



PHARMACEUTICAL AND ANALYTICAL STUDY OF DRY DECOCTION (*GHANA*) PREPARED FROM *SAPTAPARNA* (*ALSTONIA SCHOLARIS*, LINN)

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ABSTRACT

Saptaparna (*Alstonia scholaris* Linn.) is an important Ayurvedic drug indicated in *Jwara*, *Prameha*, and *Krimi*. *Ghana Kalpana* (dry decoction) is a modified dosage form of *Kwatha* that offers improved stability, shelf life, and dose accuracy.

Objective:

To prepare *Saptaparna Ghana* according to classical Ayurvedic principles and evaluate it using pharmaceutical and analytical parameters.

Materials and Methods:

Authenticated *Panchang* of *Alstonia scholaris* was used to prepare *Kwatha* in a 1:16 drug-to-water ratio, reduced to one-fourth, and concentrated to obtain *Ghana*. The formulation was assessed for organoleptic characters, physicochemical parameters, qualitative and quantitative phytochemical screening, and TLC profiling.

Results:

Saptaparna Ghana was obtained as a brownish, bitter-astringent solid. Analytical parameters were within acceptable limits. Phytochemical analysis revealed the presence of alkaloids, tannins, flavonoids, and phenolic compounds, with a consistent TLC profile.

Conclusion:

The study establishes preliminary quality control standards for *Saptaparna Ghana*, supporting its use as a standardized Ayurvedic dosage form.

Keywords: *Saptaparna*, *Alstonia scholaris*, *Ghana Kalpana*, Analytical study

INTRODUCTION:

Ayurveda utilizes a wide range of pharmaceutical dosage forms to enhance the therapeutic efficacy and acceptability of herbal drugs. *Kwatha Kalpana* is one of the most commonly prescribed preparations for extracting water-soluble constituents¹; however, its clinical utility is limited by short shelf life, large dose volume, and inconvenience in storage and administration². To overcome these limitations, classical texts describe *Ghana Kalpana*, a concentrated and dried form of *Kwatha*, which offers advantages such as improved stability, dose uniformity, and ease of use^{3,4}.

Saptaparna (*Alstonia scholaris* Linn.), a member of the family *Apocynaceae*, mentioned in classical *Ayurvedic* texts possess astringent, anti-diabetic, analgesic, and anti-inflammatory properties. It also has anti-malarial, antioxidant, anti-cancer, and cytotoxic properties, as well as radio protective CNS and anti-arthritis properties⁵. Previous pharmacological investigations on *Alstonia scholaris*, Linn have primarily utilized aqueous or alcoholic extracts of specific plant parts. Ayurveda emphasizes the therapeutic use of the *Panchanga* (whole plant) rather than isolated parts.⁶ Common *Ayurvedic* dosage forms such as *Churna* (powder) and *Guti-Vati* (tablets) typically incorporate the whole plant unless specified otherwise. *Ghana*, a concentrated aqueous solid extract, is a unique dosage form described exclusively in classical texts.⁷. Although *Saptaparna* is extensively used in traditional practice, scientific standardization of its *Ghana* form remains inadequate. Establishing pharmaceutical procedures and analytical quality parameters is essential to ensure identity, purity, and reproducibility of the formulation. Considering this scenario, the present study was undertaken to pharmaceutically prepare *Saptaparna Ghana* according to classical principles and to evaluate it using analytical and physicochemical parameters for standardization.

MATERIAL AND METHODS

Collection of plant material

Bark (*Twak*), fruit (*Phal*), flower (*Pushpa*), root (*Mula*), and leaves (*Patra*) of AS were collected from the institutional herbal garden by following Good Harvesting Practices. The collection timing adhered to the guidelines outlined in traditional *Ayurvedic* texts i.e., autumn for bark, summer for roots, and rainy season for leaves. Flowers and fruits were collected according to season, i.e. summer and the following period in this case. The leaves were dried by placing them between sheets of parchment paper, whereas the other plant parts were shade-dried at ambient room temperature. Since the plant materials were gathered at different times, each dried part was stored separately in airtight glass containers until further processing. The collected specimens were authenticated at the Botanical Survey of India, Pune, India, where a voucher sample was deposited (Specimen No. PPIAS-1).

