International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Pharmacognostical and Pharmaceutical Analysis of Ketakyadi Taila - An Ayurvedic Herbomineral Formulation for Manyastambha (Cervical Spondylosis)

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Abstract

Background: *KetakyadiTaila* is mentioned by Acharya Chakradutta as a drug for the management of *Asthigatavata*.Sofor initialization of standardization and assurance of the quality of herbal compounds pharmacognostical and pharmaceutical analysis should be done.

Methods: *KetakyadiTaila*was subjected to microscopic evaluation for pharmacognostical and physicochemical analysis like Loss on drying, Specific gravity, Saponification, Refractive index, Acid value and High-performance thin layer chromatography (HPTLC).

Results: Pharmacognostical study showed the presence of certain identifying characters of all the ingredients of*KetakyadiTaila* like*Ketaki, Nagbala, Atibala.* In pharmaceutical study, preliminary physiochemical analysis showed that loss on drying 0.0925%w/w, specific gravity 0.9174 at room temperature, acid value4.84 w/w, saponification 185.9 w/w, refractive index 1.4609 and HPTLC showed 4 spots in 254 nm and 3 spots in 366 nm.

Conclusions: Pharmacognostical and physico-chemical observations revealed the specific characteristics of all active constituents of*KetakyadiTaila* and confirmed the purity and genuinity of the drug.

Keywords: *KetakyadiTaila*,*Manyastambha*, cervical spondylosis, Pharmacognosy, Pharmaceutical analysis

Introduction

All of the cervical spine's structural elements are impacted by the progressive degenerative disorder known as cervical spondylosis. It happens early in people pursuing white-collar careers or those predisposed to neck pain since they maintain their neck in one posture all the time when reading and writingetc[i].It is the commonest cause of vertigo in adult and it leads to pain and stiffness of the neck, radiating pain to the shoulder or downwards to forearm and hand, occipital headache, numbness,

paraesthesia in the region of nerve, giddiness etc. It develops as a result of the wear & tear of the cartilage & bones of the neck.Although cervical spondylosis is not specifically mentioned in the Ayurvedic classics, this degenerative type of condition with clinical manifestation can be thought of as falling under the general category of *Vatavyadhi*, and based on the clinical characteristics of the condition, it can be corelated with *Manyastambha*.

Manyastambha has been mentioned in the eighty disorders of *vata*[ii]. The detail description regarding *Manyastambha* has been given in almost all the *Ayurvedic* texts.*Sushruta*also explains *Manyastambha*, and the causes of this illness include daytime sleep, sleeping on an uneven surface, frequently looking up, and *Avarana*of *Vayu* by*Kapha*[iii].In the modern medical system, anti-inflammatory, analgesicand DMARD medications are preferred for the treatment of cervical spondylosis.Most of the analgesics, unfortunately, have a variety of adverse effects, especially when used often and for a long time.Hence there is a need to search for an effective treatment.

*KetakyadiTaila*is mentioned in *Chakradatta* for the treatment of *AsthigataVata*[iv].*Acharya* Charakahasmentioned*Atibala in Balya Verga*[v].*Nagbala has been described in Brehatrayi for its effective Rasayana action. A study was done on Ketaki in which its anti-inflammatory action was found*[vi] . Previously many researches hasbeen carried out with *KetakyadiTaila*, used as *Matrabasti*, *Abhyanga*, *Janubasti* in management of *Janusandhigatavata*& they got significant result[vii].*Nasya Karma* provides the relief by *Srotoshodhana* as well as *Brimhana* property & has role as promotive, preventive & curative effect in cervical spondylosis.*Nasya* is indicated for the diseases that effects the region above the clavicle & pacifies *Vata* and *Kapha* present in head region. *Acharya*Charaka, Sushruta&Chakradatta have mentioned *Nasya*as the main line of treatment in *Manyastambha*.

