International Research Journal of Ayurveda & Yoga Vol. 9(4), pp. 1-7, April, 2026
Available online at http://irjay.in
ISSN: 2581-785X
DOI: 10.47223/IRJAY.2026.90401

ORIGINAL RESEARCH ARTICLE

Pharmacognostical and Pharmaceutical Analysis of *Dviruttara Hingvadi Churna* – An Ayurvedic Herbal Formulation for *Purishaja Udavarta* by Charaka Samhita

Manish Dubey[1], Mandip Goyal[2], C. R. Harisha[3], Mukesh Nariya[4]

[1]Ph.D. Scholar, Department of Kayachikitsa, Institute of Teaching and Research in Ayurveda, Jamnagar, Gujarat, India.
[2]Professor and Head, Department of Kayachikitsa, Institute of Teaching and Research in Ayurveda, Jamnagar, Gujarat, India.
[3]HOD, Pharmacognosy, Laboratory, Institute of Teaching and Research in Ayurveda, Jamnagar, Gujarat, India.
[4]HOD (In-charge), Modern Pharmaceutical Chemistry Laboratory, Institute of Teaching and Research in Ayurveda, Jamnagar, Gujarat, India.

ARTICLE INFO

Article history:
Received on: 07-03-2026
Accepted on: 18-04-2026
Published on: 30-04-2026

Key words:
Constipation,
Dviruttara Hingvadi Churna,
High Performance Thin Layer Chromatography,
Pharmaceutical Analytical Study,
Pharmacognostical Study,
Physiochemical Analysis,
Purishaja Udavarta

ABSTRACT

Background: In today's era, the evaluation of the quality of herbal formulations is essential to provide a basis for ensuring their authenticity and quality. *Dviruttara Hingvadi Churna* is one of the polyherbal formulations that has been explained by Acharya Charaka in his treatise Charaka Samhita for the treatment of *Purishaja Udavarta.* Despite use in clinical practice, there is a lack of data regarding its pharmacognostical standardization and Physicochemical analysis, which ensures its quality, safety, and reproducibility.

Aim: The study aims to develop the authenticity of *Dviruttara Hingvadi Churna* through the evaluation of pharmacognostical and physiochemical analysis.

Material and Methods: Pharmacognostical evaluation was carried out at the pharmacognosy department, and pharmaceutical study was carried out at the pharmaceutical department, ITRA, Jamnagar. High-performance thin-layer chromatography (HPTLC) was carried out at Vasu Research Center, Vadodara, Gujarat.

Results: Pharmacognostical findings confirmed the authenticity and genuine ingredients of *Dviruttara Hingvadi Churna.* The average values of physicochemical parameters, such as loss on drying – 7.66%, ash value – 3.65%, water soluble extract – 19.44%, alcohol soluble extract – 18.56%, and pH value – 6.5, were analyzed, which were within normal referential range. In the HPTLC study, 4 spots at 254 nm, 6 spots at 366 nm, and 10 spots at 540 nm were obtained.

Conclusion: The pharmacognostical and Physicochemical analysis of *Dviruttara Hingvadi Churna* confirmed the purity and genuineness of the drug. This data can serve as reference standards for quality control for future research, supporting their safe and effective therapeutic application.

1. INTRODUCTION

Dviruttara Hingvadi Churna is one of the polyherbal formulations that have been explained by Acharya Charaka in his treatise Charaka Samhita for the treatment of *Purishaja Udavarta.*[1] *Purishaja Udavarta is a condition in which, due to the vitiation of Vata Dosha,* particularly Apana Vata, its normal downward movement (Adhogati) is obstructed and diverted upward (Urdhvagati), resulting in retention of stool.[2] The classic symptoms of *Purishaja Udavarta* resemble the features of functional constipation in contemporary science. Classical texts advocate the use of herbal formulations possessing *Deepana* (digestion and metabolism enhancing), *Pachana* (digesting *Ama*), and *Anulomana* (foods helping in proper elimination of flatus, feces) properties for the treatment of such a clinical entity of *Purishaja Udavarta.*[1] *Churna Kalpana* is a classical Ayurvedic pharmaceutical preparation that involves the conversion of single