Preparation of *Alstonia scholaris* extract

Saptaparna Ghana i.e. water-decocted solid concentrate, was prepared as per classical references in two steps, i.e. decoction (*Kwath*) preparation and water-decocted solid extract (*Ghana*). In the first stage, coarse powders of the five plant parts (250 g total; 50 g each, passed through sieve no. 20) were soaked in sixteen times the volume of potable water (4000 mL) in a stainless-steel vessel and kept overnight (12 h). The next day, the

mixture was heated gently (90–95 °C) with continuous stirring until the volume was reduced to one-eighth (approximately 500 mL). The decoction obtained was filtered through a four-fold muslin cloth. In the second stage, the filtered decoction was further concentrated by mild heating (60–65 °C) with continuous stirring until it attained a honey-like consistency. The semi-solid mass was then evenly spread on a stainless-steel plate and shade-dried at room temperature. The dried product, *Alstonia scholaris* solid extract (AS-SE), was collected and stored in an airtight glass container at room temperature (25 ± 2 °C), protected from direct sunlight and humidity to ensure stability and prevent microbial contamination.

Analytical Study of AS-SE

An analytical study was conducted at Ayurvedic Drug Testing and Standardization Laboratory, Wagholi, Pune (ISO 9001:2015). The prepared extract was subjected to standard physicochemical evaluations, including determination of moisture content, total ash, acid-insoluble ash, and water- and alcohol-soluble extractives, as per protocols outlined in the Ayurvedic Pharmacopoeia of India⁸. Thin Layer Chromatography (TLC) was carried out using a solvent system of toluene: ethyl acetate: formic acid: methanol (7:2:0.8:0.2) on silica gel 60F₂₅₄ plates (E. Merck KGaA, Germany) of decoction and AS extract⁹. Preliminary phytochemical screening was also performed to detect the presence of various secondary metabolites such as alkaloids, flavonoids, tannins, saponins, glycosides, and phenolic compounds using standard qualitative procedures¹⁰. Quantitative estimation of total tannins, phenols and flavonoids was carried out using Folin Ciocalteu¹¹ and Aluminum chloride colorimetry methods¹².

RESULTS

Extract preparation and physicochemical analysis

The coarse powder of whole plant mixture of AS was greenish brown with a weak, peculiar odour. Physicochemical analysis showed total ash 10.31%w/w and acid insoluble ash 1.10 %w/w. Extractive values revealed high water-soluble constituents (75.73 %w/w) than alcohol-soluble extractive value (11.79 %w/w). In the first step, the AS decoction was dark brown coloured thin liquid, without specific odour having pH 6.08 and total solid content of 3.84%w/w. The final product yield of AS-SE was 15 g (6 %w/w) compared to raw material (250 g). AS-SE in dried form was dark brown solid hard mass with a peculiar odour. Total ash and acid insoluble ash values were 20.31 and 3.13 %w/w, respectively; and pH value of 1% solution in distilled water was 6.01. The water soluble and alcohol soluble extractive values were 79.93 %w/w and 1.19%w/w, respectively.

Thin layer chromatography of AS decoction showed 3 spots at R_f- 0.23 (Blue), 0.35 (Blue), 0.44 (Blue) under UV 254 nm; 3 spots at R_f- 0.34 (White), 0.44 (Yellow), 0.75 (Blue) under UV 365 nm and 2 spots at R_f: 0.35, (Brown) 0.43 (Blue) after derivatization with iodine vapours. Similarly, AS-SE showed 4 spots at R_f- 0.35, 0.47, 0.50, 0.64 (All Brown) under UV 254 nm; and 4 spots at same R_f: 0.35 0.47, 0.50, 0.64 (All Brown) after derivatization with iodine vapours.

Phytochemical screening of AS extract

Preliminary phytochemical qualitative screening of the AS-SE conducted to identify the presence of major classes of bioactive compounds. It showed that CF-SE was composed of various group of compounds such as primary metabolites viz., carbohydrates, protein and amino acids, and secondary metabolites viz.,

alkaloids, glycosides, phenols, tannins, phytosterols, triterpenoids, and flavonoids, except saponins. Quantitative estimation of major phytoconstituents, viz., total tannins, phenols, and flavonoids carried out for AS-SE was expressed as percentage Gallic Acid Equivalent (%GAE) for tannins and phenols, and percentage Quercetin Equivalent (%QE) for flavonoids. The percentage of tannins, 24.79%GAE, and phenols, 16.37%GAE, was quite high, while the flavonoid content was much lower, 0.49%QE.

