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Research Article

# PHARMACEUTICAL, ANALYTICAL AND CHROMATOGRAPHIC EVALUATION OF *ARK TAIL*: AN AYURVEDIC OIL FORMULATION

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## ABSTRACT

*Arka Taila*, a classical Ayurvedic medicated oil formulation described in *Sharangadhara Samhita*, is traditionally used for the management of skin disorders such as *Vicharchika* (eczema), *Pama* (scabies), and *Kacchu* (itching). Despite its therapeutic significance, limited scientific research has been conducted on its pharmaceutical and analytical characterization. **Materials and Methods**: *Arka Taila* was prepared using the *Sneha Kalpana* method with a standard ratio of 1:4:16 *(Kalka:Sneha:Drava)* incorporating *Haridra Kalka* (Curcuma longa), *Murchita Sarshapa Taila* (processed mustard oil), and *Arka Patra Swarasa* (Calotropis juice). *Murchana Sanskara* was performed as per classical texts to enhance the oil base. Pharmaceutical evaluation included observation of *Sneha Siddhi Lakshanas*. Organoleptic parameters, physicochemical tests (including refractive index, acid value, saponification value, iodine value, pH, etc.), and HPTLC profiling were carried out as per the standards of the Ayurvedic Pharmacopoeia of India. **Results and Discussion**: The formulation exhibited classical *Sneha Siddhi Lakshanas* confirming proper processing. Physicochemical parameters were within acceptable limits: refractive index (1.46729), acid value (1.245), iodine value (116.9), and peroxide value (1.02), indicating stability and purity. HPTLC profiling revealed multiple distinct phytochemical bands in *Arka Taila* that were absent in both *Amurchit* and *Murchit* mustard oil, validating the successful infusion of herbal and distillate bioactive components. **Conclusion**: The study validates the traditional preparation and pharmacological integrity of *Arka Taila* through modern scientific parameters. Its pharmaceutical stability, phytochemical richness, and favourable physicochemical profile support its continued therapeutic use and pave the way for further clinical and pharmacological investigations in dermatological applications.

## INTRODUCTION

Herbal remedies are widely recognized for their therapeutic benefits in managing various health conditions. *Sneh Kalpana* refers to a traditional pharmaceutical method in which active herbal or medicinal components are incorporated into lipid-based medium such as *Ghrita* (clarified butter) or *Taila* (oil) making the formulation suitable for both internal consumption and external application.[1] Prior to the actual infusion process, a preparatory step *Murcchana* is carried out. *Murcchana* is considered a *Sanskara* (purificatory process) of the lipid medium. It enhances the quality of the lipid by imparting additional therapeutic and preservative properties, improving the overall efficacy and stability of the final formulation.[2,3]

The initiative has been taken for this research to study an Ayurvedic oil formulation- Ark Tail mentioned in *Shadangdhar Samhita* which is widely used externally for various therapeutic purposes especially in skin diseases: *Pama* (scabies), *Kacchu* (itching), *Vicharchika* (eczema). It contains *Arka Patra*

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*Swaras* (juice of Calotropis plant leaves), *Haridra Kalka* (paste of Curcuma longa rizome) and *Sarshapa Taila* (mustard oil).[4] All three ingredients possess *Katu Rasa* (pungent taste), *Ushna Virya* (hot potency), and *Katu Vipaka* (pungent post-digestive effect), which contribute to balancing aggravated *Vata* and *Kapha Doshas*. *Arka Taila* can be considered a potent formulation in the treatment of skin diseases, as it helps alleviate symptoms by pacifying aggravated *Kapha* and *Pitta Doshas.* Researches have demonstrated its effectiveness in the management of conditions such as *Vicharchika* (eczema) and *Karnasrava* (otomycosis).[5,6]

Very limited scientific work has been conducted on *Ark Tail*, particularly concerning its comprehensive pharmaceutical and chromatographic profiling. The present study aims to fill this gap by performing an integrated pharmaceutical, analytical, and chromatographic evaluation of *Ark Tail*. It will contribute in safety, efficacy, quality control and scientific validation of claimed therapeutic effects.

