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Preliminary profile of pharmacognostical and pharmaceutical analysis of *Laghusutashekhara rasa* tablet prepared by the method of *Panchabhautika chikitsa*- An ayurvedic herbo-mineral formulation

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Abstract

Background: *Laghusutshekhara Rasa* (LSSR) is very popular formulation consisting of one herbal drug and one mineral drug which had been mentioned in the context of treatment of gastrointestinal tract disorders in different classical texts of Ayurveda. The classical composition of LSSR is having three contents but the *yoga* which has been used in present study is different from it. The present *yoga* of LSSR has been adopted from the famous *Panchabhautika Chikitsa Paddhati* which is very popular and being used by many practitioners in their daily practice. This is an *Anubhuta Yoga* (experiential formulation), which is having different contents, their proportions and method of preparation than that of classical *yoga*. Even though the dosage form of *vati* had been suggested for this formulation in classics, but for proper dose fixation it was converted in tablet form. Hence the need regarding its pharmacognostical and pharmaceutical analysis was felt for its standardization purpose.
Aim: To develop preliminary profile of pharmacognostical and pharmaceutical analysis of *Laghusutashekhara Rasa* tablet prepared by the method of *Panchabhautika Chikitsa*.
Methods: The LSSR tablet was subjected to macroscopic study, organoleptic parameters and microscopic study for pharmacognostical evaluation. Physico-chemical analysis like weight variation, tablet disintegration time, tablet hardness, loss on drying, ash value, acid insoluble ash, iron content, water and methanol soluble extracts, pH value along with high performance thin layer chromatography (HPTLC) were carried out for pharmaceutical evaluation.
Results: Pharmacognostical study showed the presence of certain diagnostic characters of LSSR, ingredients in the formulation like fibres coated with *Gairika*, scalariform vessels coated with *Gairika*, starch grains coated with *Gairika* etc. Preliminary physico-chemical analysis showed that hardness of tablet 1 kg/cm^2, tablet disintegration time 1 minute, ash value 37.556% w/w, loss on drying 4.908 % w/w, water and methanol soluble extracts as 8.86 % w/w and 3.785% w/w respectively, acid insoluble ash 15.69 % w/w and pH value 5.5. HPTLC showed fifteen spots at 254nm and fifteen spots at 366nm.
Conclusion: The study was carried out to standardize the finished product *Laghusutashekhara Rasa* tablet in terms of its identity, quality and purity. Pharmacognostical and physico-chemical observations revealed the specific characters of all active constituents in the preparation. This preliminary profile of *Laghusutashekhara Rasa* tablet may prove beneficial for its further standardization.

Keywords: *Laghusutashekhhara rasa*, pharmacognosy, pharmaceutical analysis, standardization, *Panchabhautika chikitsa*

Introduction

Laghusutashekhara Rasa (LSSR) is an ayurvedic herbo-mineral formulation, consisting one herbal drug and one mineral drug namely *Shunthi* (*Zingiber officinale* Roscoe) and *Shuddha Suvarna Gairika* (Ferric oxide red). It is explained as an ideal formulation for the management of different kinds of gastrointestinal disorders in the classical texts of Ayurveda like Rasatantra Sara & Siddha Prayoga Sangraha [1], Ayurvedic Formulary of India [2] and Ayurvediya Aushadhigunadharmashastra [3].

In ayurvedic parlance, the combination is having *Katu* (pungent), *Tikta* (bitter), *Madhura* (sweet) and *Kashaya* (astringent) in taste, *Vishada* (Vivid), *Laghu* (light) and *Ushna* (hot) properties. It pacifies all three *Doshas* (*Vata*, *Pitta*, *Kapha*) but especially acts mainly as *Pittashamaka*. This drug has been specially mentioned for the management of diseases manifested due to vitiation of *Pitta* like *Pittaja Shirashula* (Headache), *Ardhavabhedaka* (partial headache), *Suryavarta* (migraine), *Amla Chhardi* (Sour Vomiting), *Nidranasha* (insomnia), *Pittaja Unmada* (insanity), *Daha* (Burning Sensation), *Daurgandhya* (foul smelling), *Urdhwaga Raktapitta* (bleeding disorders), *Mukhapaka* (stomatitis) [4] etc. In the classical texts of Ayurveda, oral administration of LSSR in the form of *Vati* has been mentioned. But in present study, it was converted into tablet form for better palatability and uniformity of dose. The ingredients of LSSR with their proportions are described in Table 1.

