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PHARMACOGNOSTICAL AND PHARMACEUTICAL EVALUATION OF *PUNARNAVADI YAVAKUTA* IN THE MANAGEMENT OF HYPOTHYROIDISM

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ABSTRACT

Thyroid diseases are common worldwide. In India too, there is a significant burden of thyroid disease. Hypothyroidism, specifically, is the most widespread thyroid disorder in India, affecting one in ten adults. Researchers have been trying since long to unfold the pathogenesis of Hypothyroidism. The concepts of *Agnimandya* and *Ama* in Ayurveda have much in common with Hypothyroidism. The clinical presentation of the disease is very much similar to the *Ama lakshanas*. The Sole causative factor for *Ama* formation is *Agnimandya*. The trial drug *Punarnavadi Kashaya*, cited in *Chakradutta* for the management of *Shotha*, contains *Deepana*, *Anulomana*, *Shothahara* and *Vatakapha shamaka* drugs, targeting at the core cause of disease. Pharmacognostical & Analytical study of *Punarnavadi Yavakuta* has been carried out for evaluation of its efficacy in Hypothyroidism. On pharmacognostical study, Acicular crystals of *Punarnava*, Cork cells of *Shunthi*, Fibres through medullary rays of *Devadaru*, Sceleriform vessels of *Shunthi*, Lignified pitted vessels of *Punarnava*, Tannin content of *Devdaru*, Oil globules and crystal fibres of *Devdaru*, Phloem fibres of *Devdaru*, Pitted vessels of *Punarnava*, Lignified and crystal fibres of *Devdaru* were found. Analytical study showed 9 spots at 254 nm and 8 spots at 366 nm.

KEYWORDS: *Agnimandya*, *Ama*, Hypothyroidism, *Punarnavadi Kashaya*.

INTRODUCTION

The incidence of thyroid disorders in India is high, with Hypothyroidism being the most common health issue that is not adequately controlled in the country at present. Hypothyroidism is nothing but a hypo-functional state of *Agni* (*Agnimandya*).[1] Hypo functional state of *Agni* leads to the formation of *Ama.* In Ayurvedic texts, *Ama* is defined as the *Ahara rasa* resulting due to hypofunctioning of *Agn*i.[2] The clinical presentations of Hypothyroidism can be incorporated in the *Ama lakshanas* quoted in Ayurvedic Classics. Hoarseness of voice, decreased appetite, or constipation can be linked with *Strotorodha* (obstruction in channels), Inability to tolerate cold or cold intolerance can be equated to *Balabhramsha* (decreased tolerance), Puffiness over face, heaviness in abdomen, peripheral edema, weight gain etc, which are few common presentations of Hypothyroidism can be correlated with *Gaurava* (heaviness) *lakshana* of *Ama*. Thus *Agnimandya* and resulting *Ama* can be thought of as the pathogenesis behind Hypothyroidism.

The treatment protocol in such condition should focus on *Pachana* (digestion of existing *Ama*), *Deepana* (increasing digestive power), *Anulomana* (purge) and *Shamana* (medicine) to avoid further formation of *Ama* and to alleviate the symptoms.

The trial drug *Punarnavadi Kashaya*[3] is explained in *Chakradutta* for the management of *Shotha. Punarnavadi Kashaya* consists of – *Punarnava, Devadaru* and *Shunthi* along with *Guggulu* as *Prakshepa dravya,* which are easily available, cheap & affordable.

Punarnava is the most commonly used effective medicine to lessen swelling. It enhances the qualities of bodily tissues including *Rasa* (nutrient plasma), *Rakta* (blood), *Mamsa* (Muscle), *Meda* (fat), *Majja* (Bone marrow and nerves), *Shukra dhatu* (reproductive fluids).[4] The roots of *Punarnava* are reputed to be diuretic and laxative[5], thus being functional in alleviating swelling which is the most frequent manifestation in cases of Hypothyroidism.