Corresponding Author:
Manish Dubey, Ph.D. Scholar,
Department of Kayachikitsa, Institute of Teaching and Research in Ayurveda, Jamnagar, Gujarat, India.
Email: dr.manish181@gmail.com

or multiple medicinal substances into a fine powder form for internal or external administration. Owing to its simple method of preparation, enhanced bioavailability due to increased surface area, and convenient mode of administration, it remains one of the most widely utilized dosage forms in Ayurvedic therapeutics. For internal administration, herbal formulations must be safe, effective, unadulterated, and prepared with appropriate ingredients in proper proportions. However, identification of herbal drugs becomes challenging when they are in dried or powdered form, increasing the risk of substitution or adulteration. Therefore, establishing well-defined standardization parameters has become essential. Pharmacognostical evaluation plays a crucial role in authentic plant identification and in setting quality standards for traditional herbal medicines. Physicochemical analysis further aids in understanding the pharmacokinetic and pharmacodynamic aspects of the drug. Such analytical studies help in ensuring uniformity, purity, and differentiation from adulterants. Advanced techniques such as high-performance liquid chromatography and thin-layer chromatography (TLC) are widely employed for analyzing plant-derived secondary metabolites. The incorporation of these modern quality control measures is increasingly necessary in Ayurveda to ensure the safety and efficacy of both raw materials and finished products. Adoption of scientific validation methods enhances the credibility of Ayurvedic medicines and supports their global acceptance. Hence, the present study was undertaken to evaluate the authenticity of *Dviruttara Hingvadi Churna* through detailed pharmacognostical procedures and to establish its pharmacognostical and phytochemical profile.

1.1. Aim and Objectives

The study aims to develop the authenticity of *Dviruttara Hingvadi Churna* through the evaluation of pharmacognostical and physiochemical analysis.

2. MATERIALS AND METHODS

2.1. Collection of Raw Drugs

All the raw drugs of *Dviruttara Hingvadi Churna* were collected from the Pharmacy ITRA, Jamnagar, Gujarat, after proper identification and assessment.

2.2. Method of Preparation of *Dviruttara Hingvadi Churna*

The fine powder of the ingredients of *Dviruttara Hingvadi Churna* was procured from the pharmacy of ITRA, Jamnagar, and was authenticated in the Pharmacognosy Laboratory of ITRA, Jamnagar, Gujarat. The drug was prepared in the Pharmacy of ITRA, Jamnagar, Gujarat. All the ingredients of *Dviruttara Hingvadi Churna,* i.e., 1 part *Hingu,* 2 parts *Vacha*, 4 parts *Chitraka,* 8 parts *Kushtha,* 16 parts *Swarjikshara*, and 32 parts of *Vidanga* were taken and mixed well, and stored under aseptic and good hygienic conditions. Details of the ingredients are depicted below [Tables 1 and 2].

2.3. Pharmacognostical Evaluation of *Dviruttara Hingvadi Churna*

As per the API standards, the drugs which were used in the formulation of Dviruttara Hingvadi Churna was identified and authenticated by the Pharmacognosy Laboratory, ITRA, Jamnagar.[9]

2.4. Pharmaceutical Analysis of *Dviruttara Hingvadi Churna*

Physicochemical analysis was conducted at the pharmaceutical laboratory, ITRA, Jamnagar, to find out the following parameters.

2.4.1. pH

The acidic or basic property of a drug is determined by measuring pH. The pH value of an aqueous liquid shows how many hydrogen ions are present in a given sample. A pH value below 7 indicates an acidic nature and above 7 indicates a basic nature of the drug.[10]

2.4.1.1. Method

pH litmus paper was taken and dipped in the solution of the given specimen, The pH of the sample was assessed by immersing litmus paper into the prepared solution of the specimen and observing the resulting colour change.

