JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

PHARMACOGNOSTICAL AND PHARMACEUTICAL ANALYSIS OF KANSA HARITAKI AVALEHA -AN AYURVEDIC HERBAL FORMULATION FOR HYPOTHYROIDISM

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ABSTRACT

Background: *Kansa Haritaki Avaleha* is indicated as one of the drugs for management of *Shotha*, So, for assurance of quality of polyherbal compound, pharmacognostical and pharmaceutical analysis should be done. **Methods:** *Kansa Haritaki Avaleha* was subjected to microscopic evaluation for pharmacognostical, physiochemical analysis like loss on drying, ash value, pH value, water-soluble extract, alcohol soluble extract and high-performance thin layer chromatography (HPTLC). **Results:** Pharmacognostical study showed the presence of certain identifying characteristics of all the ingredients of *Kansa Haritaki Avaleha* that is *Dashmoola, Trikatu, Trijata etc.*In the pharmaceutical study, preliminary physiochemical analysis showed that total sugar value 236.1, reducing sugar 51.1, ash value 2.15%w/w, loss on drying 30.41%w/w, water soluble extract 65.2%w/w, alcohol soluble extract 72.8%w/w and HPTLC showed 7 spots in 254 nm and 8 spots in 366 nm. **Conclusion:** Pharmacognostical and physicochemical observations revealed the specific characters of all active constituents of *Kansa Haritaki Avaleha* and confirmed the purity and genuinity of the drug.

KEYWORDS: *Kansa Haritaki Avaleha*, Hypothyroidism, Pharmacognosy, Pharmaceutical analysis.

INTRODUCTION

Hypothyroidism, also called underactive thyroid is a hypometabolic clinical state resulting from inadequate production of thyroid hormones for prolonged period. It is much more prevalent in women than in men, potentially leading to many symptoms like Weight gain, Dyspnea, Tiredness, Weakness, Hair loss, Difficulty in concentrating, Poor memory, Constipation, Hoarseness of voice, Dry &coarse skin, Cool extremities, Diffuse alopecia, Bradycardia, Peripheral edema.[1]

There is no direct description of hypothyroidism found in Samhitas. There is a close resemblance between the functions of thyroid hormones and functions of *Jatharagni* (digestive fire). *Agni* plays prime important role to

digestion and various metabolic activity of body. It can be understood as disease entity of *KaphaVata Dosha* along with involvement of *Aama* and *Dhavagnimandya*.

In spite of many advances, the modern management of hypothyroidism still remains unsatisfactory. It leads affected person to remain dependent on hormonal replacement throughout his life and excessive thyroid hormone replacement carries serious longterm metabolic complications (e.g., increased appetite, insomnia, accelerated osteoporosis, drug intolerance, hypersensitivity). So, a better, safer and effective therapy is needed.

As hypothyroidism is mainly caused due to malfunctioning of *Agni*. Increasing the quantum and of *Agni* is the mainstay of treatment so drugs having *Deepana, Pachana, Lekhana, Kaphashamaka, Vatanulomana, Srotoshodhana* and *Shothagna* properties seems to be effective in this condition. So, in a study, an attempt is being made to study the effect of *Kansa Haritaki Avaleha*.

Kansa Haritaki Avaleha is mentioned in *Charak Chikitsasthana Shothachikitsaadhyaya*[2] and consists of 20 ingredients *Dashmoola, Trikatu, Trijata, Yavakshara, Madhu and Guda*. As hypothyroidism is mainly caused due to malfunctioning of *Agni*, increasing the quantum and quantity of *Agni* is the mainstay of treatment. So drugs having *Lekhana, Kaphamedashamaka, Vatanulomana, Srotoshodhana* and *Shothagna* properties seems to be effective in this condition.

In the case of internal administration of any drug, it should be safe, effective, and free from adulteration, with appropriate quantity and ingredients. It is difficult to identify the individual herbal drug in dry or powdered form. So, it is need of time to set proper parameters for the standardization of herbal drugs. Pharmacognostic investigations identify plants and provide standards for standardisation that can be applied to herbal traditional medicine. Typically, a drug's physiochemical analytical research aids in the interpretation of the pharmacokinetic and pharmacodynamic processes at play. Analytical tests using physiochemical methods can be used to standardise the medicine and identify adulterants. The traditional techniques used in the examination of secondary metabolites derived from plants include high-performance liquid chromatography (HPLC) and thin-layer chromatography (TLC). It is now necessary in the realm of Ayurveda to carry out quality control on both the raw pharmaceuticals and the finished products using modern criteria, as this gives Ayurvedic medicines credibility and also aids in the globalisation of Ayurveda. Hence to evaluate the authenticity of *Kansa Haritaki Avaleha* through various pharmacognostical procedures, and to develop the pharmacognostical and phyto-chemical profile of *Kansa Haritaki Avaleha*, the present study was carried out.