Table 1: Proportions of Ingredients of *Laghusutashekhara Rasa*

Sr. No.	Name of Drug	Latin/English name	Part used	Proportion
1.	*Shuddha Suvarna Gairika*	*Ferric oxide red*	-	1 part
2.	*Shunthi*	*Zingiber officinale* Roscoe.	Dried Rhizome	1 part

Pharmacognosy is also the first step to standardize a drug which is the need of the day. It should be noted that herbal drug standardization is not new in the field of Ayurveda. In the classics it is mentioned in a codified manner, such as *Grahya Lakshana*, Method of collection etc. It is a timely necessity followed by compulsion to go for quality control of the raw drugs as well as final products using modern parameters. This will not only provide a scientific basis and credibility to ayurvedic drugs and pharmaceutics but also help in the globalization of Ayurveda.

Aim

1. To develop preliminary profile of pharmacognostical and pharmaceutical analysis of *Laghusutashekhara Rasa* tablet prepared by the method of *Panchabhautika Chikitsa*.

Objectives

1. To evaluate the raw herbal drug (*Shunthi*) and *Laghusutashekhara rasa* without *Bhavana* and with three *Shunthi Kwatha Bhavana* for authenticity through various pharmacognostical procedures.
2. To develop the preliminary pharmacognostical and physico-chemical profile of *Laghusutashekhara rasa* tablet.

Materials and Methods

Procurement and Preparation of *Laghusutashekhara Rasa* tablet

1. Proper authentication of the raw drugs was done in Pharmacognosy Laboratory, I.P.G.T. & R.A., Jamnagar.
2. Preparation of drug *Laghusutashekhara Rasa* Tablet was carried out in Pharmacy, Gujarat Ayurved University, Jamnagar.
3. The analysis of the finished product was carried out in the Modern Pharmaceutical Chemistry Laboratory, I.P.G.T. & R.A., Jamnagar.

Collection, Identification and Authentication of raw drugs

Shuddha Suvarna Gairika Churna was purchased from the local market of Jamnagar. *Shunthi Churna* and *Shunthi Yavakuta* for *bhavana* were procured from the Pharmacy, Gujarat Ayurved University, Jamnagar.

Proportions of Ingredients of *Laghusutashekara Rasa* as per *Panchabhautika Chikitsa Paddhati* [5]: (Table 2)

Table 2: Proportions of Ingredients of *Laghusutashekhara Rasa*

Sr. No.	Name of Drug	Latin/English name	Part used	Proportion
1.	*Shuddha Suvarna Gairika*	*Ferric oxide red*	-	1 part
2.	*Shunthi*	*Zingiber officinale* Roscoe.	Dried Rhizome	1 part

Method of Preparation of *Laghusutashekhara Rasa* tablet as per *Panchabhautika Chikitsa Paddhati* [6]

The tablets of *Laghusutashekhara Rasa* were prepared in Pharmacy, Gujarat Ayurved University, Jamnagar by following standard aseptic methods. The ingredients of trial drug fine powder of *Shuddha Suvarna Gairika* and powder of *Shunthi* were taken in equal quantity in the end roller and mixed properly. On the other side, the *Kwatha* of *Bhavana Dravya* (*Shunthi Yavakuta Kwatha* was prepared as per classical method. For this, the coarse drug (750gm) was soaked in water (12 litres) overnight before preparation of *Kwatha*.

Later it was boiled on medium flame until ¼th (3 litres) of it remains.

The *Kwatha* was filtered into a separate container. After proper mixing of *Churna*, 3 litres of *Shunthi Kwatha* was added in mixture of powders of *Shuddha Suvarna Gairika* and *Shunthi* for *Bhavana*. The *Bhavana* was given by end roller and the process was continued till proper absorption of *Kwatha*. *Shunthi Kwatha Bhavana* was given for three days but the next *Bhavana* was given after proper drying of previously *Bhavita* drug and rolling till evenly mixed. The same process was repeated continuously for three days. Later, the granules were prepared and put in the oven for one day for drying. After drying, the granules were ready for tablet manufacturing. Then the tablets of weight 250mg each were punched in tablet punching machine. After this process, the tablet container was directly sealed at the Pharmacy, Gujarat Ayurved University, Jamnagar.

