

PHARMACEUTICAL AND ANALYTICAL EVALUATION OF MUKHAVYANGAHARA ARKA AND KASHAYA: AN AYURVEDIC FORMULATION

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ABSTRACT

Introduction: *Mukhavyanga*, known as facial blemishes or melasma, falls under *Kshudra Roga* in *Ayurveda*. It's widespread and impacts both appearance and mental health. The classical *Ayurvedic* texts recommend *Mukhavyangahara Arka* (a distillate) and *Mukhavyangahara Kashaya* (a decoction) for management of *Mukhavyanga*. Both formulations contain the same herbal ingredients, *Vatankura* (*Ficus benghalensis*), *Masura* (*Lens culinaris*), and *Manjistha* (*Rubia cordifolia*), following *Arkaprakasha* (7/6). Although both dosage forms rely on identical ingredients, there's a lack of comparative pharmaceutical and analytical studies between them. **Methods:** To prepare *Arka*, the herbal mixture (100 g in total, equal parts of each) is soaked in 1000 mL water (10×), then distilled to yield 600 mL (60%). For *Kashaya*, the same amount is boiled in 1600 mL water (16×), then reduced to 200 mL (1/8th volume). Both formulations are evaluated for

organoleptic properties, pH, specific gravity, and Loss on Drying. HPTLC is carried out using silica gel 60 F₂₅₄ and a mobile phase of Toluene:Ethyl acetate:Diethyl ether (3:3:1 v/v/v), with detection at 254 nm and 366 nm. **Results:** *Arka* appeared colourless, clear, with mild aromatic odour and slightly astringent taste; pH was 5.2 and specific gravity 0.998. *Kashaya* appeared brownish to dark brown, turbid, with strong herbal odour and predominantly astringent taste; pH was 5.9 and specific gravity 1.025. HPTLC at 254 nm showed *Kashaya* had multiple peaks across a wide R_f range (0.05–0.61) with major peaks

near Rf 0.30 and 0.60, while *Arka* showed fewer peaks mostly below Rf 0.35. At 366 nm, *Kashaya* demonstrated strong fluorescence with a dominant peak at Rf 0.08–0.11 (~80% area); *Arka* had limited fluorescent peaks but showed a distinctive trace spot at Rf 0.95.

Discussion and Conclusion: Even though both formulations start with the same ingredients, their chemical profiles diverge because of the different extraction methods. *Kashaya*, rich in polar and non-volatile compounds like tannins and flavonoids, supports superficial astringent and depigmenting actions. *Arka* carries volatile, low molecular weight constituents, which penetrate quickly. The HPTLC fingerprints not only offer reference standards for quality control but also reaffirm classical pharmaceutical principles.

KEYWORDS: *Mukhavyangahara Arka*, *Mukhavyangahara Kashaya*, HPTLC, Melasma, Ayurvedic pharmaceuticals, Decoction, Distillate.

INTRODUCTION

Mukhavyanga,^[1] an ailment described in *Ayurveda* under *Kshudra Roga*^[2] (minor diseases), tends to show up as painless, thin, bluish-black or brownish patches on the face. It lines up pretty closely with what modern medicine calls melasma^[3]—a chronic hyperpigmentation disorder that often affects sun-exposed areas like the cheeks, forehead, nose, and upper lip. Modern medicine pins melasma on factors like UV exposure, hormonal shifts, genetics, and stress. *Ayurveda*, meanwhile, sees *Mukhavyanga* as the result of an imbalance in *Vata*, *Pitta*, and *Rakta Dosha*,^[4] tied in with psychological states such as anger, grief, and intense mental strain. Even though it's marked as minor, *Mukhavyanga* really impacts someone's appearance and mental well-being, making it more than just a trivial concern and pushing for safe, effective treatment options.