MATERIALS METHODS: Collection, identification and authentication of raw drugs.

The raw materials were procured from the pharmacy of ITRA, Jamnagar and the raw drugs were identified and authenticated in the pharmacognosy laboratory of the Institute of teaching and research in Ayurveda, Ministry of Ayush, Gov. of India, Jamnagar. The ingredients and parts used of the *Kansa Haritaki Avaleha* are given in Table 1.

Table no.1: Ingredients of *Kansa Haritaki Avaleha*

S.n.	Drugs	Latin name	Family	Part used	
1.	*Bilva*	*Aegle marmelos* Corr.	Rutaceae	Root	3.072 ml Kwath (1 kansa)
2.	*Agnimanth*	*Premna integrifolia* Linn.	Verbinaceae	Root	
3.	*Shyonaka*	*Oroxylum indicum* Vent.	Bignonaceae	Root	
4.	*Patala*	*Sterospermum suaveolens* DC.	Bignoniaceae	Root	
5.	*Gambhari*	*Gmelina arborea* Linn.	Verbinaceae	Root	
6.	*Brihati*	*Solanum indicum* Linn.	Solanaceae	Root	
7.	*Kantakari*	*Solanum surratense Burm.F.*	Solanaceae	Root	
8.	*Shalparni*	*Desmodium gangeticum* DC.	Fabaceae	Root	
9.	*Prishniparni*	*Uraria picta* Desv.	Fabaceae	Root	
10.	*Gokshura*	*Tribulus terrestris* Linn.	Zygophyllaceae	Root	
11.	*Haritaki*	*Terminalia chebula* Retz.	Combretaceae	Fruit	100 in number
12.	*Shunthi*	*Zingiber officinalis* Roxb.	Zingiberaceae	Dry Rhizome	48 gms
13.	*Maricha*	*Piper nigrum* Linn.	Piperaceae	Fruit	48 gms
14.	*Pippali*	*Piper longum* Linn.	Piperaceae	Fruit	48 gms
15.	*Twak*	*Cinnamom zeylanicum* Blume.	Lauraceae	Bark	48 gms
16.	*Patra*	*Cinnamomum tamala* Nees.	Lauraceae	Leaf	48 gms
17	*Ela*	*Elettaria cardamomum* Maton	Zingiberaceae	Seed	48 gms
18.	*Madhu*		-		384 gms
19.	*Guda*	Jaggery	-		4800 gms
20.	*Yavakshara*	Alkaline substance of Hordeum vulgare Linn.		Water soluble ash of plant	12 gms

METHOD OF PREPARATION:

All the ten drugs of *Dashmoola* mentioned in table no.1 will be taken and 8 times water will be added. When ¼th of the water remains, then the *Kwatha* will be filtered. During preparation of the *Kwatha*, the fruit of *Haritaki* will be packed in a pottali and suspended in *Kwatha*. *Haritaki* pottali will be removed after boiling and the *Haritaki* pulp will be prepared. Then the *Paka* of *Dashmoola Kwatha* and seasonal jaggery will be done till one thread consistency and the *Haritaki* pulp will be added in it and again heated till *Avaleha Siddhi Lakshanas*. The vessel will be taken-off from stove. *Prakshepa dravyas* will be added gradually with continuous stirring and the honey will be added after self-cooling. After that, the *Avaleha* will be stored in air tight containers under hygienic conditions.

Pharmacognostical study

The pharmacognostical study was divided into organoleptic study and microscopic study of the finished product.[3]

Organoleptic study

The genuinity of the polyherbal formulation can be fined with organoleptic characters of the given sample. Organoleptic parameters comprises taste, color, odour and touch of *Kansa Haritaki Avaleha* which was scientifically studied.