Pharmacognostical Analysis

Details of methods

The identification was carried out based on the macroscopic features, organoleptic features and powder microscopy of the drugs. The microphotographs were taken under the microscope.

Macroscopic study

The collected samples were identified and authenticated by studying their characters and were studied systematically as per the methods described in the textbooks of Pharmacognosy. The specimens were observed as such with naked eyes.

Organoleptic Study

The organoleptic parameters of ayurvedic drugs are very important and give the general idea regarding the genuineness of the sample. Organoleptic parameters i.e. taste, colour, odour and touch of LSSR tablet were scientifically studied following standard references [7].

Microscopic Study

LSSR tablet was powdered and dissolved in water. Microscopy of the sample was done without stain and after

staining with Phloroglucinol + HCl. Microphotographs of LSSR were also taken under Carl- Zeiss strinocular microscope [8].

Physico-chemical analysis

LSSR tablet was analyzed using various standard physico-chemical parameters. The common parameters mentioned for compressed tablets in Ayurvedic Pharmacopia of India [9] and CCRAS[10] guidelines are total ash, pH value and water and methanol soluble extracts. On this basis these parameters were taken. Presence of more moisture content in a sample can create preservation problem. Hence loss on drying was also selected as one of the parameters [11].

High performance Thin Layer Chromatography (HPTLC)

Method of Preparation of Methanolic extract:

A solution was prepared by mixing 2.5 gm of powder of *Laghusutashekhara Rasa tablet* powder and 50 ml of 70% methanol and the solution was kept in a clean and dry place for 24 hr. with intermittent shaking. Then extract was collected and filtered through Whitman filter paper no. 1. From the above solution, 20 ml was taken and heated on thermostatic water bath till a dark brownish residue was obtained which yielded 15% w/w.

Method

HPTLC was performed as per the guideline provided by API. Methanolic extract of drug sample was used for the spotting. HPTLC was performed using Toluene + Ethylacetate + (7:1) solvent system and observed under visible light. The colour and Rf values of resolved spots were noted [12].

Observations & Results of Pharmacognostical Evaluation

Macroscopic study: As per API, herbal raw drug i.e. rhizome of *Shunthi* used in formulation was identified and authenticated.

Organoleptic parameters of *Laghusutashekhara Rasa* tablet

Organoleptic parameters of *Laghusutashekhara Rasa* tablet like colour, taste, touch, and odour were recorded. They have been presented in Table- 3.

Table 3: Organoleptic parameters of *Laghusutashekhara Rasa* tablet

Sr. No.	Organoleptic parameter	Result
1.	Texture	Hard, each tablet weight 250mg
2.	Colour	Glitterier
3.	Odour	Slightly aromatic
4.	Taste	Astringent followed by pungent

- **Microscopic Study of *Laghusutashekhara Rasa* without *bhavana* of *Shunthi Kwatha*: (Plate 1)**

Identifying characters of ingredients of *Laghusutashekhara Rasa* without *Bhavana* of *Shunthi Kwatha* under the microscope showed below listed characters-

1. Fibres coated with *Gairika* (Fig.1.1)
2. *Gairika* not processed with Starch grains (Fig.1.2)
3. *Gairika* with starch grains (Fig.1.3)
4. Iodine stained starch grains (Fig.1.4)
5. Scalariform vessels (Fig.1.5)
6. Simple fibres (Fig.1.6)
7. Simple starch grains (Fig.1.7)