Today, doctors usually tackle melasma with topical depigmenting creams, chemical peels, or laser therapy. But these treatments often come with side effects—skin irritation, recurring pigment, sometimes even long-term dependency. That sets up a need for gentler, longer-lasting solutions. *Ayurveda* steps in here, focusing on a holistic approach—cleansing the blood (*Raktashodhana*), enhancing complexion (*Varnya*),^[5] and balancing *Dosha*, along with herbal medicines used both inside and external application. Traditional Ayurvedic remedies like *Mukhavyangahara Arka*^[6] and *Mukhavyangahara Kashaya* show promise: they come from natural sources, offer action on multiple targets, and carry little risk for side effects.

Ayurvedic pharmaceuticals (*Bhaishajya Kalpana*) has a huge influence on how effective a treatment is. Two key dosage forms stand out: *Arka Kalpana* and *Kashaya Kalpana*. *Arka Kalpana*, detailed in classical texts like *Arkaprakasha*, uses water and a distillation apparatus (*Arka Yantra*) to produce a potent distillate. Thanks to qualities like being light (*Laghu*), rapidly spreading (*Vyavayi*), and subtle (*Sukshma*), *Arka* is absorbed quickly and delivers fast action.^[7] *Kashaya Kalpana* (decoction), on the other hand, is made by boiling herbs to pull out water-soluble active compounds.^[8] These decoctions are packed with polar phytoconstituents—tannins, flavonoids, glycosides—and work well for both systemic and local treatment.

Arkaprakasha (7/6) provides the classical reference for *Mukhavyangahara Arka*, prescribing *Vatankura*^[9] (Aerial roots of *Ficus benghalensis*), *Masura*^[10] (*Lens culinaris* seeds), *Manjistha*^[11] (*Rubia cordifolia* root), and *Kshaudra*^[12] (honey) for managing facial pigmentation. These ingredients are recognized for complexion improving (*Varnya*), blood purifying (*Raktashodhaka*), and skin nourishing (*Twak Prasadana*) effects. Interestingly, the same herbal mix can be made into a decoction—*Kashaya*—by simply extracting them in water, offering an alternative dosage option. In both preparations, honey isn't added during the process; it's mixed in right before application as a vehicle. This dual approach fits neatly with the Ayurvedic tradition of using different pharmaceutical processes to boost potency, improve absorption, and target treatment more precisely.

In today's world, there's a push for standardizing and validating *Ayurvedic* formulations to ensure quality and consistency. Pharmaceutical standardization means assessing things like taste, texture, physical properties, and preparation technique. Analytical validation goes a step further, using advanced methods such as HPTLC (High Performance Thin Layer Chromatography) to profile phytoconstituents and to fingerprint the active compounds. These tools help unpack the complexity of herbal formulations, track down active ingredients, and keep batches consistent. They essentially help bring age-old wisdom into the realm of contemporary science.

There's still a gap in research—especially comparative studies that analyses *Arka* and *Kashaya* made from the same herbs. Most existing research focuses on how effective they are in clinics or looks at single preparations, without connecting pharmaceutical methods to their chemical makeup or therapeutic effects. The way distillation (for *Arka*) and decoction (for *Kashaya*) pull out different phytoconstituents from identical raw materials, and how that

affects absorption and activity, remains mostly unstudied. So, this study sets out to methodically evaluate *Mukhavyangahara Arka* and *Mukhavyangahara Kashaya*—prepared from the same ingredients, minus honey during prep—to generate scientific data supporting their classical use and lay groundwork for future clinical and pharmacological exploration.

AIM AND OBJECTIVES

This study set out to evaluate and compare the pharmaceutical preparation and analytical profiles of *Mukhavyangahara Arka* and *Mukhavyangahara Kashaya*, both made from the same herbal ingredients. Here's what we focused on: preparing both formulations—*Arka* and *Kashaya*—using *Vatankura*, *Masura*, and *Manjistha*, following classical Ayurvedic methods and leaving honey out during preparation; examining their organoleptic characteristics like colour, odour, taste, and appearance; assessing physicochemical parameters; running HPTLC fingerprinting for analytical profiling; and comparing the phytochemical profiles of *Arka* and *Kashaya* based on what we saw in the HPTLC analysis.