Microscopic study:

Kansa Haritaki Avaleha was dissolved with water and microscopy of the sample was done without stain and after staining with phloroglucinol and HCl. Microphotographs of *Kansa Haritaki Avaleha* were also taken under a Corl-zeisstrinocular microscope.[4]

Physico-chemical analysis

With the help of various standard Physico-chemical parameters, *Kansa Haritaki Avaleha* was analyzed. The common parameters mentioned for *Avaleha Kalpana* in Ayurvedic Pharmacopeia of India[5], and CCRAS[6] guidelines are loss on drying, pH value, water-soluble extract, methanol soluble extract, ash value and total sugar content.

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 a complicated matrix. HPTLC is used for the identification of active constituents, identification and determination of impurities and quantitative analysis of active constituents. The 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 flows through because of capillary action against gravitational force. The component with more affinity towards the 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.[7]

RESULTS:

The initial purpose of the study was to confirm the authenticity of the drugs used in the preparation of *Kansa Haritaki Avaleha*. For this, all the ingredients of *Kansa Haritaki Avaleha* 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 features like color, odour, taste and touch of the *Kansa Haritaki Avaleha* were recorded and are placed in Table 2.

Table 2: Organoleptic characters of *Kansa Haritaki Avaleha*

Parameters	Result
Color	Dark brown
Odour	Aromatic
Taste	Sweet followed by astringent
Touch	Semisolid

Microscopic evaluation

Microscopic evaluation was conducted by dissolving *Kansa Haritaki Avaleha* in the distilled water and studied under a microscope for the presence of characteristics of ingredient drugs. The diagnostic characters are black debris of *Maricha* (Figure A), brown content of *Pippali* (Figure B), group of stone cell of *Maricha* (Figure C), simple starch grains of *Shunthi* (Figure D), scalariform vessels of *Shunthi* (Figure E), annular vessels of *Kantakari* (Figure F), cork cells of *Agnimantha* (Figure G), cork in surface view of *Shyonaka* (Figure H), crystal fibers of *Bilwa* (Figure I), crystal of *Gambhari* (Figure J), fibers of *Agnimantha* (Figure K), fibers of *Patra* (Figure L), fibers along with brown content of *Bilwa* (Figure M), fibers of *Bilwa* (Figure N), fibers of *Gambhari* (Figure O), fibers of *Kantakari* (Figure P), lignified stone cells of *Shyonaka* (Figure Q), lignified cork cells of *Gambhari* (Figure R), lignified cork cells of *Patra* (Figure S), lignified fiber of *Patra* (Figure T), lignified stone cells of *Gambhari* (Figure U), lignified stone cells of *Gokshura* (Figure V), lignified stellate trichome of *Kantakari* (Figure W), lignified stone cells of *Patra* (Figure X), oil glands with fibers of *Twak* (Figure Y), oil globules of *Pippali* (Figure Z), rhomboidal crystal of *Patra* (Figure 2A), rhomboidal crystal of *Agnimantha* (Figure 2B), rhomboidal crystal of *Shyonaka* (Figure 2C), stellate trichome of *Brihati* (Figure 2D), simple trichome of *Kantakari* (Figure 2E), sclereid of *Haritaki* (Figure 2F), tannin of *Haritaki* (Figure 2G), sclereids with stain of *Twak* (Figure 2H).

Physico-chemical parameters

Physico-chemical parameters like loss on drying, pH values were found within the normal range. Methanol and water-soluble extractive values of *Kansa Haritaki Avaleha* were found to be 72.8% and 65.2% respectively. Details is shown in Table 3.

Table 3: Physico-chemical parameters of *Kansa Haritaki Avaleha*

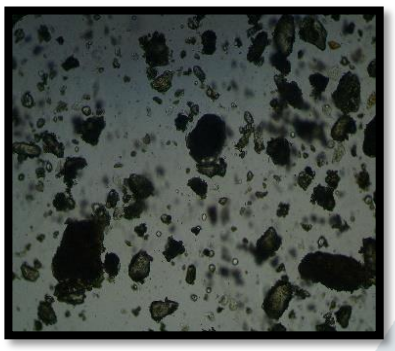
PARAMETERS	VALUES (%)
Loss of drying (w/w)	30.41
Ash value (w/w)	2.15
Water-soluble extract (w/w)	65.2
Alcohol-soluble extract (w/w)	72.8
pH (by pH indicator paper)	6.0
Reducing sugar	51.1
Total sugar	236.1
Non reducing sugar	185

High-performance thin layer chromatography

Densitometry scanning of the HPTLC pattern showed 7 spots at corresponding R_f values 0.03, 0.22, 0.31, 0.37, 0.52, 0.64 and 0.72 in short wave UV 254 nm and 8 spots at corresponding R_f values -0.01, 0.06, 0.18, 0.32 ,0.38, 0.45, 0.54 and 0.64 obtained in long wave UV 366 nm (Table 4). Though it is not possible to identify particular chemical constituents from the spot obtained, the pattern may be used as a reference standard for further quality control research.