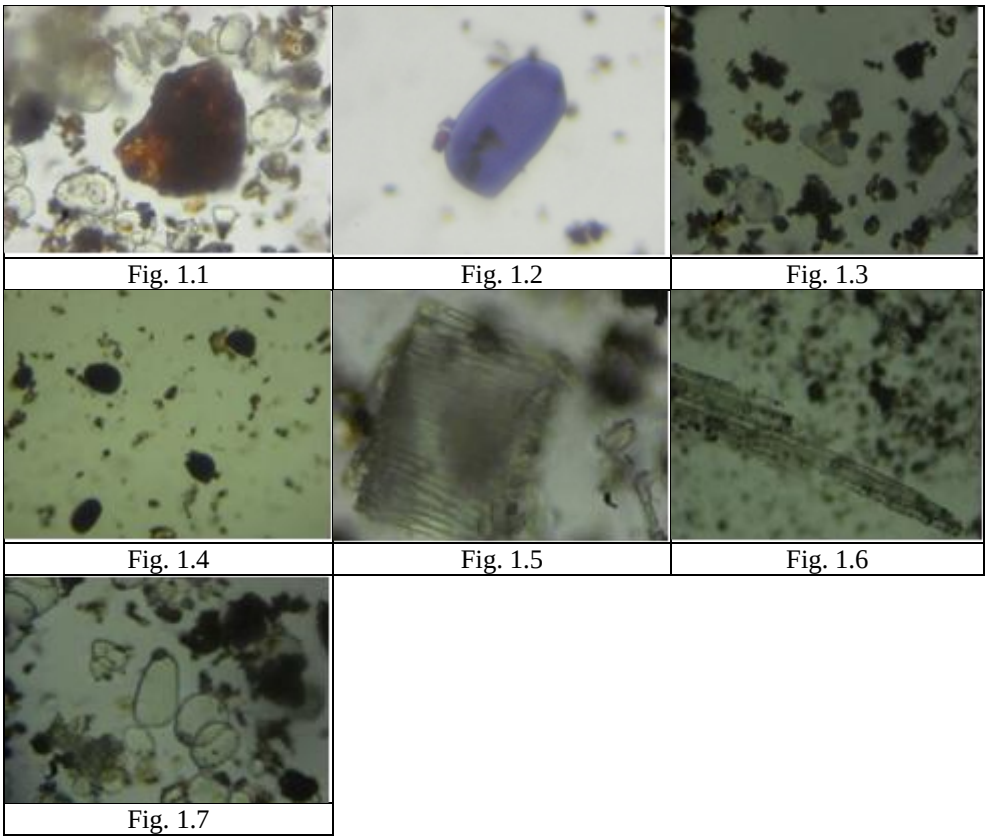


Fig. 1.1 | Fig. 1.2 | Fig. 1.3

Fig. 1.4 | Fig. 1.5 | Fig. 1.6

Fig. 1.7

Plate 1: Microscopic Study of *Laghusutashekhara Rasa* without *bhavana* of *Shunthi Kwatha*: (Plate 1)

- **Diagnostic Characters of finished product i.e. *Laghusutashekhara Rasa* with 3 *Bhavanas* of *Shunthi Kwatha*: (Plate 2)**

The photographs of finished product i.e. powder and tablet of LSSR have been shown in Plate 2. (Fig.2.1) *Laghusutashekhara Rasa* with 3 *Bhavanas* of *Shunthi Kwatha* under the microscope showed below listed diagnostic characters –

1. Starch grains coated with *Gairika* (Fig.2.2)
2. Deposition of *Gairika* particles (Fig.2.3)
3. Scalariform Vessels coated with *Gairika* (Fig.2.4)
4. Parenchyma cells of *Shunthi* with olioresine (Fig.2.5)
5. Fibre coated with *Gairika* (Fig.2.6)
6. Iodine stained starch grains of *Shunthi* (Fig.2.7)


