



Comparative phyto-pharmacognostical study of kokilaksha whole plant natural powder and kshara

Khushbu B Joshi^{1*}, Mukeshkumar B Nariya¹, Harisha C R², Rabinarayan Acharya³, Vinay J Shukla⁴

¹ Pharmacology Laboratory, Institute of Teaching and Research in Ayurveda (Institute of National Importance), Jamnagar, Gujarat, India

² Pharmacognosy Laboratory, Institute of Teaching and Research in Ayurveda (Institute of National Importance), Jamnagar, Gujarat, India

³ Central Council of Research in Ayurvedic Sciences (CCRAS), Delhi, India

⁴ Pharmaceutical Chemistry Laboratory, Institute of Teaching and Research in Ayurveda (Institute of National Importance), Jamnagar, Gujarat, India

Abstract

Introduction: *Kshara* is an alkali contains water soluble ash, due to its corrosive nature (*Ksharanat*), it is known as *Kshara* (alkali). *Kshara* are derivatives of plant drug ashes in the form of solutions, powder or crystals, all of which have the basic quality of being alkaline.

Materials and Methods: *Kokilaksha* whole plant powder and *kshara* was prepared as per the method of Ayurvedic Formulary of India (AFI) and subjected to phyto-pharmacognostical study as per standard protocol.

Results and Discussion: The powder characters showed simple trichomes, pollen grains, cytolith, polygonal cells, spiral vessels etc. and the microscopy of *Kshara* revealed presence of different forms of crystal structures. Physico-chemical analysis shows total ash less than 9% and acid insoluble ash to be less than 1%. The qualitative phytochemical analysis showed the presence of phyto constituents like alkaloids, phenols, steroids, tannins and flavonoids.

Conclusion: The parameters evaluated will serve as pharmacognostical standards and will help in correct identification and authentication of the plant that can maintain its therapeutic efficacy.

Keywords: *Kokilaksha*, pharmacognosy, physico-chemical analysis, phyto-chemical analysis, powder study

Introduction

The role of traditional medicines in resolving health problems is invaluable on a global level. Medicinal plants continue to provide valuable therapeutic agents, in both modern and traditional medicine [1]. With the associated side effects of modern medicine, traditional medicines are gaining importance and are now being studied to find the scientific basis of their therapeutic actions [2]. Research work on medicinal plants has intensified, and information on these plants has been exchanged. This research will go a long way in the scientific exploration of medicinal plants for the benefit of man and is likely to decrease the dependence on synthetic drugs [3].

Asteracantha longifolia [*Syn-Hygrophila auriculata* (Schum.) Heine; *Hygrophila spinosa* T. Anders. (L.) Nees, belongs to family Acanthaceae, is a source of the Ayurvedic drug, '*Kokilaksha*' and the Unani drug, *Talimakhana*. It is mentioned in Ayurvedic treatise like '*Sushruta Samhita*' and '*Charak Samhita*' as *Rasayan* or rejuvenator. *A. longifolia* is described in Ayurvedic literature as *Ikshura*, *Ikshugandha* and *Kokilasha* "having eyes like the *Kokila* or Indian Cuckoo". Bhavaprakash has mentioned its properties as *sheetal*, *madhura* and *snigdha*. *Acharya Charak* included *Ikshuraka* along with other drugs in *Ashmari chikitsa*. They are also constituent of ayurvedic formulation "*Srirativallabh modak*" and "*Rativardhanyog*" described in ancient text to improve sexual behaviour and as a general tonic [4].

Many pharmacological studies have been conducted on *A. longifolia* Nees. Its root, leaves and whole-plant possess anti-tumor, anti-inflammatory, anti-pyretic, hepatoprotective, diuretic, analgesic etc. properties [5]. The use of herbal medicines has increased remarkably in line with the global trend of people returning to natural therapies [6]. Ayurveda utilizes different forms of herbs in therapeutics, *Kshara* is one among such forms. The meaning of word '*Kshara*', is the substance which possesses corrosive, caustic, pungent, saline and acidic properties [7]. *Acharya Sushruta* has introduced a chapter on *Kshara Karma* owing to its importance. He considered *Ksharas* superior among *Shashtra* (surgical) and *Anushastra* (para surgical) procedures, due to its properties like *Chedana* (excision), *Bhedana* (incision) and *Lekhana* (scraping). According to *Chakrapanidatta* *Kshara* of *Kokilaksha* is administered internally along with *gomutra* or water in case of *shotha* (edema). The whole plant *kshara* of *kokilaksha* is used in case of *Mutraashmari*, *pittaashmari*, *shotha*, *mutrakrichha* and *udararoga* [8].