Table 4: Planar chromatographic performance of *Kansa Haritaki Avaleha*(MeOH Ext) on SilicaGel normal Phase Using T:EtOAc(9:1v/v) under UV radiation.

Variable	R_f value at 254 nm	R_f value at 366 nm
HPTLC	0.03, 0.22, 0.31, 0.37, 0.52, 0.64 and 0.72	-0.01, 0.06, 0.18, 0.32 ,0.38,0.45, 0.54 and 0.64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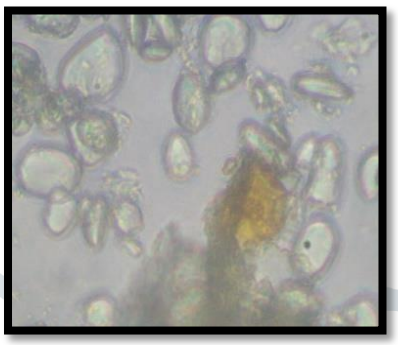
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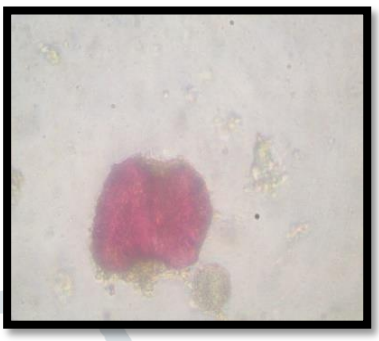
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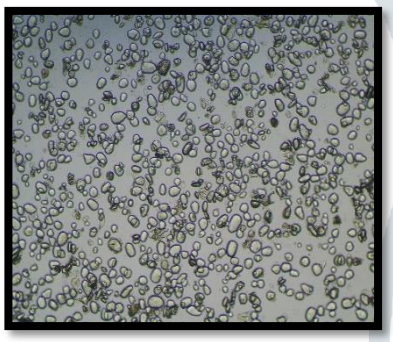
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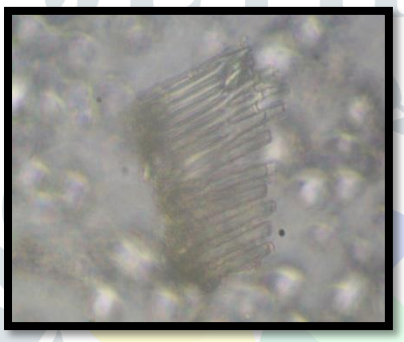
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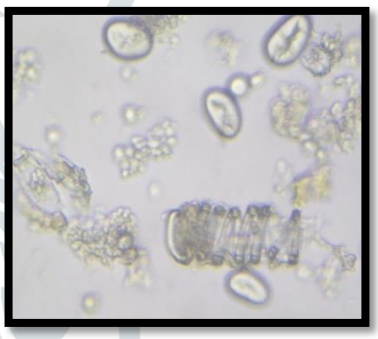
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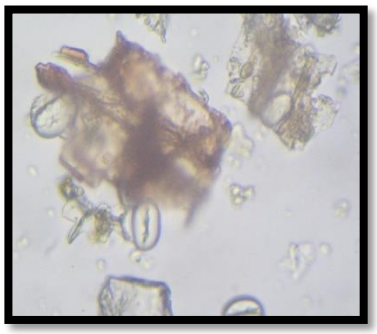
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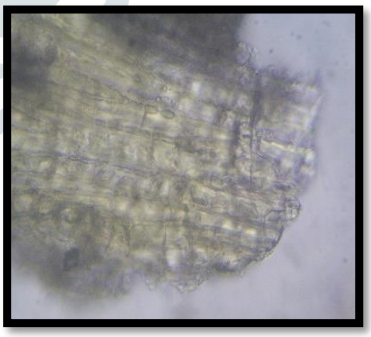
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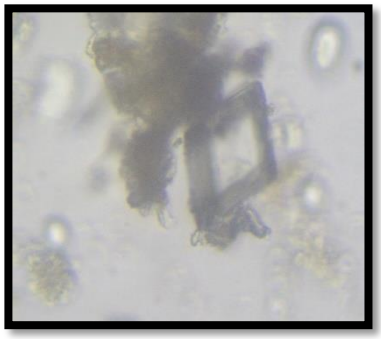
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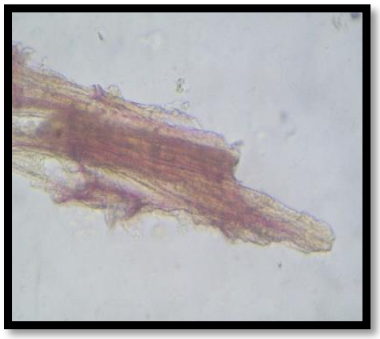
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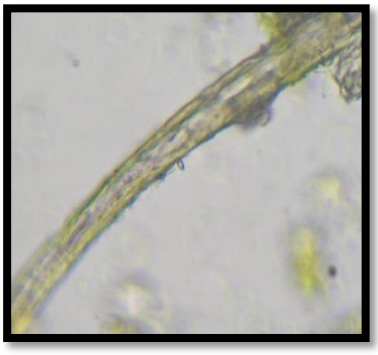
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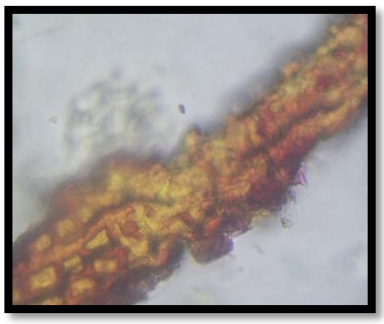