Fig. 2.1

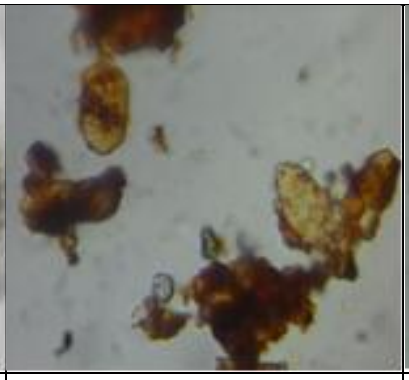


Fig. 2.2

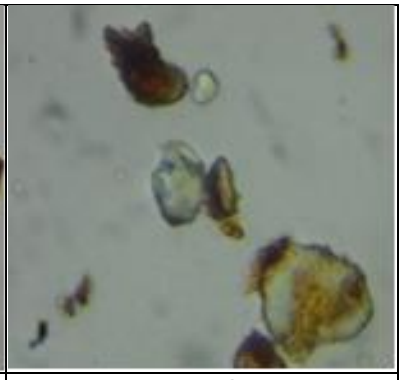


Fig. 2.3

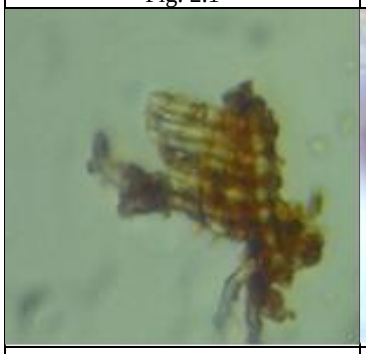


Fig. 2.4

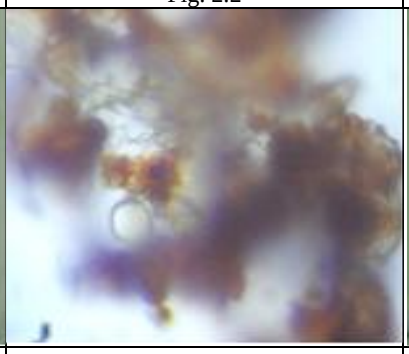


Fig. 2.5


Fig. 2.6


Fig. 2.7

Plate 2: Diagnostic Characters of finished product i.e. *Laghusutashekhara Rasa* with 3 *Bhavanas* of *Shunthi Kwatha*: (Plate 2)

Physico-chemical analysis of *Laghusutashekhara rasa* Tablet: The final results of all the physico-chemical parameters of *Laghusutashekhara Rasa* tablet as stated above are summarized in Table 4.

Table 4: Results of Physico-Chemical Parameters of *Laghusutashekhara Rasa* tablet

Sr. No.	Physico-Chemical Parameter	Result
1.	Uniformity of Tablet	Average weight of tablet = 314.8 mg
		Highest weight of tablet = 395 mg
		Lowest weight of tablet = 246 mg
2.	Tablet Disintegration Time	1 minute
3.	Tablet Hardness	1 kg/cm^2
4.	Loss on drying	4.908 % w/w
5.	Ash Value	37.556 % w/w
6.	Acid Insoluble Ash	15.67 % w/w
7.	Iron content	15.57 %
8.	Water soluble extract	8.86 % w/w

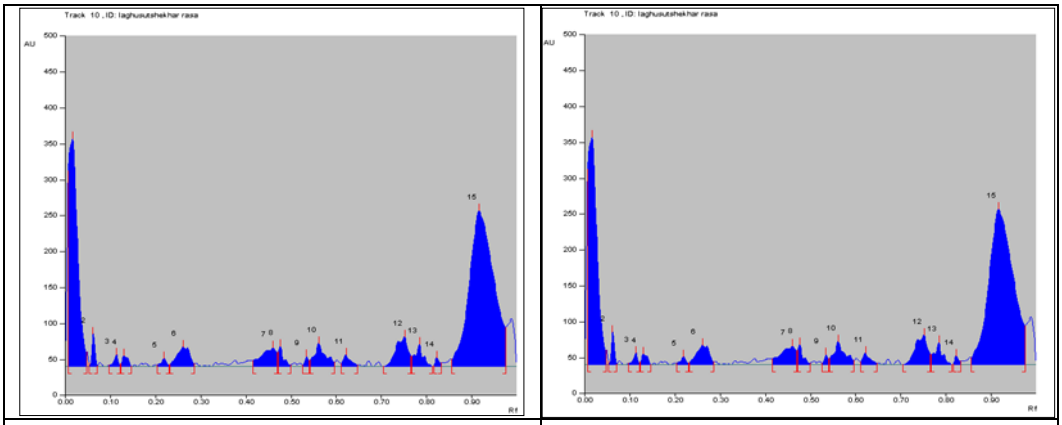
9.	Methanol soluble extract	3.785 % w/w
10.	pH value	5.5

HPTLC Study

The chromatographic study (HPTLC) was carried out under 254 and 366 nm UV to establish fingerprinting profile. It showed 15 spots at 254 nm and 15 spots at 366nm which Rf values were recorded, those may be responsible for expression of its pharmacological and clinical actions. Among these four spots i.e. 0.06, 0.75, 0.78 and 0.82 were found common. (Plate 3, Table 3).