For this study, the preparation of *Arka Taila* was carried out according to the general principles of *Sneha Kalpana*, using the standard ratio of - *1 (Kalka Dravya): 4 (Sneha Dravya): 16 (Drava Dravya)*. The *Kalka Dravya* used was a paste of *Haridra* (turmeric), the *Sneha Dravya* was *Sarshapa Taila* (mustard oil), and the *Drava Dravya* was *Arka Patra Swarasa* (juice of *Arka* leaves).[7] Prior to the preparation of *Arka Taila*, the *Sarshapa Taila* was subjected to *Murchana*. *Arka Taila* was prepared with *Murchita Sarshapa Taila*. *Murchana Sanskara* was carried out as per the guidelines of *Bhaishajya Ratnavali*. For pharmaceutical evaluation, *Arka Taila* was prepared using the *Sneha Kalpana* method described in the *Sharangadhara Samhita*. Analytical evaluation was performed by Ayurveda Parameters and physicochemical parameters, including refractive index, weight per milliliter, acid value, saponification value, iodine value, peroxide value, pH, free fatty acid content, total fatty matter, viscosity, and specific gravity as per the standards of the Ayurvedic Pharmacopoeia of India (API). Chromatographic evaluation was conducted using High-Performance Thin Layer Chromatography (HPTLC) method. All evaluated parameters were found to be within acceptable limits and met standard quality criteria.

## MATERIAL AND METHODS

### Pharmaceutical Evaluation of *Ark Tail*

### Collection of Raw Material

- Fresh *Arka patra* (leaves of the *Calotropis* plant) and *Haridra* (rhizome of *Curcuma longa*) were collected from the Herbal Garden of B.M. Ayurveda College, Nandanvan, Nagpur.
- The drugs required for *Sarshap Taila Murchana*: *Sarshap Taila* (mustard oil) and ingredients- *Amalaki, Haridra, Mustaka, Bilva, Dadima, Nag Keshar, Krushna Jirak, Hribera/Netra bala, Bibhitaki, Nalika/Naluka, Manjistha/Aruna* were procured from an Ayurvedic herbal drugs shop.
- **Identification and authentication -** were carried out in the Department of Dravyaguna Vigyan B. M. Ayurveda College Nandanvan Nagpur.

### Preparation of *Ark tail*

- Before preparation of *Ark tail Sarshap tail* subjected to *Murchana*. The *Murcchana* (purificatory processing) of *Sarshapa Taila* (mustard oil) was carried out as per classical Ayurvedic procedure mentioned in *Bhaishajya Ratnawali*.[8]
- Preparation of *Ark Tail* from *Murchit sarshap tail* was carried out as per Classical Ayurveda text *Shadangdhar Samhita*[9] in the department of Ras Shastra and Bhaishajya Kalpana, B. M. Ayurveda College, Nandanvan, Nagpur.

**Table 1: Ingredients of *Ark Tail***

| Ingredient | Type *(Dravya)* | Proportion | Quantity Used |
|---|---|---|---|
| *Haridra Kalka* (turmeric paste) | *Kalka Dravya* (herbal paste) | 1 part | 500gm |
| *Murchit Sarshapa Taila* (mustard oil) | *Sneha Dravya* (lipid base) | 4 parts | 2000 ml |
| *Arka Patra Swarasa* (juice of calotropis leaves) | *Drava Dravya* (liquid) | 16 parts | 8000 ml |

### Preparation of *Arka Patra Swaras*

Fresh *Arka patra* (Calotropis leaves) were collected and thoroughly washed to remove any physical impurities. The cleaned leaves were then cut into small pieces and ground using a mixer grinder to form a coarse paste. This paste was subsequently squeezed through a clean cotton cloth to extract the *Swarasa* (juice).

### Preparation of *Haridra Kalka*

Fresh *Haridra* (turmeric) rhizomes were collected and thoroughly washed to remove physical impurities such as soil. They were then cut into small pieces and ground using a mixer grinder. The resulting *Kalka* (paste) was collected in a stainless steel vessel.

### Preparation of *Ark Tail*

- 2000ml of *Murchita Sarshapa Taila* was taken in a steel vessel and heated on *Manda agni* (mild flame). *Haridra kalka* was added to the oil, followed by *Arkapatra swarasa*. The entire mixture was then heated on *Madhyama agni* (moderate flame) with continuous stirring for 3 hours.

- On the next day, the mixture was again heated on *Madhyama agni* for a duration of 4 hours.
- On the third day, heating was carried out on *Mandagni* for 7 hours until the appearance of *Kharpak siddha lakshana* (indications of completion), such as frothing of the oil and the *Kalka* breaking apart when attempting to form a *Varti* (stick).[10,11]
- After self-cooling, the oil was filtered through a clean, dry cloth. The final quantity of oil obtained was 1780 ml. The prepared oil was then stored in a clean, dry container.