The macroscopic and microscopic description of a medicinal plant is the first step towards establishing identity and degree of purity of such materials and should be carried out before any further tests are undertaken [9]. As a consequence in present work, an attempt has been done to lay down comparative pharmacognostic and physico-chemical analysis of *kokilaksha* whole plant powder & *kshara*.

Materials and Method

Collection and Authentication of plant

The fresh drug sample was collected in bulk amount from the outskirts of Junagadh (21.5° N, 70.4° E). The verified voucher specimen has been kept in the Dept. of Pharmacognosy of ITRA, Vide no: Ph.M. 6330/2020-21. Whole plant of *kokilaksha* was collected in month of February. Whole plant powder and *kshara* were prepared as per reference of Ayurvedic Formulary of India [10] and stored in airtight container for further studies.

Pharmacognostical study

The detailed morphological and microscopical study of all parts of *A. longifolia* was already been reported [11]. Hence, in present work pharmacognostical study of *A. longifolia* whole plant powder and *kshara* were only done. Macroscopic studies were carried out using organoleptic evaluation method. The colour, odour, taste and touch [12] were observed and photographs were taken by using digital camera.

Microscopy enables to examine the presence of diagnostic characteristics like the presence of crystals, starch grains, oil globules, different types of tissues, cells and their components. In this study small amount of powder and *kshara* were kept on the slide and mounted with a drop of water. The general and specific features of powder and *kshara* were observed and noted down and photomicrographs were taken. Behaviour of powder with different staining reagents like iodine, phloroglucinol + HCl was performed to detect the presence of starch grains and lignified compounds respectively.

Physico-chemical analysis:

The powder was evaluated for its physicochemical parameters like foreign matter, pH, total ash, acid insoluble ash, loss on drying, water soluble extractive value and alcohol soluble extractive value [13].

Preliminary phyto-chemical analysis

Preliminary phytochemical screening of *A. longifolia* extract was done for the presence of various phyto constituents by using standard procedure [14]. The aqueous and methanolic extract were used for the purpose of phytochemical screening. The whole plant of *A. longifolia* was coarsely powdered and extracted with methanol and water. The extracts were filtered and concentrated on water bath.

Results and Discussion

The organoleptic characters of the *kokilaksha* whole plant natural powder and *kshara* has been given in table 1. The microscopy of the *kokilaksha* whole plant powder reveals presence of Simple & multi-cellular trichomes, pollen grains, epicarp cells & epidermal cells, group of fibres & fimbriated fibres, simple starch grains, polygonal cells of

fruit, cystolith and epidermal cells with stomata. After staining with specific reagents the powder showed presence of group of lignified fibres & lignified simple trichomes, spiral vessels and scalated sclereids. This is because natural powder of plants or herbs composed of different complex chemical entities and consists of many different type of constituents and hence shows a mixture of diverse microscopic characters than *Kshara* [14] Fig.1.

On the other hand, *Kshara* when observed under microscope shows existence of different types of calcium oxalate crystals only such as sickle/needle shaped crystals (large in number), uneven shaped crystals, diagonal shaped crystals, prismatic crystals and group of crystals. The probable reason behind this, is the method of preparation (extraction) of *Kshara*. *Kshara* is prepared by burning the plant to ash that is just the carbon material and when this ash is dissolved in specified amount of water, it remains undissolved and gets sedimented at the bottom of vessel and only the inorganic form present in ash (*Kshara*) gets dissolved with water. The vessel is kept in an undisturbed condition for specific time period and the supernatant was filtered carefully to get the liquid that contains the only inorganic material i.e., *Kshara* which is being collected by evaporating the whole water portion and getting the product in powder form [10]. *Kshara* can be any one of the acidic, basic (alkaline) or salt in nature that are basically crystalline in nature [15] and same is being observed under microscope Fig.2.

The physical constant evaluation of the drugs is an important parameter in distinguishing adulteration or inappropriate handling of drugs. The moisture content of the drug is in permissible limit, thus it could discourage bacterial, fungi or yeast growth. The ash value and acid-insoluble ash value determination are equally important in the evaluation of crude drugs as it reveals the presence or absence of foreign inorganic matter such as metallic salts and/or silica. The physicochemical parameters like pH, loss on drying, ash value, acid insoluble ash, water soluble extractive value, alcohol soluble extractive value were found within the limits [16] as shown in table 2. The average values are expressed as percentage of air-dried material. The preliminary phytochemical analysis revealed the presence of alkaloids, glycosides, saponins, flavonoids, phenols in *Kokilaksha* whole plant powder as provided in table 3.