2.4.2. Loss on drying at 110°C

The test loss on drying determines the water content in the given sample. The lower the value shows less water content in the sample.[11]

2.4.2.1. Method

The loss on drying was determined by taking a 2 g accurately weighed sample of the given specimen in dried and previously weighed petri-dishes. Samples were spread evenly and dried in an oven at 110°C till constant weight was noted. The weight after drying was noted, and loss on drying was calculated.

2.4.3. Total ash content

The total ash value provides the total amount of minerals present in the given sample.[12]

2.4.3.1. Method

Total ash value was determined by taking 2 g of accurately weighed sample of specimen in a dried and previously weighed crucible and incinerated at a temperature not exceeding 450°C until free from carbon. Then it was allowed to cool and weighed, and the percentage of ash value was calculated based on the air-dried sample.

2.4.4. Determination of water-soluble extractive (WSE) value

This method determines the number of active constituents extracted with water from a given number of medicinal plants. It also gives some idea about the amount of water-soluble constituents present in a particular drug, such as salt, mucilage, glycosides, and tannin.[13]

2.4.4.1. Method

About 5 g accurately weighed sample of the drug was macerated with 100 mL of distilled water in closed flasks for 24 h. The solution was shaken frequently during 6 h and was allowed to stand for 18 h. Then the solution was filtered, taking precautions against loss of solvent, and 25 mL of the filtrate was evaporated to dryness in a flat-bottomed, previously weighed, dried evaporating dish. It was first dried over a water bath and then at 105°C in a hot air oven, till constant weight was achieved. From the weight of the residue, the percentage of WSE was calculated with reference to the air-dried sample.

2.4.5. Determination of alcohol soluble extractive (ASE) value

Alcohol soluble extract indicates the presence of different constituents, which are soluble in alcohol, and high-performance thin-layer chromatography (HPTLC) fingerprints can also be developed for identification and semi-quantitative analysis from these extracts.[14]

2.4.5.1. Method

ASE value was determined by the same procedure as described in WSE value, by taking 95% methanol instead of water.

2.4.6. HPTLC

An HPTLC study was carried out at the pharmaceutical laboratory of VASU Research Centre, Vadodara, Gujarat.

2.4.6.1. Materials and methods

Dviruttara Hingvadi Churna was separated chromatographically using TLC on silica gel 60 F254 aluminum plates that had been previously coated (Merck). The plates were developed in a CAMAG glass twin-trough chamber, pre-saturated with the mobile phase for 30 min. The mobile phase consisted of Toluene: Ethyl Acetate: Acetic acid in a ratio of 7:2:1 (v/v). Plates were analyzed under 254 nm, 366 nm, and 540 nm ultraviolet light.[15]

2.4.6.2. Sample preparation

1 g sample was weighed accurately in a reflux flask. To it, 10 mL of methanol was added, refluxed for 15 min on a water bath. Then, allowed to cool and filtered with the help of Whatman filter paper No. 1. The filtrate thus obtained was used for HPTLC fingerprinting.

Preparation of spray reagent: (anisaldehyde – sulfuric acid reagent): 0.5 mL anisaldehyde is mixed with 10 mL glacial acetic acid, followed by 85 mL methanol and 5 mL sulfuric acid (98%).

3. RESULTS

The initial purpose of the study was to confirm the authenticity of the drugs used in the preparation of *Dviruttara Hingvadi Churna.* For this, fine powder of ingredients was subjected to organoleptic and microscopic evaluations to confirm the genuineness of the raw drugs. Later, after the preparation of the formulation, pharmacognostical evaluation was carried out.

3.1. Organoleptic evaluation

Organoleptic Parameters of Prepared Drug refers to the analysis of characters such as *Rupa* (color)*, Rasa* (taste)*, Gandha* (odor), and *Sparsha* (consistency). 2 g of the prepared drug was taken, and the identification was carried out based on organoleptic features [Table 3].