**Analytical Evaluation of *Ark Tail***

**Table 2: Analytical Study of Ark Tail on Ayurvedic Parameters-*Panchabhautik Parikshan* (Organoleptic parameters)** [12]

| Sr.No | Organoleptic parameters | Observations |
|---|---|---|
| 1 | *Gandha Pariksha* (smell evaluation) | *Haridra Gandhi* (characteristic smell of turmeric) |
| 2 | *Varna Pariksha* (color evaluation) | Greenish brown |
| 3 | *Rasa Pariksha* (taste evaluation) | The *Taila* exhibited a bitter and slightly astringent taste |
| 4 | *Sparsha Pariksha* (touch evaluation) | The oil was smooth and non-greasy |
| 5 | *Sneh Siddhi Lakshan* (indicators of proper oil processing) | Soft *Kalk*: The residue was pliable and soft. Oil devoid of moisture |
| 6 | *Varti* (wick) | A well-formed, smooth, and firm *Varti* was produced from the *Kalka* residue |
| 7 | *Agni Pariksha* (fire test) | A drop of *Taila* placed on flame burned without crackling |
| 8 | *Fen Pariksha* (foam test) | On heating, a small amount of foam appeared during final stages and subsided quickly |

**Analytical Study of *Ark tail* on Physico Chemical Parameter**[13-16]

Analytical study of *Ark Tail* on physico chemical parameters was carried out at Qualichem Laboratories, Nagpur, as per standard reference of Ayurvedic Pharmacopoeia of India. As far as physicochemical parameters concern following results were found.

**Table 3: Physico - Chemical Parameters of *Ark Tail***

| S.No. | Physico - Chemical Parameters | Results |
|---|---|---|
| 1 | Refractive Index at 40°C | 1.46729 |
| 2 | weight per ml at 25°C | 0.8954 |
| 3 | Acid value | 1.245 |
| 4 | Saponification value | 189.8 |
| 5 | Iodine value | 116.9 |
| 6 | Peroxide value | 1.02 |
| 7 | pH of 1% | 7.92 |
| 8 | Free fatty acid | 0.625 |
| 9 | Total fatty matter | 99.10 |
| 10 | Viscosity at 40°C | 25.25 |
| 11 | Specific gravity at 40°C | 0.902 |

**Chromatographic Evaluation of *Ark Tail***

- The High-Performance Thin Layer Chromatography (HPTLC) profiling of *Arka Taila* was performed at Qualichem Laboratories, Nagpur. The analysis was conducted to identify the presence of herbal constituents and *Arka* (distillate) extracts incorporated within the formulation. A total of four samples were subjected to HPTLC analysis: 1) Blank (control) 2) *Amurchit* mustard oil (unprocessed mustard oil) 3) *Murchit* mustard oil (processed mustard oil) 4) *Arka Taila* (final medicated oil formulation)
- Chromatographic separation was carried out on silica gel 60 $F_{254}$ TLC plates using an appropriate mobile phase consisted of Toluene: Ethyl Acetate: Formic Acid. The developed plates were scanned at 254nm [Fig.1] and 366nm [Fig.2] using a CAMAG TLC Scanner integrated with WinCATS Planar Chromatography Manager software. Detection at these wavelengths enabled the visualization of UV-active constituents and the evaluation of the formulation chemical profile. [17]

The resulting chromatograms provided characteristic fingerprints that support the identification and quality assessment of *Arka Taila*, indicating the presence of multiple phytochemical markers derived from the formulation herbal and distillate components. [Fig.3]

**RESULTS AND DISCUSSION**

The pharmaceutical evaluation of *Arka Taila* provides insight as - The *Ark Taila* was prepared following classical Ayurvedic methods, involving *Murcchana* of *Sarshapa Taila*, extraction of *Arka Patra Swarasa*, preparation of *Haridra Kalka*, and a three-day *Taila Paka* process under controlled heat (*Mandagni* and *Madhyama Agni*). The final yield was 1780ml of oil from an initial 2000ml of mustard oil, demonstrating approximately 11% reduction, which can be attributed to evaporation and absorption by herbal residues during processing. The *Sneha Siddhi Lakshanas* observed including the formation of soft *Kalka* residue, a steady flame in *Agni Pariksha*, and absence of moisture or foam at the end stage confirm that the oil was processed to *Madhyama Pak* stage, as per classical Ayurvedic standards.