In the case of internal administration of herbal drug, it should be safe, effective and free from adulteration, with appropriate quantity and ingredients. It is difficult to identify the herbal drug in dry or powdered form. So, it is a need of time to set proper parameters for standardization of herbal drugs. Pharmacognostical studies reveal plant identification and set parameters for standardization which can be done in the case of herbal traditional medicine. Generally,the physiochemical analytical study of drugs helps to interpret the pharmacokinetics and pharmacodynamics involved. With the help of physiochemical analytical studies, it is possible to standardize the drug and differentiate the adulterants. High-performance liquid chromatography (HPLC) and thin-layer chromatography (TLC) are the conventional methods used in the analysis of secondary metabolites originating from plants. It is necessity of time in the field of Ayurveda to go for quality control of the raw drugs as well as final products using modern parameters which provides credibility to Ayurvedic medicines and also help in the globalization of Ayurveda. Hence to evaluate the Authenticity of *KetakyadiTaila* through various pharmacognostical procedures, and to develop the pharmacognostical and phytochemical profile of *KetakyadiTaila*the present study was carried out

Materials and Method: Collection, identification and authentication of raw drugs.

The raw materials were procured from the pharmacy of ITRA Jamnagar, outside authentic source and the raw drugs were identified and authenticated in the pharmacognosy laboratory of Institute of teaching and research in Ayurveda, Ministry of Ayush, Gov. Of India, Jamnagar. The ingredients and part used of *KetakyadiTaila* the are given in Table 1.

Table No. 1: Ingredients of *KetakyadiTaila*

DRUG	LATIN NAME	FAMILY	PART USED	PROPORTION
Ketaki	*Pandanus odoratissimus*Roxb.	Pandanaceae	Flower	1 Part
Nagbala	*Grewiatenax*Vanb.	Tiliaceae	Root	1 Part
Atibala	*Abutilon indicum* Linn.	Malvaceae	Root	1 Part
Tushodaka				6 Parts
TilaTaila	*Sesamum indicum Linn.*	Pedaliaceae	Seed oil	1.5 Parts

Method of preparation-All the drugs of *KetakyadiTaila* will be taken and four times water will be added. When 1/4th of water remains the *Kwatha*will be filtered. Equal amount of *Tushodaka* will be taken as that of *Kwatha* and both will be processed in *TilaTaila* until *Snehapaka Siddhi Lakshana*. As *Sneha paka siddha lakshnas* is observed it is kept for cooling. After complete cooling *Taila* is filtered and measured and stored in bottles under hygienic conditions.

Pharmacognostical study:

The pharmacognostical study was divided in to organoleptic study and microscopic study of the finished product.

Organoleptic study: Thegenuinity of the polyherbal formulation can be fined with organoleptic characters of the given sample. Organoleptic parameterscomprisesof color, odor and touch of *KetakyadiTaila*which was scientifically studied as per the standard references.

Microscopic study:*KetakyadiTaila*ingridents was taken in powder form and dissolved with water and microscopy of the sample was done without stain and after staining with phloroglucinol and HCl. Microphotographs of all ingridents of *KetakyadiTaila* were also taken under Corl-zeisstrinocular microscope[viii].

Physico-chemical analysis-With the help of various standard physico-chemical parameters, *KetakyadiTaila* was analyzed. The common parameters mentioned for *Taila*(Sneha) Kalpana in Ayurvedic Pharmacopeia of India, and CCRAS, guidelines are loss on drying, specific gravity, acid value, saponification and refractive index.

High-performance thin layer chromatography-High-performance thin layer chromatography (HPTLC) is a powerful analytical method suitable for the separation and quantitative determination of a considerable number of compounds even from complicated matrix. HPTLC is used for identification of active constituents, identification and determination of impurities and quantitative analysis of active constituents. Principle of HPTLC remains the same as of TLC i.e., adsorption. One or more compounds can be spotted in a thin layer of adsorbent coated on a chromatographic plate. The mobile phase solvent flowsthrough because of capillary action against gravitational force. The component with more affinity towards stationary phase travels faster. Thus, the components are separated on a thin layer chromatographic plate based on the affinity of the components towards the stationary phase. For the given drug prechromatographic derivatization of oil sample performed on plate using 4% alcoholic KOH.

Observation and results: The initial purpose of the study was to confirm the authenticity the drugs used in preparation of *KetakyadiTaila*. For this, all ingredients was subjected to organoleptic and microscopic evaluations to confirm the genuineness of all the raw drugs. Later after the preparation of formulation, pharmacognostical evaluation was carried out. Organoleptic evaluation organoleptic features like color; odor and taste of the *KetakyadiTaila* were recorded and are placed in Table 2