DISCUSSION

Ayurveda is one of the oldest medical systems, comprising thousands of medical concepts, drugs, and hypotheses. Interestingly, Ayurveda can treat many chronic diseases such as cancer, diabetes, arthritis, and asthma. Unfortunately, due to a lack of scientific validation of various concepts, Ayurveda suffers from wider acceptance. Hence, evidence-based research is highly needed for the global recognition and acceptance of Ayurveda.

In the present study, *Saptaparna Ghana*, i.e. water-decocted solid extract of *Alstonia scholaris* (AS), was prepared from the whole plant with a yield of 5% and was subjected to various physicochemical parameters. Ash value, the total inorganic substances present in a particular drug, is important in Quality Control (QC) and standardization of drugs. The higher the inorganic substances present in a drug, the higher the ash value. Here, the ash value was 20.31% which may be due to the extensive heating process involved in concentrating the extract. Various organic compounds show solubility in particular media. In this study, the soluble phytochemicals of the samples were measured in water and ethanol. It revealed a higher value in water (79.93%) than in ethanol (1.19%) depicting more bioavailability in the water medium.¹³

TLC decoction of *Alstonia scholaris*, and AS-SE, revealed distinct spots on observation under UV 254nm, 365 nm and after derivatization with iodine vapours. The similarity in R_f values across decoction and CF-SE may indicate that the major phytoconstituents remain intact even after the pharmaceutical process.¹⁴ TLC of such water-soluble solid concentrates is not documented in any previous works. Hence, findings from the present study can be considered as a standard for any further studies. The TLC profile of *Alstonia scholaris* stem bark from ICMR standards shows major bands at R_f 0.12 (echitamine), 0.31, 0.46 (α -amyrin acetate), and 0.64, reflecting the presence of key alkaloids and triterpenoids. In the present study, a band at R_f 0.47 in AS-SE and R_f 0.44 in decoction aligns well with the standard R_f 0.46 (α -amyrin acetate). The detection of R_f 0.64 in both AS-SE and standard further supports phytochemical continuity. These correspondences confirm that the *Ghana Kalpana* preserves major bioactive constituents, validating its relevance as a standardized dosage form¹⁵.

AS extract was subjected to preliminary qualitative phytochemical screening, which depicted a diverse array of bioactive compound groups, such as alkaloids, tannins, carbohydrates, glycosides, proteins, amino acids, phenolics, triterpenoids, phytosterols, and flavonoids. Quantitative assessments of Total Tannin Content (TTC), Total Phenolic Content (TPC), and Total Flavonoid Content (TFC) yielded satisfactory results, underscoring their antioxidant and antidiabetic potential. Alkaloids, which are reported as major bioactive constituents of *Alstonia scholaris*, are associated with antipyretic, antimalarial, and antidiabetic activities¹⁶, supporting the classical indications of Saptaparna in *Jwara* and *Prameha*. The presence of tannins and flavonoids contributes to antioxidant^{17,18}, anti-inflammatory, and antimicrobial properties¹⁹, which may be

relevant in the management of *Krimi* and systemic inflammatory conditions. *Alstonia scholaris* contains these bioactive groups, further validating their traditional use in various ailments

Different parts of a plant (roots, leaves, stems, flowers, seeds, bark) contain different types and concentrations of bioactive compounds. For example, roots and bark often have higher concentrations of alkaloids, glycosides, and tannins, while leaves are rich in flavonoids.²⁰In the present study, the AS extract of the whole plant prepared by the conventional method of Ayurvedic pharmaceutical principles showed satisfactory results and correlates with previous work reports.

CONCLUSION

The pharmaceutical process successfully yielded a stable, reproducible, and uniform *Saptaparna* Ghana. Analytical evaluation helped establish preliminary quality control parameters essential for standardization of the formulation. Phytochemical evaluation confirmed the presence of important bioactive phytoconstituents such as alkaloids, glycosides, and tannins, indicating retention of therapeutic principles during processing. These findings support the suitability of *Ghana Kalpana* as a standardized and effective dosage form of *Saptaparna* for further pharmacological studies.

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