Devadaru possess anti inflammatory, immunomodulatory and diuretic properties.[6] Vitamin C is an active component of *Devadaru.*[7] Studies have shown that natural antioxidant therapy such as vitamin C can reverse thyroid damage and prevent adverse effects to health by optimizing thyroid function.[8] Weight gain is a common manifestation of Hypothyroidism, and *Devadaru* owing to its *Lekhana* action prevents weight gain. [9]

Shunthi owns *Deepaniya*, *shula prashamana* and *Vatakapha shamaka* properties, preventing formation of *Ama*.

Guggulu is a magical remedy in many diseases. It removes blockage in various channels of the body and facilitates easy transportation of nutrients and essentials. It has been indicated in *Gandamala* and *Shotha,* which are the core manifestations of the disease.[10]

MATERIALS AND METHODS

Collection of raw drug

The raw drugs for the preparation of *Punarnavadi Kashaya* were procured from the Pharmacy, Gujarat Ayurved University, Jamnagar. The ingredients & parts used in the preparation of the final product are listed in the table 1.

Preparation of drug

The final product i.e. *Punarnavadi Yavakuta* was prepared in the pharmacy, Gujarat Ayurved University, Jamnagar.

Pharmacognostical study

The Pharmacognostical study comprises of organoleptic study and microscopic study of finished product.

Organoleptic Study

The Organoleptic characters of Ayurvedic drugs are very important and give the general idea regarding the genuinity of the sample. Organoleptic parameters like Taste, Colour, odour and touch were scientifically studied in Pharmacognosy laboratory, I.P.G.T. & R.A., Gujarat Ayurved University, Jamnagar, Gujarat, India.[11]

Microscopic Study

Punarnavadi Yavakuta was dissolved with water and microscopy of the sample was done without stain and after staining with Phloroglucinol + HCl. Microphotographs of *Punarnavadi Yavakuta* was also taken under Corl-zeiss trinocular microscope.[12]

Physico-chemical analysis

Punarnavadi Yavakuta was analyzed using various standard physico-chemical parameters such as Loss on drying, water soluble extract and alcohol soluble extract etc.[13]

High Performance Thin Layer Chromatography (HPTLC)

HPTLC was performed as per the guideline provided by API. Methanolic extract of drug sample was used for the spotting. HPTLC was performed using Toluene+ Ethylacetate+ Acetic acid (14:4:2) solvent system and observed under visible light. The colour and R_f values of resolved spots were noted.[14]

RESULTS

Organoleptic characters of *Punarnavadi Yavakuta*

Organoleptic characters of *Punarnavadi Yavakuta* such as color, odour, taste etc were examined by sensory organs and results are as shown in Table 2.

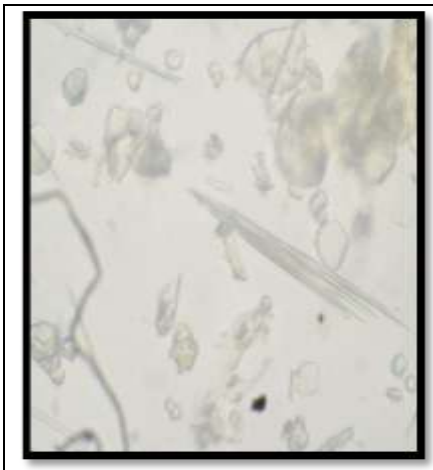
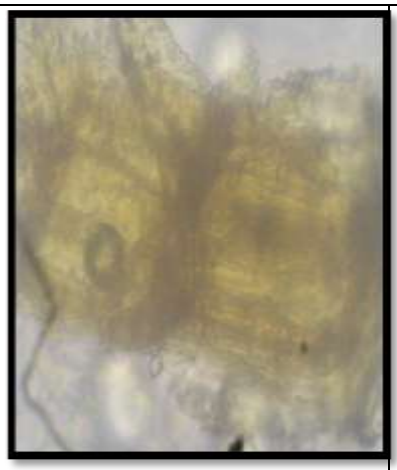
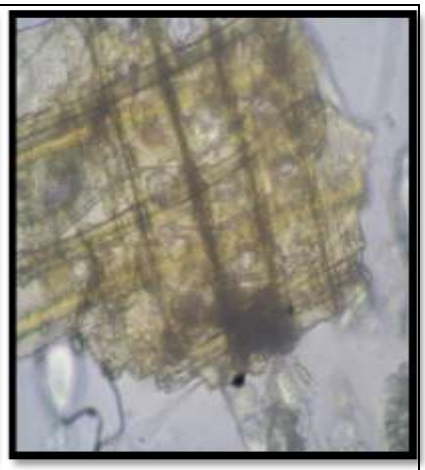
Microscopic characters of *Punarnavadi Yavakuta*