Table 2: Organoleptic characters of *KetakyadiTaila*-

Parameter	Results
Color	Brownish yellow
Odor	Aromatic
Touch	Smooth

Microscopic evaluation: Microscopicevaluation was conducted by dissolving the ingridents of *KetakyadiTaila* in the distilled water and studied under microscope for the presence of characteristics of ingredient drugs. The diagnostic characters arepitted border of *Nagbala*(Figure 1 A), cork in *Nagbala*(Figure 1 B), cork surface of *Atibala*(Figure 1 C), lignified fibers with epidermal cells of *Ketaki*(Figure 1 D), lignified fibers of *Nagbala*(Figure 1 E), lignified cork cells of *Nagbala*(Figure 1 F), parenchymal cells of *Ketaki*(Figure 1 G), rosette crystal of *Atibala*(Figure 1 H), simple and compound starch of *Ketaki*(Figure 1 I), spiral vessel of *Atibala*(Figure 1 J), starch grains of *Nagbala*(Figure 1 K).

Physio-chemical parameters: Physio-chemical parameters like Loss on drying, Specific gravity, Acid value, Saponification &Refractive index were found within the normal range. Details is shownin the Table 3.

Table 3: Physico-chemical parameters of *KetakyadiTaila*

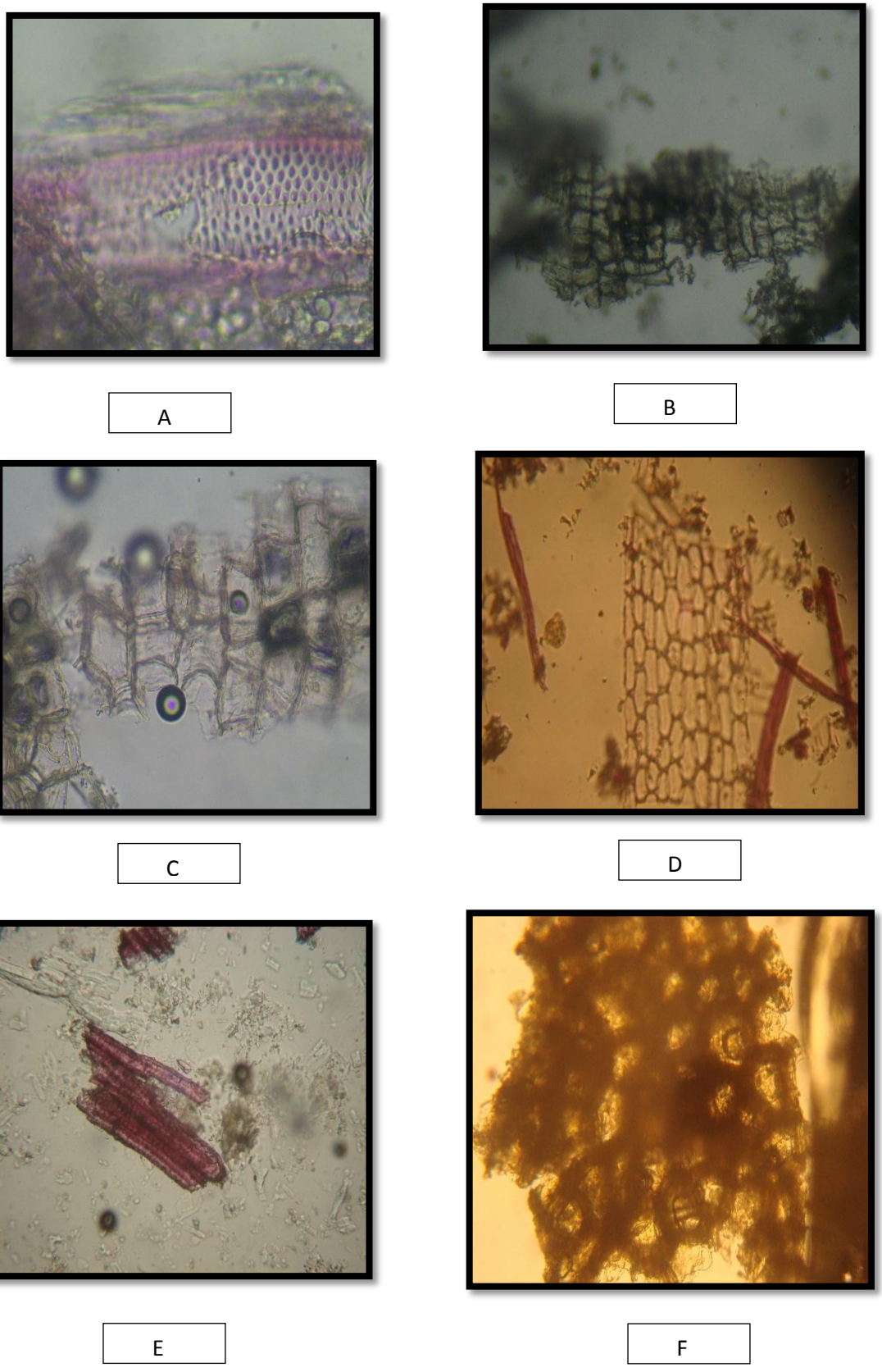
Parameter	Value (%)
Loss on drying(w/w)	0.00925
Acid value (w/w)	4.84
Saponification value	185.9
Refractive index	1.4609
Specific gravity	0.9174