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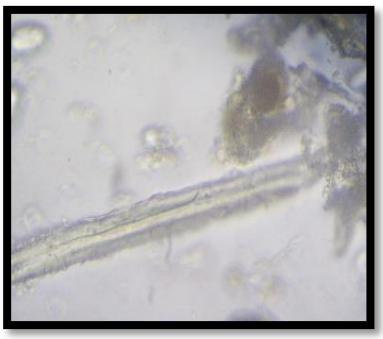

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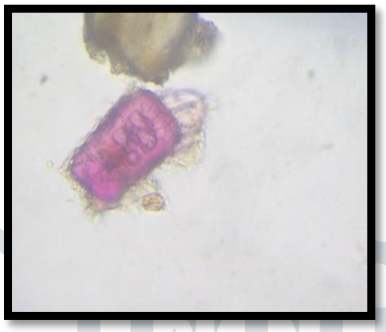

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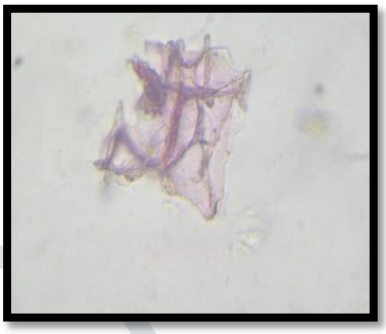

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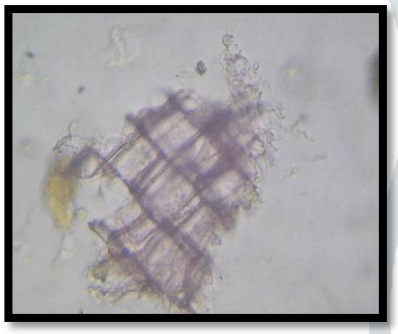

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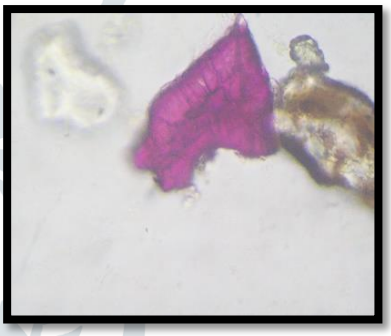

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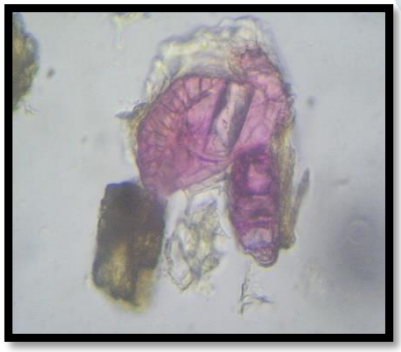