MATERIALS AND METHODS

We used authenticated raw drugs throughout the study. *Vatankura* (aerial roots of *Ficus benghalensis*), *Masura* (seeds of *Lens culinaris*), and *Manjistha* (root of *Rubia cordifolia*) formed the core ingredients for both preparations, and extraction was done with purified water. Honey (*Kshaudra*) wasn't used in the actual preparation, only added at the time of application. All materials came from a trusted source and were authenticated by *Dravyaguna* experts, ensuring purity and genuineness. For *Arka*, the equipment included an *Arka Yantra* (distillation setup) with a heating mantle, condenser, and receiver flask. For *Kashaya*, we used stainless steel vessels, a gas stove, muslin cloth, and filter papers. When it came to analysis, we relied on a calibrated pH meter, specific gravity bottle, digital balance, and the CAMAG HPTLC system (Linomat 5 applicator, TLC Scanner 4, visionCATS software).

PHARMACEUTICAL STUDY

Preparation of *Mukhavyangahara Arka*

We prepared *Mukhavyangahara Arka* per the classical *Arkaprakasha* (7/6) method. No honey went into the distillation—it's mixed with *Arka* right before application. To start, 33.3 g each of *Vatankura*, *Masura*, and *Manjistha* (100 g total) were cleaned, coarsely powdered, and blended. This mixture soaked in 1000 ml of purified water (ten times the herbal weight) for 12 hours (*Jala klinna*). After soaking, we transferred it to the *Arka Yantra* and heated it under controlled conditions. Vapours were condensed, and distillate was collected until

condensation stopped. We ended up with 600 ml of distillate—about 60% of the original water volume. We stored *Arka* in amber glass containers, sealed and kept at room temperature.

Preparation of *Mukhavyangahara Kashaya*

We prepared *Mukhavyangahara Kashaya* using the standard *Kashaya Kalpana* method and the same herbal ingredients. We left honey out during the decoction process—it's only added while applying the medicine. First, we took three herbal drugs in equal amounts, totaling 100 g, and made them into *Yavakuta* (coarse powder). Next, we mixed this powder with 1600 ml of purified water (that's 16 times the weight of the drugs) in a stainless steel vessel. The mixture boiled over gentle heat while we kept stirring, until the volume shrank to one-eighth of its original size—just 200 ml. Once the decoction was hot and ready, we filtered it using clean muslin cloth. We stored the *Kashaya* in a clean, airtight container.

Analytical Study

Both formulations went through organoleptic evaluation using sensory parameters. Three independent evaluators judged the colour, odour, taste, and general appearance, following standard descriptive methods. We checked physicochemical properties in a few steps: pH was measured at 25°C with a calibrated digital pH meter; specific gravity was tested with a pycnometer; loss on drying was determined at 105°C in a hot air oven.

For HPTLC analysis, we used *Arka* and *Kashaya* samples (without honey) directly after diluting them with methanol (1:1 v/v) for better application consistency. The analysis happened on Merck HPTLC silica gel 60 F₂₅₄ plates (100×100 mm). The mobile phase was Toluene : Ethyl acetate : Diethyl ether in a 3:3:1 v/v/v ratio, and we saturated the chamber for 20 minutes before developing the plate. We applied samples using a Linomat 5 as 8.0 mm bands, placed 8.0 mm from the lower edge, with volumes of 5 µL, 10 µL, and 15 µL for each sample. The plates were developed up to 80 mm from the lower edge. Detection happened with a TLC Scanner 4 at two wavelengths: 254 nm (UV, with deuterium lamp) and 366 nm (fluorescence, mercury lamp with K400 filter). We scanned at 100 mm/s, and data resolution was 100 µm per step. Densitograms were analyzed using visionCATS software, and we integrated peaks with the Gauss (legacy) algorithm and Savitzky Golay smoothing (window size 7). We recorded R_f values, peak heights, and peak areas.