3.2. Microscopic Evaluation

Microscopic evaluation was conducted by dissolving the powder of *Dviruttara Hingvadi Churna* in distilled water and studying it under a microscope for the presence of characteristics of ingredient drugs. Photo Microscopy in 10X revealed the presence of following contents viz; A. Brown content of Chitrak, B. Cork cells and lignified fibers of Chitrak, C. Prismatic crystal of Chitrak, D. Rosette crystal of Chitrak, E. Vessels of Chitrak, F. Cork cells of Vacha, G. Fibers of Vacha, H. Olio-resin content of Vacha, I. Vessels of Vacha, J. Lignified pitted vessels of Kustha, K. Pitted vessels of Kustha, L. Lignified stone cells of Vidanga, M. Olio-resin content of Vidanga, N. Stone cells of Vidanga which are depicted below [Figure 1].

3.3. Physiochemical Parameters

Physiochemical parameters such as pH, loss on drying, total ash content, water-soluble extract, and alcohol-soluble extract were found within the normal range. Details are shown below [Table 4].

3.4. HPTLC

Densitometry scanning of the HPTLC Pattern showed 4 spots at 254 nm, 6 spots at 366 nm, and 10 spots at 540 nm. Their corresponding Rf values are explained below [Table 5, Figures 2 and 3]. Although it is not possible to identify a particular chemical constituent from the spot obtained, the pattern may be used as a reference standard for further quality control research.

4. DISCUSSION

The study on *Dviruttara Hingvadi Churna* was a step toward pharmacognostical and pharmaceutical standardization of the drug. The pharmacognostical study revealed the presence of the diagnostic characters of *Dviruttara Hingvadi Churna* such as A. Brown content of Chitrak, B. Cork cells and lignified fibers of Chitrak, C. Prismatic crystal of Chitrak, D. Rosette crystal of Chitrak, E. Vessels of Chitrak, F. Cork cells of Vacha, G. Fibres of Vacha, H. Olio-resin content of Vacha, I. Vessels of Vacha, J. Lignified pitted vessels of Kustha, K. Pitted vessels of Kustha, L. Lignified stone cells of Vidanga, M. Olio-resin content of Vidanga, N. Stone cells of Vidanga. This confirms the presence of all ingredients of raw drugs in the final product, and there was no major change in the microscopic structure of the raw drug during the pharmaceutical process of preparation of *Churna*. This showed the genuineness of the final product. The results revealed that *Dviruttara Hingvadi Churna* is free from unwanted organic compounds, and the production site was good enough keeping samples free from dust and other solid matters.

All the physiochemical parameters, such as loss on drying – 7.66%, ash value – 3.65%, water soluble extract – 19.44%, alcohol soluble extract – 18.56%, and pH value – 6.5, were analyzed, which were within normal referential range. In the HPTLC study, 4 spots at 254 nm, 6 spots at 366 nm, and 10 spots at 540 nm were obtained, indicating the possible components of the matrix, which may possess its therapeutic effect, and the quality of *Dviruttara Hingvadi Churna* has been standardized.

5. CONCLUSION

The pharmacognostical and physicochemical analysis of *Dviruttara Hingvadi Churna* confirmed the purity and genuineness of the drug. As no standard fingerprint is available for this formulation, an attempt has been made to evolve pharmacognostical and physico-chemical profiles of *Dviruttara Hingvadi Churna*. Information acquired from this study may be beneficial for further research work and can be used as a reference standard for quality control research.

6. ACKNOWLEDGMENTS

Nil.

7. AUTHORS' CONTRIBUTIONS

All authors give equal contribution in making of this manuscript.

8. FUNDING

Nil.

9. ETHICAL STATEMENT

Ethical approval was not required for this study as it is an experimental study.

10. CONFLICT OF INTERESTS

The authors declare no conflicts of interest regarding the publication of this paper.

11. DATA AVAILABILITY STATEMENT

The data analyzed in this review were obtained from publicly available sources, including peer-reviewed articles, observational studies, and surveys accessible through databases.