Table 1: Organoleptic characters of *Kokilaksha* whole plant natural powder and *kshara*

Characters	<i>Kokilaksha</i> whole plant natural powder	<i>Kokilaksha</i> whole plant <i>kshara</i>
Colour	Green	Off white
Odour	None	None
Taste	Astringent	Salty & Astringent
Touch	Rough	Smooth

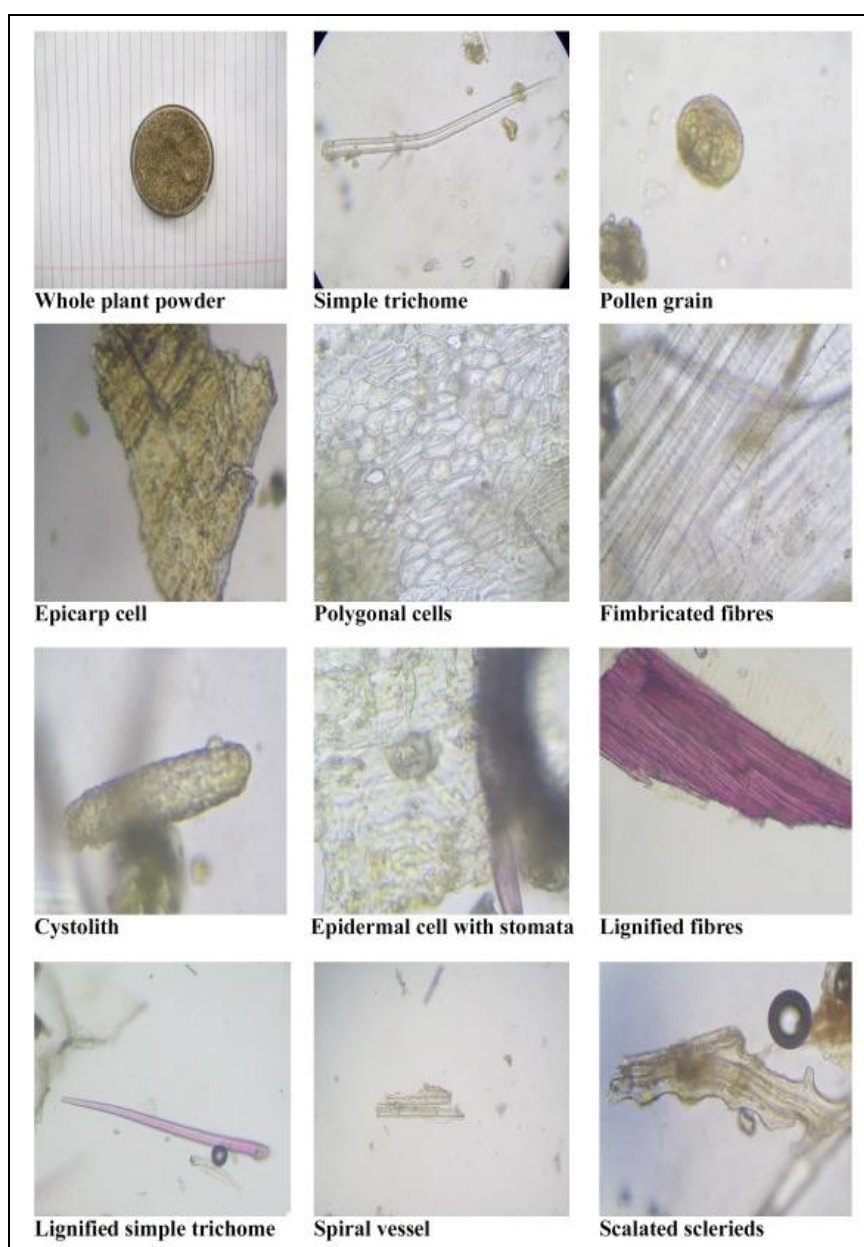
Table 2: Physico-chemical analysis of *Kokilaksha* whole plant natural powder and *kshara*

Parameters	<i>Kokilaksha</i> whole plant natural powder			Average	Mean±SD
	1 st	2 nd	3 rd		
<i>Kokilaksha</i> whole plant powder					
Foreign matter (w/w)	1.003	0.579	0.645	0.74	0.74±0.22
Loss on drying at 105°C (% w/w)	27.30	27.10	28.10	27.5	27.5±0.52
% (w/w) Total ash	6.7	6.4	6.6	6.5	6.5±0.15
% (w/w) Acid insoluble ash	0.3	0.5	0.3	0.36	0.36±0.11