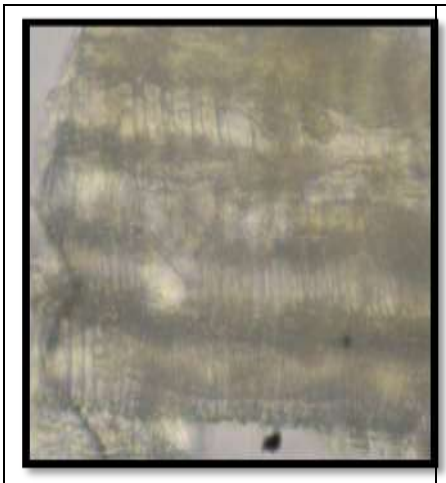
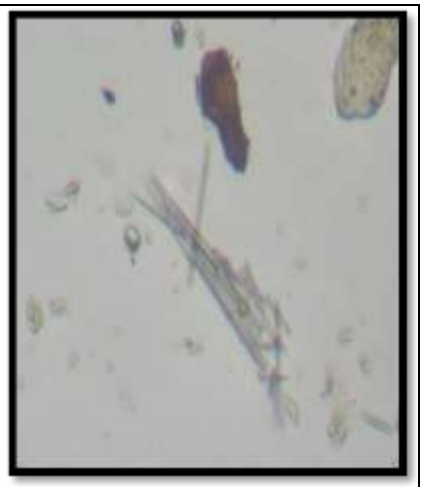
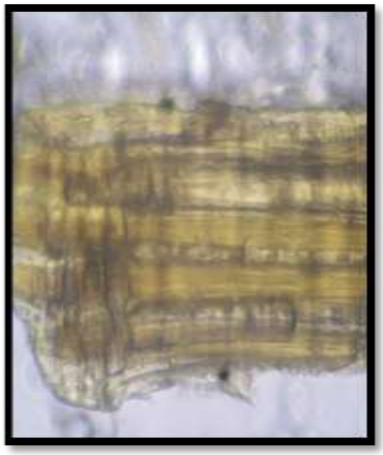
Diagnostic characters of *Punarnavadi Yavakuta* were observed under the microscope and presence of all ingredients showed their different characters, these are acicular crystals of *Punarnava*, cork in tangent shape of *Shunthi*, Fibres passing through medullary rays of *Devadaru*, Scleriform vessels of *Shunthi*, lignified pitted vessels of *Punarnava*, Group of Starch stains of *Shunthi*, Fibres along with stone cells of *Devadaru*, Oil globules of *Devadaru*, Tannin content of *Devadaru*, oleoresin and oil content of *Devadaru*, Phloem fibres and lignified fibres of *Devadaru*. (Plate 1. Fig. 1-15).