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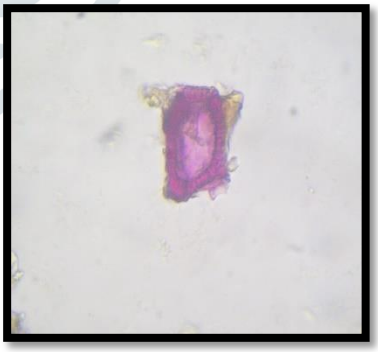

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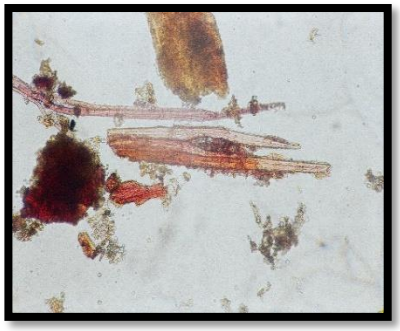

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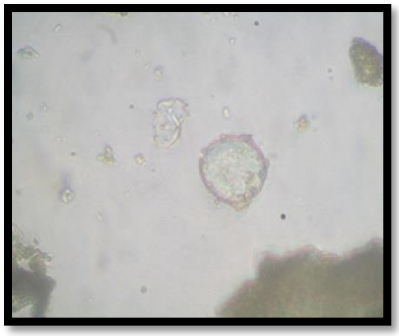

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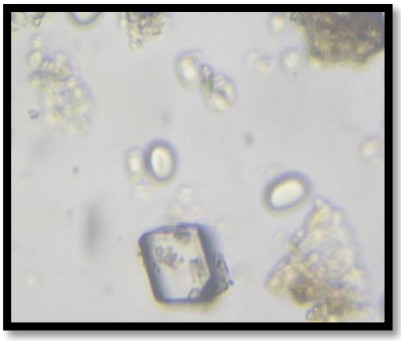

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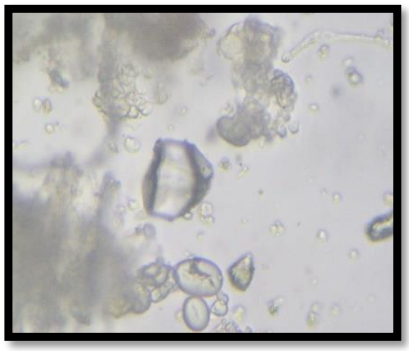

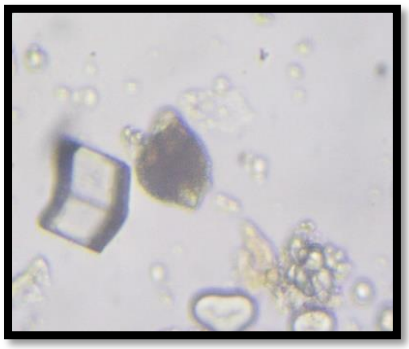

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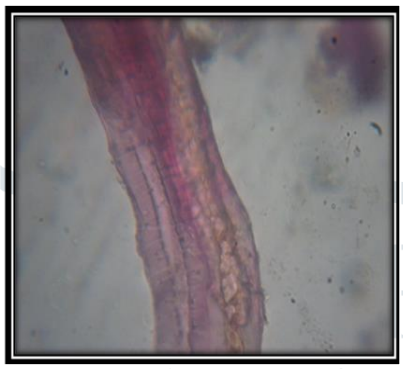

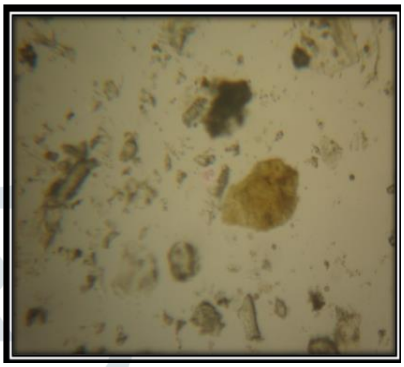

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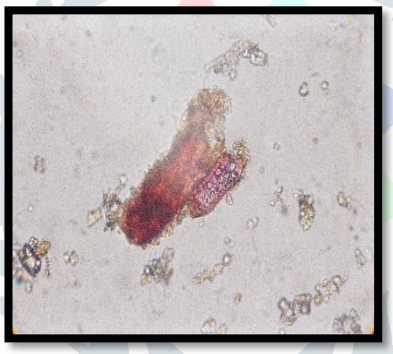