12. PUBLISHERS NOTE

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How to cite this article:
Dubey M, Goyal M, Harisha CR, Nariya M. Pharmacognostical and Pharmaceutical Analysis of *Dviruttara Hingvadi Churna* – An Ayurvedic Herbal Formulation for *Purishaja Udavarta* by Charaka Samhita. IRJAY. [online] 2026;9(4):1-7.
Available from: http://irjay.in
DOI link- https://doi.org/10.47223/IRJAY.2026.90401

Table 1: Ingredients of *Dviruttara Hingvadi Churna*[1]

S. No.	Name of ingredients	Latin name	Family	Part used	Proportion
1	*Hingu*	*Ferula asafoetida* Linn.	Apiaceae	Latex	1 part
2	*Vacha*	*Acorus calamus* Linn.	Araceae	Rhizome	2 parts
3	*Chitraka*	*Plumbago zeylanica* Linn.	Plumbaginaceae	Root	4 parts
4	*Kustha*	*Saussurea lappa* C.B.Clarke	Asteraceae	Root	8 parts
5	*Swarjikshara*	*Sodium bicarbonate*	---	*Panchaanga*	16 parts
6	*Vidanga*	*Embelia robusta* Burm.	Myrsinaceae	Fruit	32 parts

Table 2: Ayurvedic parameters (*Rasa Panchaka* of *Dviruttara Hingvadi Churna*)

Drugs	*Rasa*	*Guna*	*Virya*	*Vipaka*	*Karma*
Hingu	*Katu*	*Laghu, Snigdha Sara, Tikshna*	*Ushna*	*Katu*	*Kapha-Vata Shamaka, Sangnasthapana, Vedansthapana, Deepana, Pachana, Rochana,* and *Anulomana.*[3]
Vacha	*Katu, Tikta*	*Laghu, Tikshna*	*Ushna*	*Katu*	*Kapha-Vatahara, Deepana, Medhya, Lekhana,* and *Krimighna.*[4]
Chitraka	*Katu*	*Laghu, Tikshna*	*Ushna*	*Katu*	*Kapha-Vata Shamak, Mentions Deepana, Pachana,* and *Bhedana.*[5]
Kustha	*Katu, Tikta*	*Laghu, Ruksha, Tikshna*	*Ushna*	*Katu*	*Deepana, Pachana, Vatanulomana, Krimighna,* and *Kusthaghna.*[6]
Swarjikshara	*Katu, Lavana*	*Laghu, Ruksha, Tikshna*	*Ushna*	*Katu*	*Bhedana, Lekhana, Deepana,* and *Pachana.*[7]
Vidanga	*Katu, Tikta*	*Laghu, Ruksha, Tikshna*	*Ushna*	*Katu*	*Krimighna, Deepana, Pachana, Kushtaghna, Kandughna,* and *Medohara.*[8]

Table 3: Organoleptic characters of *Dviruttara Hingvadi Churna*

S. No.	Parameter	Results
1	Color	Lightly muddy brown
2	Taste	Lightly astringent
3	Odor	Slightly aromatic
4	Touch	Coarse

Table 4: Physiochemical parameters of *Dviruttara Hingvadi Churna*

S. No.	Parameters	*Dviruttara Hingvadi Churna*
1	Loss on drying	7.66% w/w
2	Ash value	3.65% w/w
3	Water-soluble extract	19.44% w/w
4	Alcohol-soluble extract	18.56% w/w
5	pH value	6.5

Table 5: Rf values of *Dviruttara Hingvadi Churna*

Variables	Rf value at 254 nm showing 4 spots	Rf value at 366 nm showing 6 spots	Rf value at 540 nm showing 10 spots
HPTLC	0.18, 0.32, 0.57, 0.70	0.22, 0.36, 0.42, 0.48, 0.66, 0.79	0.22, 0.32, 0.42, 0.54, 0.64, 0.70, 0.74, 0.79, 0.82, 0.84