**Table 4: Ayurvedic Organoleptic Parameters shows following results**

| Sr.No | Organoleptic Parameters | Observation | Interpretation |
|---|---|---|---|
| 1 | *Gandha* (Smell) | Characteristic turmeric odor *(Haridra Gandhi)* | Indicating proper extraction and infusion of *Haridra* (turmeric) properties into the oil. |
| 2 | *Varna* (Color) | Greenish brown | Suggests proper extraction and assimilation of the active phytoconstituents from *Ark Patra swaras* into the *Taila* (oil) |
| 3 | *Rasa* (Taste) | Bitter and slightly astringent | Supports presence of *Haridra* and *Arka* phytochemicals |
| 4 | *Sparsha* (Touch) | Smooth, non-sticky, spreads easily | Desired quality in *Sneha Kalpana* |
| 5 | *Fen Pariksha* | Minimal foam formation, subsided quickly | Indicates proper moisture removal |

| | | | |
|---|---|---|---|
| 6 | *Agni Pariksha* | Steady burning, no sputtering | Confirms absence of water and proper processing |
| 7 | *Varti Pariksha* | *Varti* from residual paste formed well, maintained integrity without breaking | Confirms proper *Kalka paka* and adequate absorption of active constituents into the *Taila* |

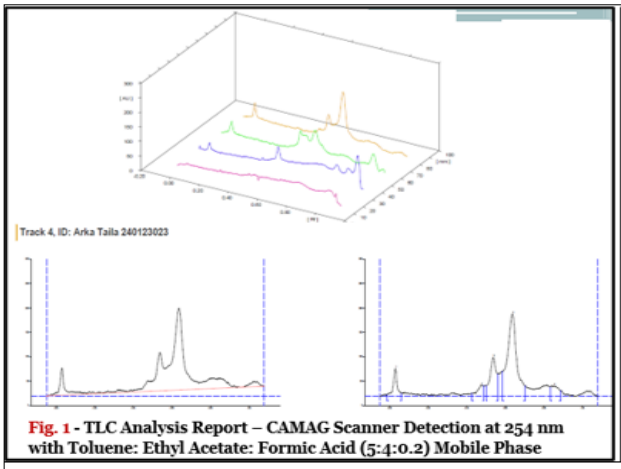



**Fig. 1 - TLC Analysis Report – CAMAG Scanner Detection at 254 nm with Toluene: Ethyl Acetate: Formic Acid (5:4:0.2) Mobile Phase**

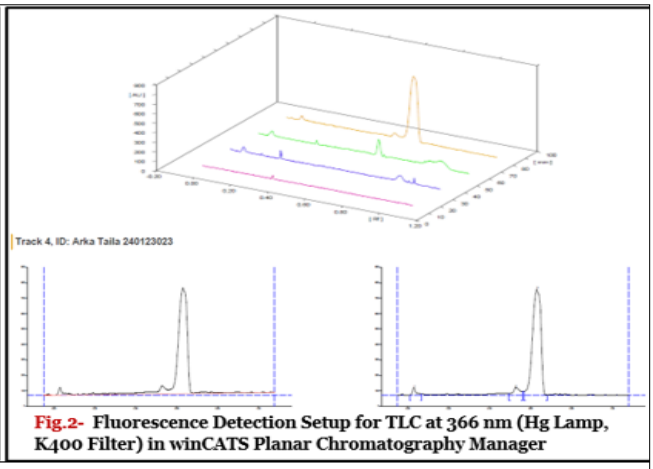
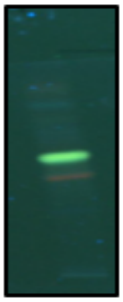



**Fig.2- Fluorescence Detection Setup for TLC at 366 nm (Hg Lamp, K400 Filter) in winCATS Planar Chromatography Manager**

**Track 1.**-Blank, **Track 2.**-Amurchit Mustard oil, **Track 3.**-Murchit Mustard oil **Trak 4.**- Ark Tail

**Fig-3**

**TLC Plate Visualization at 254 nm Under UV Remission Using CAMAG Visualizer with DXA252 Camera**



**TLC Plate Visualization at 366 nm Under UV Fluorescence Using CAMAG Visualizer with DXA252 Camera**

These parameters collectively validate that the oil is pharmaceutically stable and properly prepared according to classical guidelines.