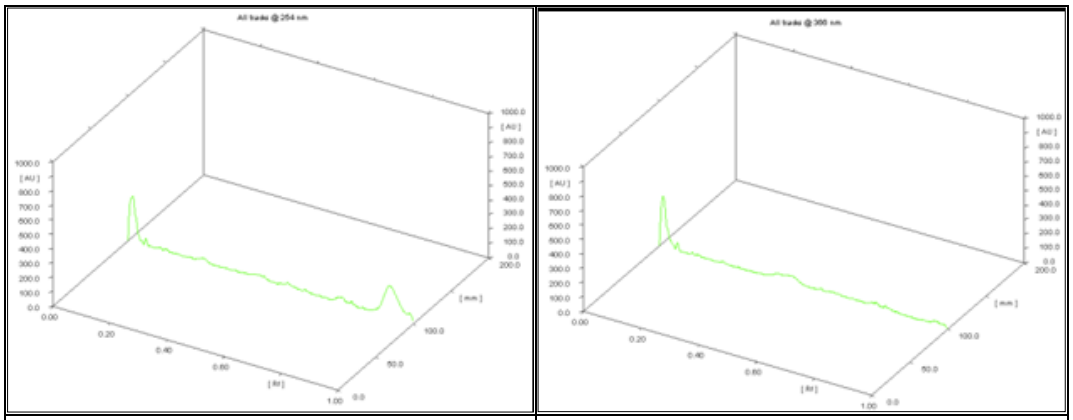
Table 4: HPTLC Study of *Laghusutashekhara Rasa* tablet

Wave length	Number of spots	Rf value
254nm	15	0.02, 0.06, 0.11, 0.13, 0.22, 0.26, 0.46, 0.48, 0.53, 0.56, 0.62, 0.75, 0.78, 0.82, 0.92
366nm	15	0.01, 0,.06, 0.10, 0.19, 0.38, 0.43, 0.55, 0.58, 0.71, 0.75, 0.78, 0.82, 0.90, 0.93, 0.98



Peak Display at 254nm | **Peak Display at 366nm**

Plate 3: Densitogram of *Laghusutashekhara Rasa* Tablet at 254 nm and 366 nm



254 nm | **366 nm**

Fig 1: 3D graph of *Laghusutashekhara Rasa* Tablet at 254 nm and 366 nm

Discussion

The pharmacognostical evaluation showed that organoleptic characters of the sample were Glitterier in colour, slightly aromatic odour, astringent followed by pungent in taste, hard in touch. Microscopics study showed that fibre coated with *Gairika*, scaliriform vessels coated with *Gairika*, starch grain coated with *Gairika* that all the ingredients present in finished product and also proven that the purity of the finished products.

The Physiochemical parameters play an important role in the standardization of the formulation. According to the present study, total ash is particularly important in the evaluation of the purity of drugs, i.e. the presence or absence of foreign matter such as metallic salts or silica [13], [14]. The hardness (1 kg/cm2) of tablet is a function of how much pressure has been exerted in making it, and it varies with the composition, thickness, and shape ad diameter of tablet. The loss and drying at 660 c was 4.908 % w/w. According to the API the total Ash value of *Laghusutashekhara rasa* tablet not be more than 22%, But here the total Ash value of the final product is higher, i.e. 37.556 % w/w. The amount of total acid insoluble matter present in the product is 15.69 %w/w. According to the API, the acid insoluble ash value of *Laghusutashekhara rasa* tablet should not be more than 11%. But here of total acid insoluble ash value of final product is higher, i.e. 15.69 %w/w. here that value change due to the *Gairika* and also number of *Bhavana* of *Shunthi Yavkuta Kwatha* during preparation of tablet. The water soluble extractive value (8.86 %w/w) indicated the presence of sugar, acids, etc. The pH from 5.5% w/v solution revealed that pH formulation was comparable and was neutral.

HPTLC not only confirms but also establishes the identity of natural products. It is also an ideal screening tool for detection of adulteration and is highly suitable for evaluation and monitoring of cultivation, harvesting and

extraction processes and testing of stability of the product [15]. HPTLC is one of the ideal TLC techniques for the analytical purposes because of its increased accuracy, reproducibility, and ability to document the results, compared with standard TLC. Because of this, HPTLC technologies are also the most appropriate TLC technique for conformity with GMPs. The Rf values reflect the phyto-constituents of the plant which may establish the identification of the genuine source.

Conclusion

The study was carried out to standardize the finished product *Laghusutashekhara Rasa* tablet in terms of its identity, quality and purity. Pharmacognostical and physico-chemical observations revealed the specific characters of all active constituents in the preparation. This preliminary profile of *Laghusutashekhara Rasa* tablet may prove beneficial for its further standardization. This preliminary information may be beneficial for future researchers and can be used as a reference standard in the further quality control researchers.

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