HPTLC: High-performance thin-layer chromatography

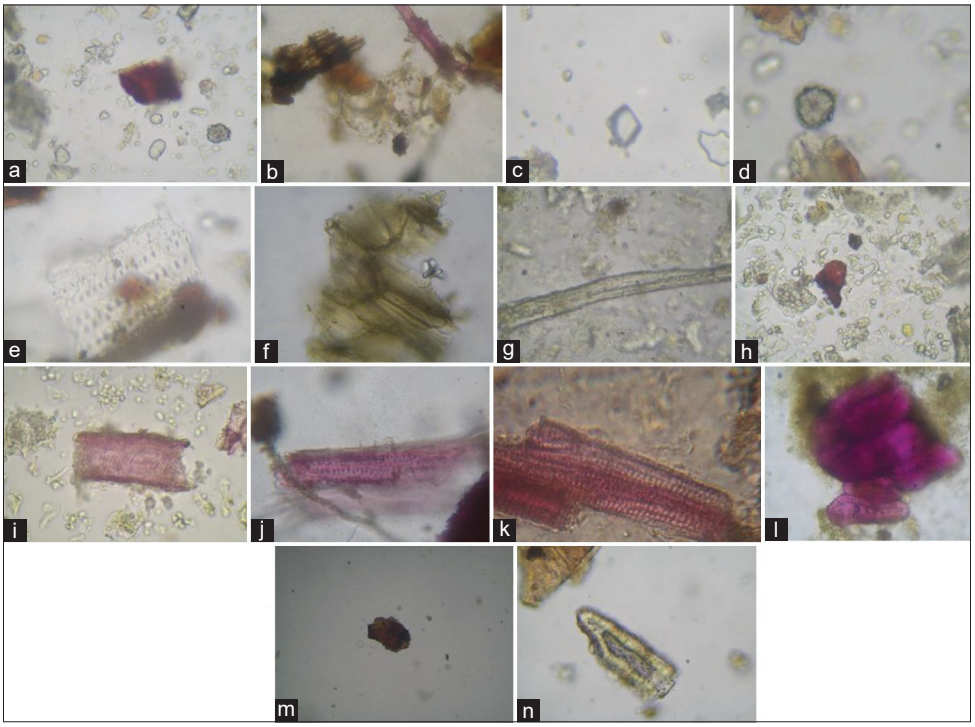

Figure 1: Microscopic characters of *Dviruttara Hingvadi Churna.* (a) Brown content of Chitrak, (b) Cork cells and lignified fibres of Chitrak, (c) Prismatic crystal of Chitrak, (d) Rosette crystal of Chitrak, (e) Vessels of Chitrak, (f) Cork cells of Vacha, (g) Fibres of Vacha, (h) Olioresine content of Vacha, (i) Vessels of Vacha, (j) Lignified pitted vessels Kustha, (k) Pitted vessels of Kustha, (l) Lignified stone cells Vidanga, (m) Olioresine content of Vidanga, (n) Stone cells of Vidanga