The physico-chemical analysis of *Ark Tail* provides significant insight as - The refractive index at 40°C (1.46729) falls within the expected range for *Sarshap Tail* (Mustard oil) based medicated oils, indicating purity and the absence of adulteration. The weight perml at 25°C (0.8954) and specific gravity at 40°C (0.902) align with standard values for herbal oils, suggesting that the formulation retains the typical physical characteristics of its base oil. The acid value (1.245) and free fatty acid content (0.625%) are low, reflecting minimal hydrolytic rancidity and indicating that the oil has not undergone significant degradation or spoilage. This also suggests good storage stability and proper preparation techniques.

The saponification value (189.8) falls within the acceptable range for Ayurveda oils, particularly (175–195) according to API, confirming the appropriate triglyceride composition and compatibility of herbal components with the base oil. The iodine value (116.9) suggests a high degree of unsaturation, which is consistent with the presence of essential fatty acids and indicates potential anti-inflammatory and skin-penetrating properties.

The peroxide value (1.02 meq/kg) is well below the threshold of concern, confirming that the oil is fresh and free from oxidative rancidity. A pH of 7.92 (in a 1% solution) indicates a mildly alkaline nature, which may enhance its stability and compatibility with skin application, especially for dermatological use.

The viscosity at 40°C (25.25) is in a desirable range for topical oil formulations, ensuring ease of spreadability, absorption, and therapeutic action without being too greasy.

The total fatty matter (99.10%) shows a high concentration of fatty substances, reinforcing the purity and richness of the oil base, which is essential for the solubility and delivery of lipophilic herbal constituents.

The physico-chemical analysis of *Ark Tail* provides significant insight into its quality, stability, and safety profile. Each parameter evaluated reflects important aspects of the formulation's pharmaceutical integrity and therapeutic viability.

**High-Performance Thin Layer Chromatography (HPTLC) Profiling of *Arka Taila***- The resulting chromatograms provided characteristic fingerprints that support the identification and quality assessment of *Arka Taila*, indicating the presence of multiple phytochemical markers derived from the formulation herbal and distillate components

HPTLC Profile at 254nm- *Arka Taila*: Exhibited significant bands at Rf values of 0.43**,** 0.50**,** 0.59, and 0.84. The presence of multiple distinct bands in *Arka Taila*, which are absent in *Amurchit* mustard oil, suggests the incorporation of additional phytoconstituents, likely from herbal extracts and *Arka* (distillate) sources.

HPTLC Profile at 366nm- *Arka Taila*: Displayed bands at Rf 0.50 and 0.57. *Arka Taila* exhibited bands overlapping with those of *Murchit* oil (Rf 0.50, 0.57), along with additional bands seen at 254nm, further confirming the inclusion of both herbal and *Arka* extracts.

Interpretation- From the comparative HPTLC analysis:

- *Murchit* mustard oil contains additional phytoconstituents compared to *Amurchit* mustard oil, which confirms the addition of herbal extracts during its preparation.
- *Arka Taila* shows a more complex phytochemical profile, with bands corresponding to both herbal extracts (seen at 366nm) and likely *Arka* distillate components (noted at 254nm), indicating a dual contribution from both sources.

This analytical differentiation affirms that *Murchit* mustard oil and *Arka Taila* are enriched preparations containing bioactive markers not present in plain *Amurchit* mustard oil, aligning with their traditional Ayurvedic processing methods.

## CONCLUSION

The present study scientifically validates the traditional Ayurvedic formulation of *Arka Taila* through comprehensive pharmaceutical, organoleptic, physicochemical, and chromatographic evaluations. The oil was prepared following classical *Sneha Kalpana* principles, incorporating *Murchana Sanskara* and standardized processing methods to ensure quality and stability. Pharmaceutical parameters, including *Sneha Siddhi Lakshanas* and organoleptic tests, confirmed the proper preparation and desired characteristics of the formulation. Physicochemical analysis revealed compliance with Ayurvedic Pharmacopoeia standards, indicating purity, stability, and suitability for external therapeutic application. HPTLC profiling demonstrated a unique phytochemical fingerprint with markers from both herbal and distillate components, differentiating *Arka Taila* from *Amurchit* and *Murchit* mustard oil. These findings collectively support the safety, efficacy, and therapeutic potential of *Arka Taila*, especially in the management of dermatological disorders, and establish a scientific foundation for its continued use and further research.

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