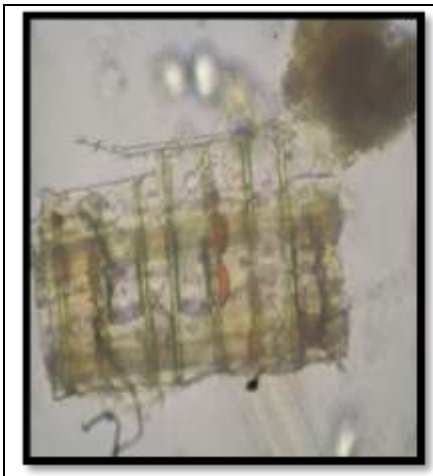
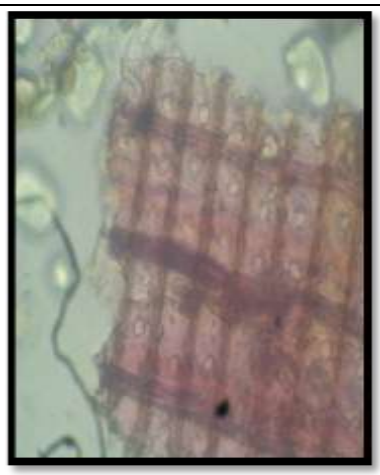
Physicochemical parameters of *Punarnavadi Yavakuta*

The results for Physicochemical parameters of *Punarnavadi Yavakuta* such as ash value, water soluble extract, alcohol soluble extract, pH etc. are show in Table 3.

PLATE 1: MICROPHOTOGRAPHS OF *PUNARNAVADI YAVAKUTA*

		
1. Acicular crystals of *Punarnava*	**2. Cork cells of *Shunthi***	**3. Fibres through medullary rays of *Devadaru***

		
4. Sceleriform vessels of *Shunthi*	**5. Lignified pitted vessels of *Punarnava***	**6. Group of Acicular Crystals of *Punarnava***
		
7. Group of Starch grains of *Shunthi*	**8. Fibres along with stone cells of *Devdaru***	**9. Tannin content of *Devdaru***

		
10. Oil globules and crystal fibres of *Devdaru*	**11. Lignified fibres and Parenchymal cells**	**12. Phloem fibres of *Devdaru***

		
13. **Pitted vessels of *Punarnava***	**14. Lignified fibres of *Devdaru***	**15. Crystal fibres of *Devdaru***

PLATE 2 (Fig. 1-2): HPTLC: at 254 nm & 366 nm of *Punarnavadi Yavakuta*

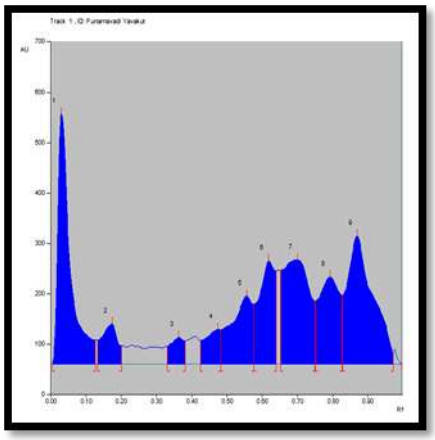
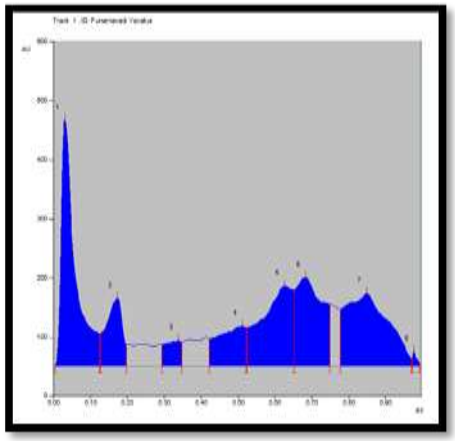
	

