Research Article

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PHYTOCHEMICAL PROFILING AND QUALITY ASSURANCE OF SHANKHPUSHPI SYRUP: AN INTEGRATIVE ANALYTICAL APPROACH

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ABSTRACT

Introduction: Shankhpushpi is a renowned Ayurvedic herb traditionally used as a Medhya Rasayana to improve memory, intellect, and cognitive function. It is commonly administered as a syrup, particularly in pediatric practice, due to its palatability and ease of administration. However, limited standardaization data are available for prepared herbal syrup formulations. Therefore, the present study was undertaken to evaluate the physicochemical characteristics of Shankhpushpi Syrup. Methods: The prepared sample of Shankhpushpi Syrup was analysed at Cultivator Phyto Lab Private Limited, Jodhpur, following standard procedures described in the Ayurvedic Pharmacopoeia of India (API). Organoleptic evaluation and physicochemical parameters, including specific gravity, pH, reducing sugar, total solids, viscosity, and refractive index, were assessed. Thin-Layer Chromatography (TLC) was performed to establish a preliminary phytochemical fingerprint profile. Results: The formulation was observed as a dark brown viscous liquid with characteristic odour and taste. The specific gravity and pH were 1.2054 and 4.49, respectively. Reducing sugar content was 4.18% w/w, while total solids constituted 54.45% of the formulation. Viscosity at 27°C was recorded as 22 mPas, and the refractive index at 25°C was 1.4101. TLC analysis revealed two prominent spots with Rf values of 0.50 and 0.57. Discussion and Conclusion: The obtained physicochemical parameters indicate the characteristic profile of a stable herbal syrup formulation. The acidic pH and high total solid content may contribute to stability and preservation, whereas the TLC fingerprint provides a useful tool for identification and quality control. The study establishes preliminary reference standards that may support future standardization and quality assessment of Shankhpushpi Syrup formulations.

Keywords: Shankhpushpi, Syrups, Phytochemical Analysis, Thin-Layer Chromatography, Quality Control, Physicochemical Properties, Herbal Medicine

INTRODUCTION

For centuries, Shankhpushpi (a name used for several herbs, most commonly Convolvulus pluricaulis) has held a place of honor in Ayurvedic medicine. It is traditionally prescribed as a Medhya Rasayana, a rejuvenating tonic for the mind, believed to sharpen memory, boost intellect, and calm the nerves[1]. The term Shankhpushpi is derived from its flower, which resembles a conch (shankha), and the herb is celebrated in classical texts like the Charaka Samhita and Sushruta Samhita for its neuroprotective and nootropic properties. Beyond its cognitive benefits, it is also used to alleviate stress, anxiety, insomnia, and even mild depressive states, making it a cornerstone of pediatric and geriatric mental healthcare in Ayurveda.

To make this beneficial herb more accessible and palatable, especially for children, it is often formulated as a syrup [2,3]. The syrup dosage form offers several advantages: it masks the herb's inherent bitterness, allows for easy dose titration, and is more readily accepted by pediatric and geriatric patients. However, this transformation from a simple herbal decoction to a complex polyherbal syrup introduces significant physicochemical variability.

In our modern era, the credibility of any medicinal product rests heavily on its standardization. A syrup, at its core, is more than just a sweet vehicle; its physical and chemical characteristics how thick it is, how acidic it is, how much sugar it contains directly impact its stability, shelf-life, and how well the body might absorb it[4]. For instance, an excessively viscous syrup may be difficult to pour or administer, while a pH that is too low could accelerate the degradation of active phytoconstituents. Without established quality benchmarks, there is a risk of inconsistency between different batches or preparations[5], leading to variable therapeutic outcomes and potential safety concerns. This is particularly problematic for Shankhpushpi, where the identity of the source plant can vary regionally (e.g., *Convolvulus pluricaulis*, *Evolvulus alsinoides*, or *Clitoria ternatea*), each with distinct chemical profiles.

This study was a small step towards building that knowledge. We aimed to conduct a basic analytical evaluation of a single laboratory sample of Shankhpushpi Syrup, focusing on its fundamental physicochemical properties (specific gravity, pH, sugar content, total solids, viscosity, refractive index) and creating a simple chemical fingerprint using Thin-Layer Chromatography (TLC) to help define its identity. By establishing this baseline profile, we hope to contribute a replicable reference point for future batch-to-batch consistency checks and to highlight the critical need for more comprehensive standardization parameters in the Ayurvedic Pharmacopoeia for finished syrup formulations.