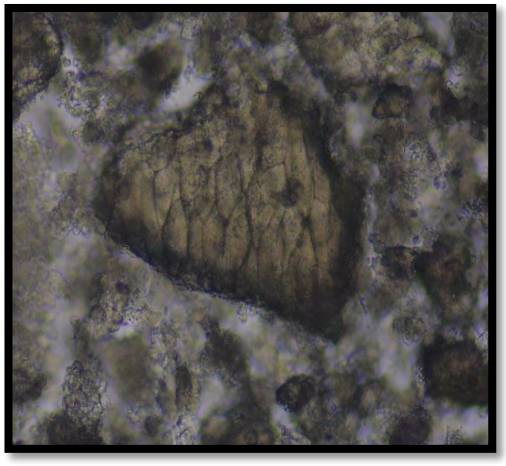
High-performance thin layer: Densitometry scanning of the HPTLC pattern showed 4 spots (Figure 2 A) at corresponding Rf values 0.20,0.14,0.09 and 0.02 in short wave UV 254 nm and 3 spots (Figure 2 B) at corresponding Rf values 0.24,0.14 and 0.08 obtained in long wave UV 366 nm (Table 4) for unsaponifiable fraction of oil sample. Though it is not possible to identify particular chemical constituent from the spot obtained, the pattern may be used as a reference standard for further quality control researches.

Table 4: R_f Values of *KetakaydiTaila*

Variable	R_f value at 254 nm	R_f value at 366 nm
HPTLC	0.20,0.14,0.09,0.02	0.24,0.14,0.08

Figure 1-





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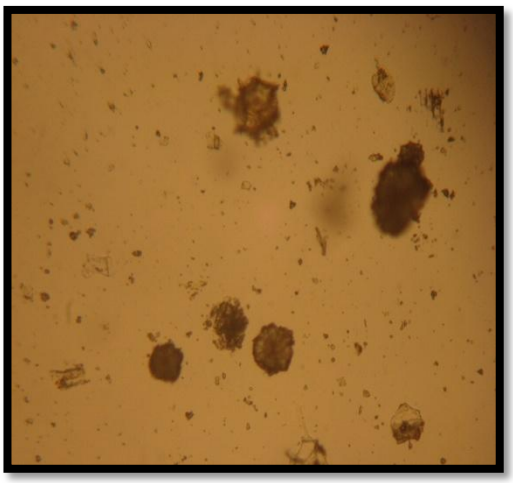

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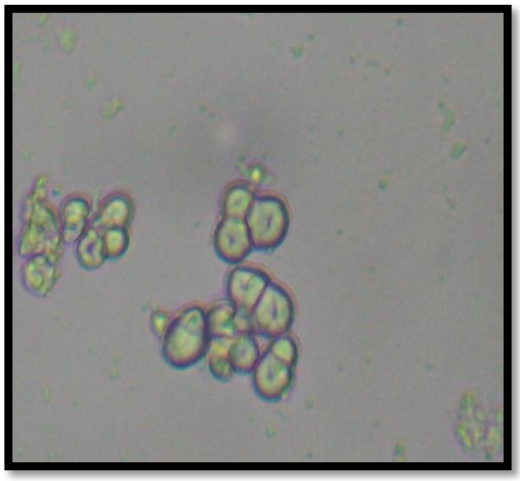