% (w/w) Water soluble extractive	10.28	11.28	10.80	10.78	10.78±0.50
% (w/w) Alcohol soluble extractive	4.68	5.80	5.88	5.45	5.45±0.67
pH	7.5	7.0	7.5	7.3	7.3±0.28
Kokilaksha whole plant kshara					Mean±SD
	KKB-1	KKB-2	KKB-3	Average	
Loss on drying at 105°C (% w/w)	13.2	13.9	13.5	13.53	13.53±0.35
% (w/w) Water soluble extractive	99.6	99.8	98.9	99.4	99.43±0.47
% (w/w) Alcohol soluble extractive	45.6	44.9	45.4	45.3	45.30±0.36
pH	8.0	7.8	8.0	7.93	7.93±0.12

Table 3: Preliminary phyto-chemical analysis of *Kokilaksha* whole plant natural powder

Phytoconstituents	Results	
	Water	Methanol
Alkaloids	-ve	+ve
Flavonoids	+ve	+ve
Proteins	-ve	-ve
Phenols	-ve	+ve
Tannin	+ve	+ve
Carbohydrates	+ve	+ve
Saponins	+ve	-ve
Phytosterols	-ve	+ve
Glycoside	+ve	+ve

**Fig 1:** *Kokilaksha* powder Microscopy

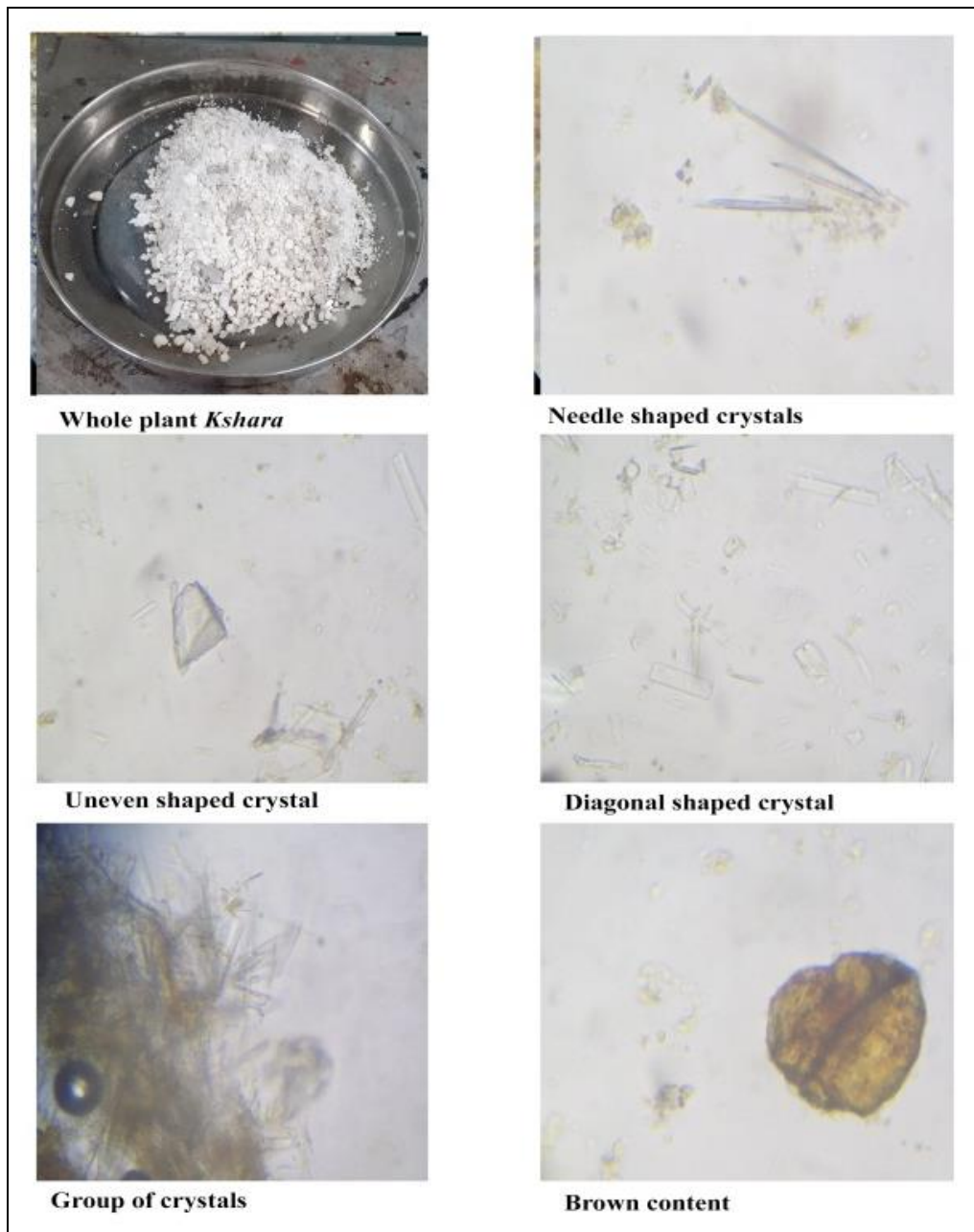


Fig 2: Kokilaksha Kshara Microscopy

Conclusion

The present study was carried out with an aim of authenticity of the drug along with Physico-chemical and phytochemical analysis of *Kokilaksha* whole plant powder and *Kshara*. *Kokilaksha* is traditionally used to treat various diseases and has many medicinal uses and therefore is worthy enough to be correctly identified to maintain the quality of crude drug. Various parameters like microscopic studies, powder studies, phytochemical and physicochemical parameters evaluated in the existing work will aid in identifying the plant and its *kshara* thus, preventing it from getting adulterated.

Conflict of Interest

There is no conflict of interest.

Acknowledgement

Would like to thank the Institute of Teaching and Research in Ayurveda, Jamnagar, Gujarat, India.

References

1. Krentz AJ, Bailey CJ. Oral antidiabetic agents: Current role in type 2 diabetes mellitus. *Drugs*,2005;65:385-411.
2. Gupta YK, Briyal S. Animal models of cerebral ischemia for evaluation of drugs. *Indian Journal of Physiology and Pharmacology*,2004;48:379-94.
3. Amadou CK. Promoting alternative medicine. *African Journal of Health Science* 1998;2:20-5 Carter M, Sheih, Jennifer C. "Nociception". Guide to research techniques in Neuroscience. Burlington MA: Academic Press, 2010, 51.