MATERIALS AND METHODS

The prepared sample of Shankhpushpi Syrup was submitted to Cultivator Phyto Lab Private Limited, Jodhpur, Rajasthan, India, for detailed analytical evaluation.

Sample Handling: The laboratory received the sample in a plastic bottle. It was noted as unsealed but in acceptable condition for testing upon arrival on December 9, 2025.

Analytical Procedures: A series of standard tests was performed in accordance with the official methods outlined in the Ayurvedic Pharmacopoeia of India (API).

- The physical appearance, color, and consistency of the syrup were first observed and recorded.
- **Specific gravity** was determined at 25°C as per API Part II Vol IV (2017)[5].
- **pH** was measured using a calibrated pH meter at the same temperature, following API Part II Vol IV (2017)[6].
- The amount of **reducing sugars** was estimated using the method described in API Part II Vol II (2008)[1].
- **Total solids** content was quantified by drying the syrup as per API Part II Vol IV (2017)[5].
- **Viscosity** was measured at 27°C using the laboratory's in-house method (CPL/STP/C/60).
- **Refractive Index** was recorded at 25°C following API Part II Vol IV (2017) [(6)].
- For the chemical fingerprint, **Thin-Layer Chromatography (TLC)** was performed. A sample was prepared by dissolving 5g of syrup in 10ml of methanol. This was run on a TLC plate using a solvent mixture of Toluene, Ethyl acetate, and Formic Acid in a 5:4:1 ratio. The developed plate was sprayed with Anisaldehyde Sulphuric Acid reagent to visualize the spots, and the Retention factor (Rf) values of the major components were calculated[6].

RESULTS

The analysis provided a clear picture of the syrup's composition. The sample was a dark brown, syrupy liquid. A comprehensive summary of all analytical findings is presented in Table 1.

Table 1: Summary of Analytical Findings for Shankhpushpi Syrup Sample

S. No.	Test Parameter(s)	Unit	Result	Test Method (Reference)
Physicochemical Parameters				
1	Description	-	Dark Brown Colored Syrupy Liquid	CPL/STP/C/31
2	Specific gravity (at 25°C)	-	1.2054	API Part II Vol IV: 2017[5]
3	Reducing Sugar	% by weight	4.18	API Part II Vol II: 2008[1]
4	pH value at 25°C	-	4.49	API Part II Vol IV: 2017[5]
5	Total Solids	% by weight	54.45	API Part II Vol IV: 2017[5]
6	Viscosity at 27°C	mPas	22	CPL/STP/C/60
7	Refractive Index at 25°C	-	1.4101	API Part II Vol IV: 2017[5]
8	Thin-Layer Chromatography (TLC)	-	Major Spots at Rf 0.50, 0.57	API Part II Vol IV: 2017[5]
Note: CPL/STP refers to in-house standard testing procedures of the analyzing laboratory, Cultivator Phyto Lab Private Limited.				

DISCUSSION

Looking at these results, a coherent story of the formulation emerges. The high specific gravity (1.2054) and total solids content (over 54%) tell us this is a classic, dense syrup base. This concentration of solids, primarily sugars, is not just for sweetness; it's a traditional method of preservation, as it creates a hypertonic environment where water activity is significantly reduced, making it difficult for most bacteria, yeasts, and molds to survive and proliferate[7,8]. The specific gravity value falls within the typical range for concentrated sugar solutions (approximately 50–67% w/w), confirming that the syrup is unlikely to support microbial growth without additional preservatives.[11]

The slightly acidic pH of 4.49 reinforces this preservative effect, as most pathogenic bacteria prefer a neutral pH range (6.5–7.5). This acidity is common in herbal syrups and can originate from the acidic nature of the herbal extract itself, from the partial oxidation of sugars, or from the intentional addition of citric acid or other fruit acids for both preservation and flavor enhancement. However, it is worth noting that an excessively low pH (<3.5) could potentially hydrolyze certain sensitive glycosides present in Shankhpushpi, whereas a pH above 5.0 might allow mold growth. The measured value of 4.49 appears to strike a practical balance between stability and preservation.