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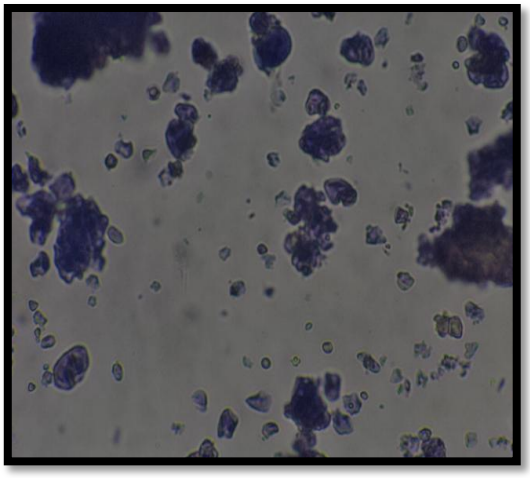
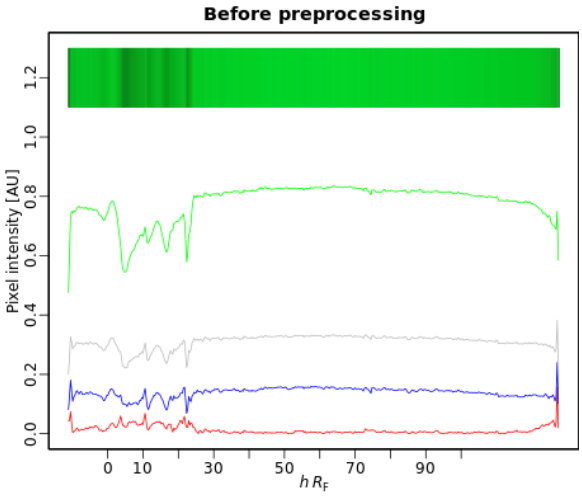
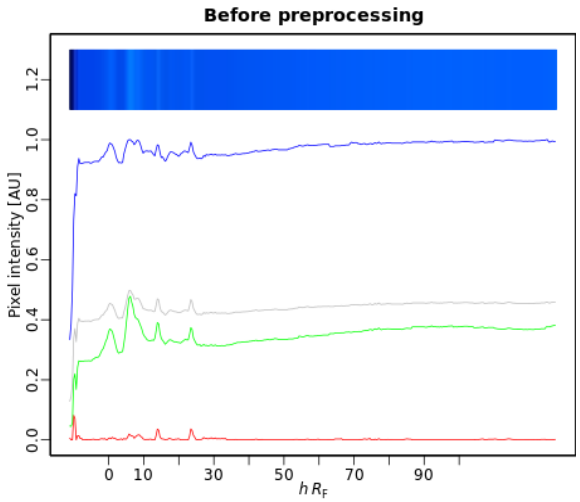


K

Figure 2-



A-Densitogram of *KetakyadiTaila* at 254nm



B-Densitogram of *KetakyadiTaila* at 366nm

DISCUSSION: Study on *KetakyadiTaila* was a step towards pharmacognostical and pharmaceutical standardization of the drug. The pharmacognostical study revealed the presence of the diagnostic characters of *KetakyadiTaila* like are pitted border of *Nagbala*, cork in *Nagbala*, cork surface of *Atibala*, lignified fibers with epidermal cells of *Ketaki*, lignified fibers of *Nagbala*, lignified cork cells of *Nagbala*, parenchymal cells of *Ketaki*, rosette crystal of *Atibala*, simple and compound starch of *Ketaki*, spiral vessel of *Atibala*, starch grains of *Nagbala*. This confirms the presence of all ingredients of raw drugs in the final product and there is no major change in the microscopic structure of raw drug during the pharmaceutical process of preparation of *Taila*, this showed the genuinity of the final product.All the physio-chemical parameters, Specific gravity- 0.9174, Acid value-4.84, Saponification –185.9, Loss on drying-0.092 and Refractive index-1.46 were analyzed and found to be innormal referential range. In this, acid value give the level of fatty acid in oil, saponification value give the level of saponifiable matter. Refractive index, Specific gravity are the attributeswhich are specific to particularoil. Unsaponifiable matter is then used for HPTLC. In HPTLC study aluminum plates precoated with silica gel as the stationary phase and the mixture of hexane:toluene:acetic acid(3:7:1 v/v/v) was used as the mobile phase. Then densitometric analysis was carried out and 4 spots at 254 nm and 3 spots at 366 nm were obtained, indicating its possible components of matrix which may possess its therapeutic effect.Hence used for standardization purpose.

Conclusion:

The pharmacognostical and physico-chemical analysis of *KetakyadiTaila* confirmed the purity and genuinity 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 *KetakyadiTaila*. Information acquired from this study may be beneficial for further research work and can be used as a reference standard for quality control researches.

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