava*



Cork cells of *Guduchi*



Septate fibres of *Patola*



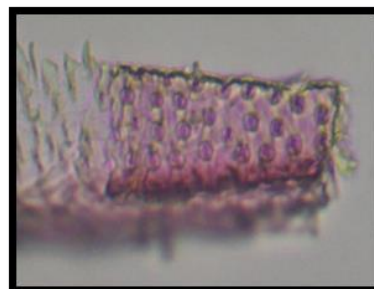
Crystal of *Katuki*



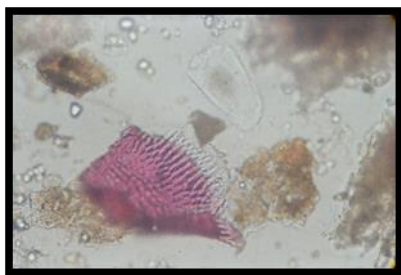
Prismatic crystal of *Chandana*



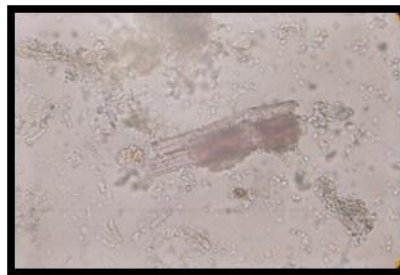
Simple trichome of *Patola*



Border pitted vessel of *Chandana*



Border pitted of *Guduchi*



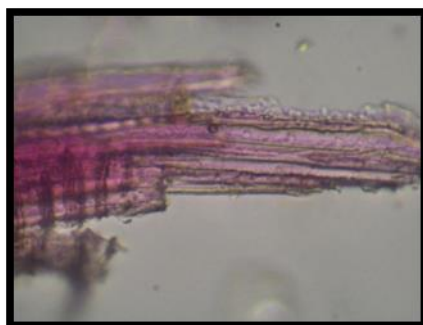
Scalariform vessel of *Shunthi*



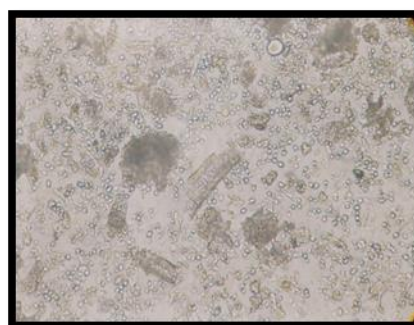
Oil globules of *Indrayava*



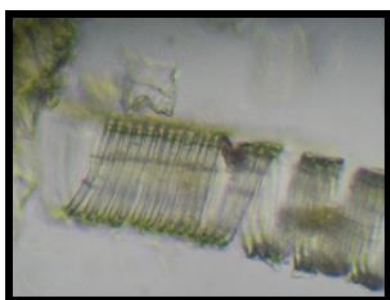
Vessels of *Katuki*



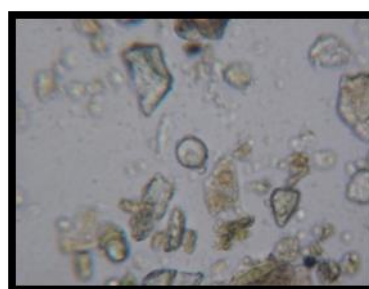
Lignified fibres of *Chandana*



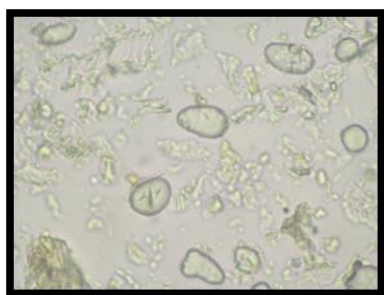
Starch grains of *Shunthi*



Spiral vessels of *Patola*



Starch grain of *Indrayava*

Starchgrains of *Guduchi*Spiral vessels of *Kiratatikta*Trichome of *Kiratatikta*

DISCUSSION

Standardization of Ayurvedic formulations is essential to ensure their identity, purity, quality, safety and reproducibility. The present study was undertaken to establish pharmacognostical and pharmaceutical standards for *Rasa Medapachaka Tablet Tablet*, a polyherbal formulation indicated in the management of *Apakva Rasa-Meda* associated conditions such as dyslipidaemia. Since no standard monograph for this formulation is available in the Ayurvedic Formulary of India (AFI), the present work provides baseline data for its quality assessment.