Fig 1. 254nm Peak display	**Fig 2. 366nm Peak display**

PLATE 3. HPTLC: Densitogram at 254 nm & 366 nm of *Punarnavadi Yavakuta*

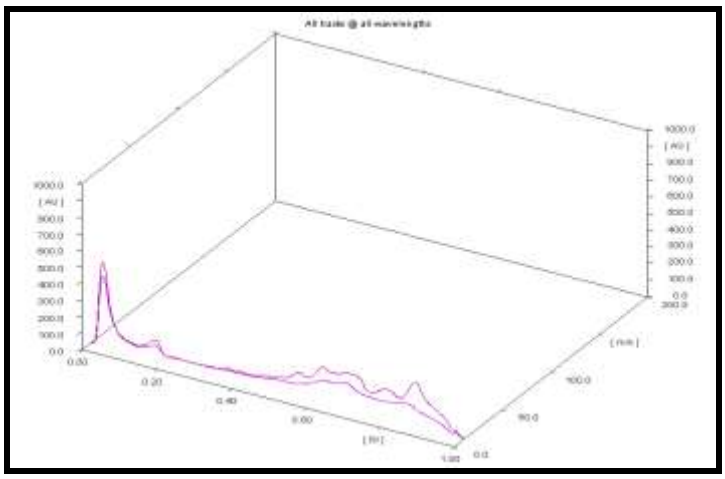


Fig 3: 254nm & 366nm 3D

Table 1: **Contents of *Punarnavadi Yavakuta***

Sr.	Drug	Latin Name	Part used	Parts
1.	*Punarnava*	*Boerhavia diffusa* Linn.	Root	1
2.	*Devdaru*	*Cedrus deodara* (Roxb.)Loud.	Stem	1
3.	*Shunthi*	*Zingiber officinale* Roxb.	Rhizome	1
4.	*Guggulu (Prakshep)*	*Commiphora mukul* (Hook ex Stocks)Engl.	Resin	1/30

Table 2: Organoleptic characters of *Punarnavadi Yavakuta*:

Sr. No.	Characters	Results
1	Colour	Light Brown
2	Odour	Pungent
3	Taste	Astringent followed by *Teekshna* taste
4	Touch	Coarse

Table 3: Physicochemical parameters of *Punarnavadi Yavakuta*

Sr. No.	Test	Result
1	Loss on Drying	9.122% w/w
2	Ash Value	4.940% w/w
4	Water soluble extract	8.960% w/w
5	Methanol soluble extract	3.585%w/w
6	pH	6
7	Particle Size	
	Unfiltered	9.35 gm
	Filtered by Sieve 60	0.18 gm
	Filtered by Sieve 85	0.22 gm
	Filtered by Sieve 120	0.24 gm

HPTLC Study

Chromatogram shows 9 prominent spots at 254nm with maximum R_f value 0.03, 0.17, 0.36, 0.47, 0.56, 0.62, 0.70, 0.79, 0.87 and 8 spots at 366nm with maximum R_f value 0.03, 0.17, 0.34, 0.51, 0.63, 0.68, 0.85, 0.98. (Plate 2 (Fig. 1-2), Plate 3).

DISCUSSION

The acicular crystals and lignified pitted vessels of *Punarnava*, group of starch stains of *Shunthi*, oil globules and Tannin content of *Devadaru etc.* were observed under the microscope, which were used as ingredients. The physicochemical analysis showed Loss on drying (9.122% w/w), Water soluble extract (8.960% w/w), Methanol soluble extract (3.585%w/w). HPTLC was performed as per the guideline provided by API. Methanolic extract of drug sample was used for the spotting. HPTLC was performed using Toluene + Ethyl acetate +Acetic acid (14:2:2) solvent system and observed under visible light. The colour and R_f values of resolved spots were noted.

CONCLUSION

Pharmacognostical study findings confirm that all characters were found in ingredient drugs of *Punarnavadi Yavakuta.* The physicochemical parameters discussed here may be used as identifying tools for the quality assessment of *Punarnavadi Yavakuta.*

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