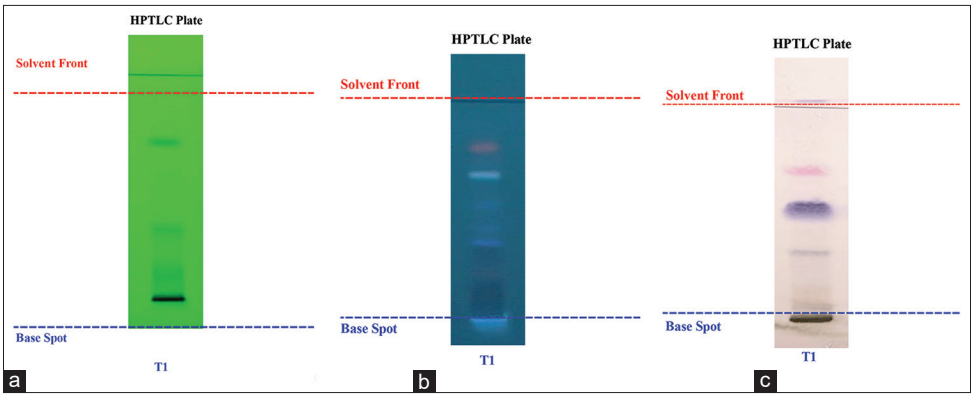

Figure 2: (a) HPTLC @ 254 nm, (b) HPTLC @ 366 nm, (c) HPTLC @ 540 nm

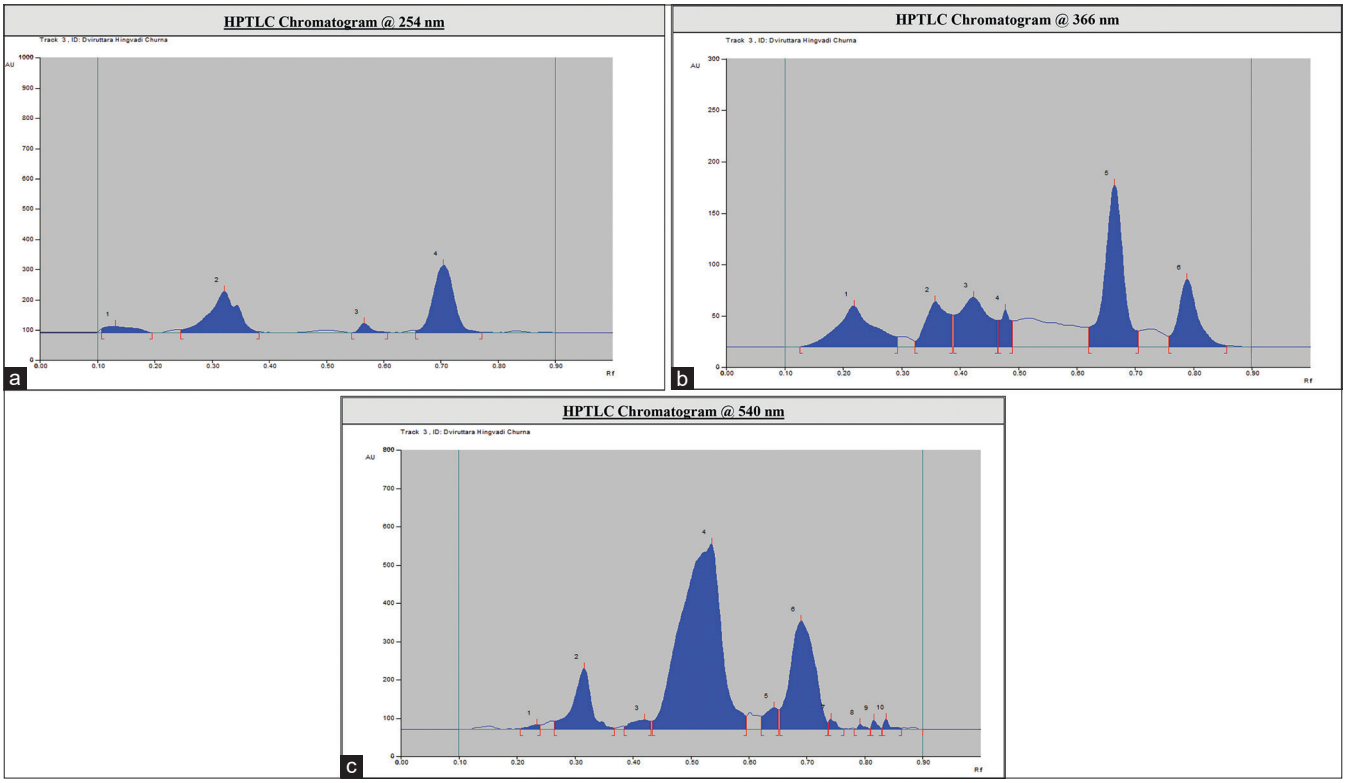

Figure 3: (a) HPTLC @ 254 nm, (b) HPTLC @ 366 nm, (c) HPTLC @ 540 nm