OBSERVATIONS AND RESULTS

The pharmaceutical preparations revealed clear differences between the two formulations. For *Arka*, using 100 grams of herbal drugs and 1000 milliliters of water (a 10x ratio) yielded 600 milliliters of distillate, which is a 60% yield. Honey wasn't added during the process. Preparation involved sealing the distillation setup tightly and watching the temperature, but the whole thing finished faster than with *Kashaya*.

Kashaya required 100 grams of herbal drugs with 1600 milliliters of water (16x ratio). After boiling and reducing the liquid to 1/8th of its original volume, the final decoction was 200 milliliters, also with no honey included. This method took more time due to continuous boiling and reduction. Key steps here were steady heating and proper filtration. *Arka* drew out mainly volatile compounds, while *Kashaya* extracted a broader range—polar and mid-polar substances.

Organoleptic Results

Table 1 summarizes these sensory findings. *Arka* looked colourless and clear, smelled mildly aromatic, and tasted slightly astringent and mild. Its appearance stayed transparent. *Kashaya* appeared brownish to dark brown, gave off a strong herbal scent, and tasted mostly astringent, with a bitter edge. It looked turbid or a bit opaque.

Table 1: Organoleptic Parameters.

Parameter	<i>Mukhavyangahara Arka</i>	<i>Mukhavyangahara Kashaya</i>
Color	Colorless / clear	Brownish to dark brown
Odor	Mild, characteristic, slightly aromatic	Strong, characteristic herbal odour
Taste	Slightly astringent, mild	Predominantly astringent with bitter undertone
Appearance	Clear, transparent liquid	Turbid or slightly opaque liquid

Physicochemical Results

Table 2 presents the main physicochemical data. *Arka* showed a pH of 5.2, *Kashaya* 5.9. *Arka*'s specific gravity was 0.998 (almost equal to water), while *Kashaya*'s was higher at 1.025. *Kashaya* had a loss on drying at 105°C of 94.72%; for *Arka*, this wasn't measured.

Table 2: Physicochemical Parameters.

Parameter	<i>Mukhavyangahara Arka</i>	<i>Mukhavyangahara Kashaya</i>
pH	5.2	5.9
Specific gravity	0.998	1.025
Loss on drying at 105°C	–	94.72 %