Microscopic evaluation of the powdered formulation revealed characteristic diagnostic features of all constituent drugs, such as collenchyma cells and border-pitted vessels of *Guduchi*, pollen grains and trichomes of *Kiratatikta*, oleoresin and starch grains of *Shunthi*, fibres and oil globules of *Indrayava*, crystals of *Katuki*, simple trichomes of *Patola* and lignified fibres of *Chandana*. The presence of these specific microscopic markers confirms the authenticity of the individual ingredients and indicates the absence of adulteration or substitution in the finished formulation. Thus, powder microscopy serves as a reliable tool for quality control of polyherbal preparations.

The organoleptic characters of the formulation, namely brownish ash colour, characteristic odour, hard touch and bitter taste, were found to be consistent with the ingredients used in the formulation. The predominance of bitter taste (*Tikta Rasa*) may be attributed to drugs such as *Katuki*, *Kiratatikta*, *Guduchi* and *Patola*, which are known for their *Deepana*, *Pachana* and *Medohara* properties. These attributes substantiate the classical rationale behind selecting these drugs for disorders involving vitiated *Rasa* and *Meda Dhatu*.

The physicochemical parameters demonstrated acceptable quality characteristics. The nearly neutral pH (6.33 ± 0.29) suggests that the formulation is unlikely to cause significant gastric irritation. The hardness value ($1.60 \pm 0.17 \text{ kg/cm}^2$) indicates sufficient mechanical strength for handling, packaging and transportation without compromising tablet integrity. Uniform tablet weight ($432.63 \pm 3.50 \text{ mg}$) reflects consistency during manufacturing.

The disintegration time ($28.70 \pm 1.81 \text{ min}$) indicates efficient tablet breakdown under experimental conditions, facilitating subsequent release of phytoconstituents. The comparatively low loss on drying ($3.42 \pm 0.43\% \text{ w/w}$) indicates limited moisture content, which is desirable for maintaining formulation stability and reducing the possibility of microbial deterioration during storage.

Total ash ($4.27 \pm 0.27\% \text{ w/w}$) and acid-insoluble ash ($1.31 \pm 0.22\% \text{ w/w}$) indicate low levels of inorganic impurities and siliceous contaminants, suggesting satisfactory purity of the formulation. The higher methanol-soluble extractive value ($18.70 \pm 0.84\% \text{ w/v}$) compared with the water-soluble extractive ($10.79 \pm 0.59\% \text{ w/v}$) suggests that a greater proportion of phytoconstituents possess moderate polarity, including phenolics, flavonoids, glycosides and related secondary metabolites.

TLC fingerprinting generated distinct and reproducible chromatographic profiles under ultraviolet light. These characteristic fingerprints provide a simple and reliable qualitative tool for authentication, routine quality assessment and evaluation of batch-to-batch consistency of *Rasa Medapachaka Tablet*.

Overall, the findings of the present study establish reliable pharmacognostical, physicochemical and chromatographic standards that may serve as reference parameters for future quality control, standardization and research on this Ayurvedic formulation.

CONCLUSION

The present study established pharmacognostical, physicochemical and thin layer chromatographic standards for *Rasa Medapachaka* Tablet. Organoleptic evaluation and powder microscopy confirmed the authenticity of the constituent herbal ingredients, while the physicochemical parameters demonstrated acceptable quality, purity and stability of the formulation. The characteristic TLC fingerprint further provided a reproducible chromatographic profile that can be employed for routine identification and quality assessment. Since no official standard is currently available for this formulation, the analytical data generated in the present study may serve as baseline reference values for its authentication, quality control, batch-to-batch consistency and future standardization. These findings provide a scientific basis for further pharmaceutical and phytochemical investigations of *Rasa Medapachaka* Tablet.

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