4. Agnivesh charak samhita ed. Vaidya yadavji trikamji, chaukabham Sanskrit series Varanasi India sutra sthan 23/26.
5. Kshirsagar AD, Ingale KG, Vyawahare NS, Thorve VS. *Hygrophila spinosa*: A comprehensive review. *Pharmacognosy Reviews*, 2010, 8(4).

6. Vaidya AD, Devasagayam TP. Current status of herbal drugs in India: An overview. *Journal of Clinical Biochemistry and Nutrition*,2007;41:1-11.
7. Aacharya Sushruta, Sushruta Samhita with the Nibandasangraha commentary of Sri Dalhana Acharya edited by VaidyaJaadvji Trikamji Acharya and Narayan Ram Acharya Kavyatirtha, Chowkhambha Surabharathi Prakashan, Varanasi, 2012, 738-78.
8. Gopinath P, Umakant S. Vanaushadhi Ratnakar. *Aligadh: Sudhanidhi*,2009;10:252-255.
9. Anonymous. Quality control methods for medicinal plant materials, World Health Organization, WHO Library, Geneva, 1998, 1-115
10. AFI. The Ayurvedic Formulary of India, Part-1. Department of ISM (2nd eds.), Ministry of Health and Family Welfare, Government of India, New Delhi, 2003, 163-167.
11. Hussain MS, Sheeba F, Ali M. Preliminary phytochemical and pharmacognostical screening of the *Hygrophila auriculata* (K. Schum) Heine. *Pharmacognosy journal*,2011;3(23):28-40.
12. Johansen DA. *Plant Microtechnique*, Edition 1: 1940 McGraw Hill Book Co, New York, London, 1940, 182-203.
13. The Ayurvedic Pharmacopoeia of India Government of India. Ministry of Health and Family Welfare Department of Ayurveda Yoga and Naturopathy, Unani, Siddha and Homoeopathy. The controller of publications civil lines, Delhi,2001:Part -2(2):176.
14. Harborne JB. *Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis*, Chapman and Hall, New York, 1976.
15. Rugmini RK, Sridurga C. Analytical study of Chinch Kshar through modern parameters like XRD, SEM, and EDS. *International Journal of Pharma Sciences and Research*,2018;9(6):2451-2455.
16. The Ayurvedic Pharmacopoeia of India Government of India. Ministry of Health and Family Welfare Department of Ayurveda Yoga and Naturopathy, Unani, Siddha and Homoeopathy. The controller of publications civil lines, Delhi,2001:Part-1(2):96.