HPTLC Results

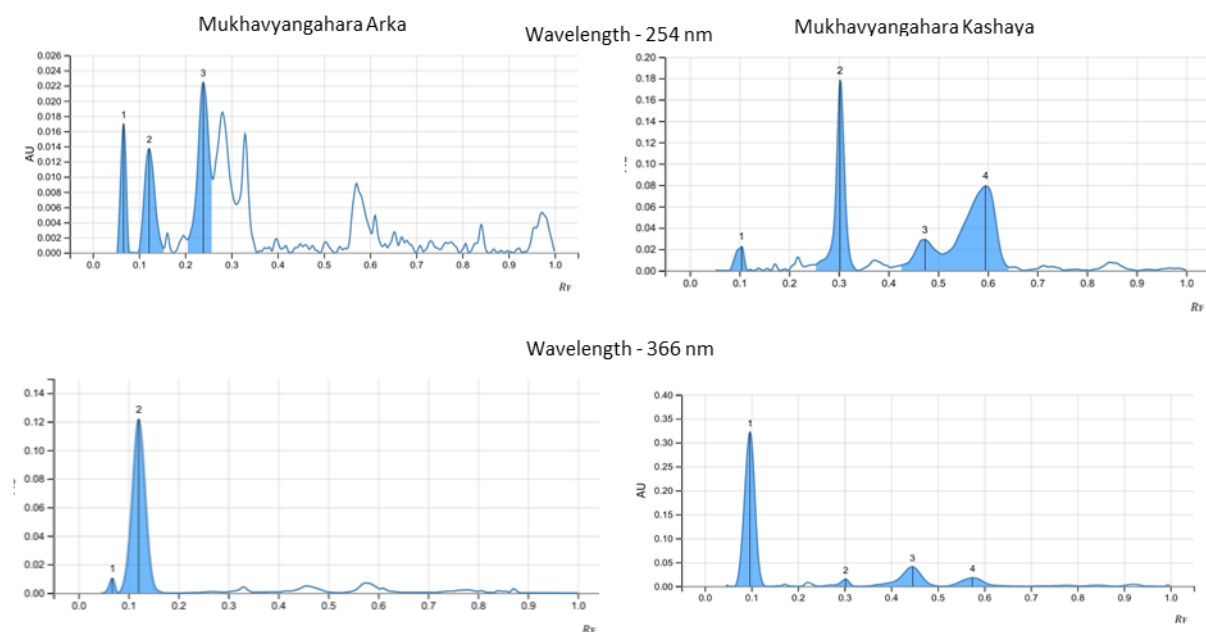


Figure 1: HPTLC Results.

Table 3: Detection at 254 nm.

Samples	Peak #	Start Rf	Max Rf	End Rf	Height (AU)	Area (% of total)
<i>Mukhavyangahara Kashaya</i>	1	0.081	0.104	0.117	0.0224	3.86
	2	0.251	0.303	0.339	0.1780	32.29
	3	0.404	0.474	0.510	0.0290	13.86
	4	0.510	0.596	0.644	0.0792	49.99
<i>Mukhavyangahara Arka</i>	1	0.053	0.067	0.079	0.0170	18.64
	2	0.097	0.122	0.153	0.0137	29.21
	3	0.204	0.239	0.258	0.0224	52.15

Table 4: Detection at 366 nm.

Samples	Peak #	Start Rf	Max Rf	End Rf	Height (AU)	Area (% of total)
<i>Mukhavyangahara Kashaya</i>	1	0.064	0.097	0.131	0.3217	70.68
	2	0.271	0.303	0.324	0.0148	3.35
	3	0.335	0.446	0.511	0.0406	18.15
	4	0.512	0.575	0.675	0.0177	8.38
<i>Mukhavyangahara Arka</i>	1	0.050	0.068	0.079	0.0102	3.24
	2	0.079	0.121	0.171	0.1217	96.76

Mukhavyangahara Kashaya

Under UV light at 254 nm, *Kashaya* produced multiple well-defined peaks across a broad Rf range. At 5 μ L, two main peaks appeared at Rf 0.287 (46.26% area) and 0.597 (53.74% area).

At 10 μL , four peaks were visible—Rf 0.104, 0.303 (dominant at 57.68% area), 0.474, and 0.596. At 15 μL , five peaks showed up at Rf 0.069, 0.111, 0.306 (dominant at 47.00% area), 0.378, and 0.613. These multiple peaks up to Rf 0.61 suggest a diverse mix of UV-absorbing compounds, including phenolics, tannins, and anthraquinones from *Manjistha*.

Switching to fluorescence at 366 nm, *Kashaya* displayed intense fluorescence, especially in the lower Rf region. At 5 μL , a dominant peak at Rf 0.078 took up 85.10% area, with a secondary at 0.446. At 10 μL , the main peak at Rf 0.097 claimed 81.47% area, alongside peaks at 0.303, 0.446, and 0.575. At 15 μL , the dominant peak at Rf 0.108 filled 80.49% area, with supporting peaks at 0.304, 0.457, and 0.574. This bright fluorescence signals the presence of flavonoids, coumarins, and phenolic derivatives, compounds noted for antioxidant and depigmenting properties.

Mukhavyangahara Arka

At 254 nm, *Arka* showed fewer peaks, all in the low Rf range. At 5 μL , no clear peaks emerged (below detection threshold). At 10 μL , three peaks were seen at Rf 0.067, 0.122, and 0.239, each with low intensity. At 15 μL , five peaks came up at Rf 0.083, 0.129, 0.253, 0.299, and 0.347, and all stayed below Rf 0.35. These results confirm *Arka* contains only volatile, low molecular weight compounds, without the heavy nonvolatile matter found in *Kashaya*.