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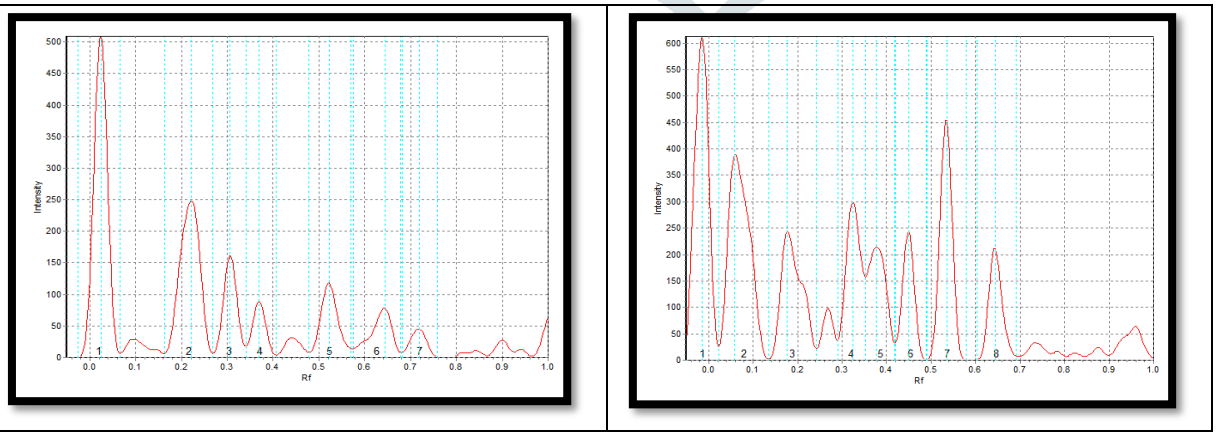

Figure 2: Densitogram of *Kansa Haritaki Avaleha* at (A) 254nm and (B) 366 nm.

DISCUSSION

Study on *Kansa Haritaki Avaleha* was a step towards pharmacognostical and pharmaceutical standardization of the drug. The pharmacognostical study revealed the presence of the diagnostic characters are black debris of *Maricha* , brown content of *Pippali* , group of stone cell of *Maricha,* scalariform vessels of *Shunthi*, annular vessels of *Kantakari,* cork cells of *Agnimantha*, lignified stone cells of *Shyonaka*, lignified stone cells of *Gokshura*, lignified stellate trichome of *Kantakari,* lignified stone cells of *Patra*, oil glands with fibers of *Twak,* oil globules of *Pippali*,, rhomboidal crystal of *Agnimantha*, rhomboidal crystal of *Shyonaka*, stellate trichome of *Brihati*, simple trichome of *Kantakari*, tannin of *Haritaki*, sclereids with stain of *Twak.* 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 *Vati*, this showed the genuinity of the final product. The Physicochemical parameters showed that the ash values are the criteria to identify the impurity of drugs. *Kansa Haritaki Avaleha* contained 2.15% w/w total ash. The results revealed that *Kansa Haritaki Avaleha* is inorganic load of product that is naturally aspirated through plant species utilized in operational stage at permissible so no need to perform acid insoluble ash for salacious material it reflects that sample free from dust and other solid matters. The 65.2% w/w of water-soluble extractives and 72.8% w/w methanol soluble extractives, reducing sugar 51.1, Total sugar 236.1, Non reducing sugar 185 were present in *Kansa Haritaki Avaleha* indicates that drug is having good solubility in water and methanol as in finished drug operational stage, the water soluble are selectively added in preparation of recipe. In HPTLC study 7 spots at 254 nm and 8 spots at 366 nm were obtained, indicating its possible discrete set of components of matrix having similar adsorption behaviour in experimental condition.

CONCLUSION

The Pharmacognostical and Physico chemical analysis of *Kansa Haritaki Avaleha* confirmed product attributes in conditions for *Misrakavarga*, however the data may vary on *Desha, Kala, Vaya* etc. natural conditional factors. As no standard fingerprint is available for this formulation, an attempt has been made to evolve pharmacognostical and physico-chemical profiles of *Kansa Haritaki Avaleha*. Information acquired from this study may be beneficial for further research work and can be used as a reference standard for quality control researches.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committe

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