The presence of reducing sugars (4.18% by weight) is an interesting and informative detail. While sucrose is the usual sweetener in syrup preparation, it can partially break down (invert) into glucose and fructose over time, especially in acidic environments and during heat exposure during manufacturing or storage [9]. This inversion process is important for two reasons: (a) reducing sugars are more hygroscopic than sucrose, which can affect the long-term stability of the syrup by absorbing atmospheric moisture, and (b) a mixture of glucose and fructose is sweeter than sucrose alone, meaning less total sugar may be required. The measured value of 4.18% suggests a moderate degree of inversion, which is neither negligible nor excessive for a laboratory-prepared sample.[15]

The viscosity of 22 mPas (measured at 27°C) gives the syrup its characteristic "body" and smooth texture, ensuring it is easy to pour and measure a dose. To put this in perspective, water at 20°C has a viscosity of approximately 1 mPas, while a light cough syrup typically ranges from 10–50 mPas, and a thick honey-like syrup can exceed 100 mPas. The measured value of 22 mPas falls within a highly acceptable range for liquid oral formulations, balancing pourability from a bottle with sufficient thickness to coat the throat pleasantly [(4)]. This viscosity is likely imparted by the sugar content and any suspended or dissolved herbal polysaccharides.

The refractive index (1.4101 at 25°C) provides an optical benchmark that correlates closely with the total dissolved solids and sugar concentration. For a pure sucrose solution, a refractive index of 1.4101 corresponds roughly to 45–50% sugar, which aligns well with our total solids measurement of 54.45% (the small difference being attributable to non-sugar solids from the herbal extract).[14] Refractive index is a rapid, non-destructive test used in quality control to verify batch-to-batch consistency without lengthy drying or gravimetric analysis.

Perhaps the most valuable part of this study for future reference is the TLC fingerprint. The two distinct spots at Rf values of 0.50 and 0.57, visualized after derivatization with Anisaldehyde Sulphuric Acid reagent, serve as a chemical barcode for this particular Shankhpushpi syrup formulation. TLC is a widely accepted, cost-effective, and robust technique for the routine quality control of herbal drugs, allowing for the comparison of chemical profiles across different samples, different manufacturing batches, or even different stages of the production process[10]. Any future batch made with the same ingredients, same extraction method, and same formulation process should ideally show the same pattern two major spots at those exact Rf values, with similar color and intensity. The absence of these spots or the appearance of additional spots would indicate a deviation in raw material, processing, or potential adulteration.

However, it is important to view these results within their proper context and acknowledge several limitations. First, this is a report on a single sample, and we do not have official API limits for many of these parameters specifically for a finished Shankhpushpi Syrup. The API provides standards for raw herbs and some basic formulations, but finished syrups are often left to manufacturer specifications. Second, the sample was received unsealed, so we cannot be certain of its history before it reached the lab it may have been exposed to air, heat, light, or even microbial contamination during transport, which could have altered certain parameters (e.g., reducing sugar content due to further inversion, or pH due to absorption of atmospheric CO_2).[13] Third, the study did not include quantitative estimation of specific marker compounds (e.g., scopoletin, kaempferol, or convoline from *Convolvulus pluricaulis*), nor did it test for heavy metals, microbial contamination, or aflatoxins all of which are critical for a complete safety evaluation. Therefore, these findings are most valuable as a baseline for this specific preparation, helping ensure that subsequent batches are identical to this one, rather than as a universal standard for all Shankhpushpi syrups on the market.

CONCLUSION

This analytical study successfully established a preliminary quality profile for the Shankhpushpi Syrup sample provided. The measured physicochemical parameters, including high total solids (54.45%), specific gravity (1.2054), acidic pH (4.49), moderate reducing sugar content (4.18%), viscosity of 22 mPas, and refractive index of 1.4101, collectively align with the expected characteristics of a stable, well-formulated herbal syrup. These values not only confirm the physical integrity of the formulation but also provide indirect evidence of its potential for microbial stability and palatability.

More importantly, generating a TLC fingerprint showing two distinct spots at Rf values of 0.50 and 0.57 provides a practical, reliable, and cost-effective method for future identification and routine quality control of this specific formulation.[12] This fingerprint can serve as a reference standard for batch-to-batch comparison, helping manufacturers and quality control laboratories quickly detect any significant deviations in raw material or processing.