For fluorescence at 366 nm, *Arka* put forward one main fluorescent peak in the low Rf region and a few weaker secondary spots. At 5 μL , a single peak at Rf 0.099 made up 100% area. At 10 μL , the dominant peak at Rf 0.121 contributed 92.24% area, plus a minor peak at 0.068. At 15 μL , the major peak at Rf 0.126 took 71.51% area, with smaller peaks at Rf 0.085, 0.479, and 0.593, and a unique trace spot at Rf 0.947. That distinctive spot at Rf 0.947 only appeared in *Arka* and might signal a highly nonpolar volatile compound, enriched by distillation.

Table 5 compares the HPTLC fingerprints. *Kashaya* displayed multiple peaks (2–5) at 254 nm across a wide Rf span (0.05–0.61), indicating polar and nonvolatile compounds as well as high phytochemical complexity. Its fluorescence came through strong. *Arka* produced fewer, less intense peaks (1–5) at 254 nm in a narrower Rf range (0.05–0.35), showing volatile, low molecular weight compounds and lower phytochemical complexity. Its fluorescence stayed moderate. Only *Arka* showed a unique fluorescent spot near Rf 0.947.

Table 5: Comparative Summary of HPTLC Profiles.

Feature	<i>Mukhavyangahara Kashaya</i>	<i>Mukhavyangahara Arka</i>
Number of peaks (254 nm)	Multiple (2–5)	Fewer (1–5, less intense)
Rf range (254 nm)	Wide (0.05–0.61)	Narrow (0.05–0.35)
Nature of compounds	Polar, non-volatile	Volatile, low molecular weight
Fluorescence intensity	Strong	Moderate
Phytochemical complexity	High	Low
Unique spot (366 nm)	None	Rf ~0.947 (trace)

DISCUSSION

This study set out to compare how *Mukhavyangahara Arka* and *Mukhavyangahara Kashaya*, both made from *Vatankura*, *Masura*, and *Manjistha*—with no honey in their initial preparation—differ in pharmaceutical properties and analytical profiles. Even though they start with identical herbs, the results show the two forms turn out quite differently, thanks to distinct methods of extraction.

Kashaya and *Arka* take completely different routes in their preparation. *Kashaya*, the decoction, boils coarse powder in water for a long time (16 times its volume, boiled down to 1/8th), pulling out loads of polar, water-soluble compounds—tannins, flavonoids, glycosides, and phenolics. This shows up in its higher decoction yield (200 ml from 100 g herbs), and greater specific gravity. By reducing down, it concentrates these actives. *Arka*, the distillate, relies on distillation (with 10 times water, yielding 60% as distillate). It only picks up the volatile and low molecular weight compounds. The distillate comes out much clearer (600 ml from 100 g herbs), with a specific gravity like water. Because it's only getting volatile components, the solid content stays low. In Ayurvedic terms, *Arka* is considered *Laghu* (light), *Sukshma* (subtle), and *Vyavayi* (quick-spreading), while *Kashaya* is *Guru* (heavy) and *Sthira* (stable). The characteristics observed match these classical ideas very closely, lending support to traditional Ayurvedic pharma concepts.

The HPTLC analysis backs this up. *Kashaya* shows a much more complex phytochemical profile, with several peaks across a broad Rf range (0.05–0.61) at both 254 nm and 366 nm. Peaks around Rf 0.30 and 0.60 at 254 nm point to mid-polar compounds, while a strong fluorescent peak at Rf 0.08–0.11 (covering about 80% of the area) suggests lots of polar fluorescent stuff like flavonoids and coumarins—well-known for antioxidant, anti-inflammatory, and tyrosinase-inhibiting activity, which matters for treating hyperpigmentation. *Arka* reveals a simpler profile, mostly with peaks below Rf 0.35 at 254 nm, hinting at its extraction of volatile, smaller molecules. At 366 nm, peaks are fewer and

mostly in the low Rf region; *Kashaya* comes out richer here. *Arka* does show a unique trace fluorescent spot at Rf 0.947 (only at the highest sample volume), probably a highly non-polar volatile like a sesquiterpene or an aliphatic compound—such things tend to get selectively concentrated by distillation.