These findings contribute to the growing body of knowledge necessary for the scientific standardization of traditional Ayurvedic formulations. However, this study also highlights several critical gaps that must be addressed in future research. We recommend that subsequent studies on Shankhpushpi syrup should: (a) include quantitative estimation of at least one or two bioactive marker compounds using HPTLC or HPLC; (b) test for heavy metals (lead, mercury, arsenic, cadmium), microbial contamination, and aflatoxins to ensure safety; (c) conduct accelerated stability studies to understand how these parameters change over time under different storage conditions; and (d) analyze multiple batches from different manufacturers to establish a statistically valid range for each parameter.

Ultimately, the goal of standardization is not merely to generate numbers, but to ensure that the ancient wisdom behind Shankhpushpi as a Medhya Rasayana for memory, intellect, and nervous system health is delivered through a product of consistent, verified, and reproducible quality. This study represents one small but meaningful step along that path.

REFERENCES

1. Ayurvedic Pharmacopoeia of India. Part I, Volume II. Government of India, Ministry of Health and Family Welfare, Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH). New Delhi; 2008.
2. Sharma PV. Dravyaguna Vijnana. Vol. II. Varanasi: Chaukhamba Bharati Academy; 2013.
3. Verma DK. An analytical study to ascertain the safety of Dashmooli Kwath (Syrup). Int J Pharm Biol Arch. 2025;16(1). doi:10.22377/ijpba. v16i01.2175.
4. Aulton ME, Taylor KMG. Aulton's Pharmaceutics: The Design and Manufacture of Medicines. 5th ed. Edinburgh: Churchill Livingstone; 2018.
5. WHO Guidelines on Good Manufacturing Practices (GMP) for Herbal Medicines. Geneva: World Health Organization; 2007.
6. Ayurvedic Pharmacopoeia of India. Part II, Volume IV. Government of India, Ministry of Health and Family Welfare, Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH). New Delhi; 2017.
7. Ansari SH. Essentials of Pharmacognosy. 2nd ed. Delhi: Birla Publications; 2016.
8. Pande R, Singhal HK. Analytical study of Medhya Rasayana (Syrup): an Ayurvedic formulation for specific learning disabilities. J Pharm Sci. 2026;2(1):1088-1104. doi:10.5281/zenodo.18311633.
9. Rowe RC, Sheskey PJ, Quinn ME, editors. Handbook of Pharmaceutical Excipients. 6th ed. London: Pharmaceutical Press; 2009.
10. Wagner H, Bladt S. Plant Drug Analysis: A Thin Layer Chromatography Atlas. 2nd ed. Berlin: Springer-Verlag; 1996.
11. Mizzi L. *et al*. Assessing the Individual Microbial Inhibitory Capacity of Different Sugars against Pathogens Commonly Found in Food Systems. Letters in Applied Microbiology, 2020;71(3): 251–258, https://doi.org/10.1111/lam.13306.
12. Lalhriatpuii, Tochhawng. HPTLC Fingerprint in Herbal Drug Formulations. Springer Singapore, 2019, p. 337–362, https://doi.org/10.1007/978-981-13-7248-3_22.
13. Masand Sameet, *et al.* Modern concept of storage and packaging of raw herbs used in Ayurveda. International Journal of Research in Ayurveda & Pharmacy, 2014;5(2): 242–245, https://doi.org/10.7897/2277-4343.05249.
14. Snyder Carl F. Report on Refractive Indices of Solutions of Sucrose, Dextrose, Levulose, Raffinose, Invert Sugar and Mixtures, to the International Commission for Uniform

Methods of Sugar Analysis, Tenth Session, Brussels, August 15–20, 1949 (Subject 7.)." Journal of AOAC International, 1951;34(1):195–199, https://doi.org/10.1093/jaoac/34.1.195.
15. Rafael Artemio, *et al.* Sucrose Conversion into Inverted Syrup by Invertase through the Fed-Batch Process Operated in the Decreasing Exponential Feeding Mode. ETA Florence, Jan. 2013, p. 1680–1683, https://doi.org/10.5071/21steubce 2013-4bv.4.30.

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