When we look at bioavailability, the molecular size, polarity, and lipophilicity make a big difference. *Kashaya* is full of bigger, polar compounds (think tannins and flavonoids), which don't cross the skin easily. Its effect stays on the surface, where it acts as an astringent, antioxidant, and mild exfoliant—useful for removing superficial pigmentation and smoothing texture. *Arka*, with its volatile, smaller, and more lipophilic compounds, penetrates skin more efficiently. Its thin consistency and quick spread make it move fast through the skin's upper layers, matching those classical Ayurvedic qualities of *Sukshma* and *Vyavayi*. That speeds up its action and helps it reach deeper targets like melanocytes in the basal layer.

Honey isn't added during preparation, but it should be mixed in right before application. As a humectant, honey boosts skin hydration, gently exfoliates with its enzymes, and protects against microbes. It also forms a coating that prevents evaporation of *Arka*'s volatile elements, keeping them in contact with the skin longer. The combination improves the therapeutic effect of both forms. In cases of *Mukhavyanga* (where *Pitta* and *Rakta* are vitiated), both formulations are indicated and complement each other. *Kashaya* lays down a phytochemical-rich surface effect—stringent, antioxidant, and depigmenting. *Arka* improves penetration and delivery, acting faster and reaching deeper. The unique volatile in *Arka* (Rf 0.947) might be behind its special pharmacology. The findings offer scientific support for choosing between these two forms, even when using the same herbs. The right pick depends on how deep the pigmentation goes, skin type, and whether a rapid effect is needed.

CONCLUSION

This study compared two forms of *Mukhavyangahara*: *Arka* and *Kashaya*, both made from *Vatankura*, *Masura*, and *Manjistha*, without honey. *Kashaya*, a decoction (using 100 grams of herbs and 16 times water, boiled down to one-eighth), produced about 200 ml of brownish, cloudy liquid. Its higher specific gravity suggests it pulls out polar, water-soluble compounds from the herbs. *Arka*, on the other hand, is created by distillation (100 grams of herbs and 10 times water, with a 60% distillate yield), resulting in 600 ml of a clear, colourless liquid. Its specific gravity matches water, meaning it mostly grabs volatile, lighter compounds. The HPTLC fingerprints differed. *Kashaya* showed a more complex profile, with many peaks up

to Rf 0.61 and strong fluorescence. *Arka*'s profile was simpler, featuring smaller peaks below Rf 0.35, and one bright fluorescent spot at Rf 0.947. From a therapeutic angle, *Kashaya* acts on the surface, offering astringent, antioxidant, and depigmenting effects. *Arka*, rich in volatile compounds, gets absorbed quickly through the skin. Adding honey during application boosts hydration, slows evaporation, and helps the medicine stay in contact with the skin longer. Both forms work well together, demonstrating how different pharmaceutical approaches to the same herbs create distinct therapeutic effects.

LIMITATIONS AND FUTURE SCOPE

This study has its limitations. It looked at only a single batch—so we need more batches to confirm and generalize these findings. There was no clinical work to directly connect analytical results with patient outcomes. HPTLC is great for qualitative or semi-quantitative insight, but it doesn't identify individual compounds. We didn't do stability tests, and the impact of honey added at application wasn't experimentally explored here.

Looking ahead, research needs to dive into clinical trials comparing *Arka* and *Kashaya*, both applied with honey, in people with melasma. Advanced analytic methods like HPLC, GC MS, or LC MS would help pinpoint and measure markers such as munjisthin, tannins, and volatile terpenes. In vitro skin permeation experiments using Franz diffusion cells could tell us how deeply *Arka* and *Kashaya* penetrate the skin. Stability studies, following ICH guidelines, are essential to determine shelf life. To see how honey affects penetration, compare applications with and without it. Finally, creating user-friendly topical forms, creams or gels—that include either *Arka* or *Kashaya* could make these treatments much easier and more appealing for patients.

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