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Research Article

PHARMACEUTICAL AND ANALYTICAL STUDY OF *PINDA TAILA*

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ABSTRACT

Rasashastra and *Bhaishajya Kalpana* is the branch in Ayurveda which deals with herbal and herbo-mineral drugs. The specialized branch which deals with identification, collection, processing, compounding and dispensing of Ayurvedic drugs is called as *Bhaishajya Kalpana. Ayurvedic* Dosage forms are exclusive in their pharmaceutics and therapeutics. *Sneha Kalpana* can be defined as pharmaceutics of medicated *Taila* and *Ghee.* These drugs treat a very wide range of diseases among patients of all age groups. In the context of *Sneha Kalpana, Taila* and *Ghrita* are supposed to undergo the process called *Murchchhana Samskar* through which better therapeutic value can be incorporated into the raw material which enhances its absorption into the biological systems. The *Taila* acts not only as a base or vehicle but also as a class 1 preservative. *Pinda Taila* was prepared using the ingredients *Manjishtha, Sariva, Rala, Madhuchchhishta* and *Tila Taila.* An attempt was made to validate the pharmaceutical preparation of *Pinda Taila.* It was prepared according to the norms of Ayurvedic classical texts. In the present study, detailed pharmaceutical processes and physicochemical evaluation of *Pinda Taila* were carried out. The physicochemical parameters included Specific gravity which was found to be 0.9627, Refractive index 1.488, Iodine value 5.88, Acid value 0.15, Saponification value 233.31, and Peroxide value 7.55. HPTLC evaluation showed variable numbers of spots when visualized in all three wavelengths. However, the chemical constituent could not be identified in the absence of a standard marker compound.

KEYWORDS: *Kashaya Kalpana*, *Sneha Kalpana, Pinda Taila,* Analytical study, HPTLC.

INTRODUCTION

Ayurveda is one of the oldest systems of medicine with its root in India which is called the ancient science of life. In Ayurveda, a healthy state is described as a condition where the *Tri-dosha* (*Vata, Pitta & Kapha*) present in the body and mind are in an equilibrium state. Ayurveda is a holistic and integral system of medicine that treats the person as a whole in combination with body, mind and soul giving importance to prevention and maintenance of health along with curing the disease-promoting longevity of life. The facts regarding health, diseases, maintenance of health and prevention of diseases through positive lifestyle were explained since long back in Ayurvedic classics viz. *Charaka Samhita, Sushruta Samhita*, etc.

Rasashastra and *Bhaishajya Kalpana* is the branch of Ayurveda which deals with herbal and herbo-mineral drugs for therapeutic use. The specialized branch which deals with identification, selection, collection, processing (manufacturing), compounding, and dispensing of Ayurvedic drugs is called *Bhaishajya Kalpana,* the Ayurvedic Pharmaceutics. Safety, efficacy, stability and palatability are the four basic necessities of a good drug dosage form. *Bhaishajya Kalpana* explains various methods of processing a drug to make the drug more palatable, rich with potency, pleasing with good odor, color, etc and long-lasting to improve the shelf life of the preparation. It is based on the concept of *Panchavidha Kashaya Kalpana*[1] the five basic forms of formulations the primary *Kalpana* viz. *Swarasa*, *Kalka, Kwatha*, *Sheeta* or *Hima* and *Phanta* and the Secondary *Kalpanas* viz. *Ksheera Paka*, *Sneha Kalpana*, *Sandhana Kalpana*, *Churna*, *Vati*, *Leha* etc.

Sneha Kalpana includes G*hrita* (Ghee) *Kalpana* and *Taila* (Oil) *Kalpana*.[2] It is a pharmaceutical process to prepare oleaginous medicaments from the *Sneha Dravya* (Oil or Ghee), *Kalka dravya* (Paste), *Drava dravya* (the liquid media) viz. *Kwatha*, *Swarasa*, *Dugdha*, *Takra*, *Gomutra, Kanji*, or Water, etc. *Gandha Dravya* (perfuming agents) are taken in a specific ratio and subjected to a unique heating pattern with a specific duration. The active principles present in the drugs are transferred into the *Sneha* (Ghee or Oil) during the pharmaceutical process. The *Sneha* present in the formulation acts as

both medicine and vehicle for transportation of active principles of the drug to various sites of treatment. *Sneha Kalpana* can be administered through various modes viz. *Pana, Abhyanga, Nasya, Basti, Karna Purana, Tarpana,* etc. as per the ailment and requirement. *Pinda Taila*[3] is a formulation mentioned in *Charaka Samhita Vatashonita Chikitsa.*

AIM AND OBJECTIVES

Aim: The proposed research aimed to perform the Studies on the Standardization of *Pinda Talia*.

Objectives: The present study was carried out with the following objectives.

1. To prepare and standardize *Pinda Taila* according to classical texts under proper SOP and SMP conditions.
2. To carry analytical studies of the above-mentioned preparations.

MATERIAL AND METHODS

All of the crude herbal drugs viz. *Manjishtha, Sariva, Sarjarasa, Madhuchchhishta* and *Tila Taila* were procured from the Market of Jaipur. All the crude herbal drugs were authenticated after the expert identification made by the experts of Dravyaguna Dept., NIA, Jaipur. All the Drugs were also tested analytically and compared with the standards in Ayurvedic Pharmacopoeia of India. All the data were found strictly as per the guidelines of the classical literature.

METHOD

The method followed for the preparation of *Pinda Taila* is reference from *Charaka Samhita Chikitsa Sthana, Vatashonita* chapter no. 29, *Shloka* no. 123. The study samples were prepared in the Laboratories of the department of *Rasashastra* and *Bhaishajya Kalpana*, NIA, Jaipur.

Pharmaceutical Processing

In present study two samples of *Pinda Taila* was prepared as per classical methods.

Table 1: Ingredients and their quantity used in Sample A & B

S.No.	Ingredients	English Name/ Botanical source	Part used	Ratio	Quantity
Kalka Dravya					
1.	*Manjishtha*	*Rubia cordifolia* Linn.	Root	1/4th Part	50g
2.	*Sariva*	*Hemidesmus indicus* R.Br.	Root	1/4th Part	50g
3.	*Sarjarasa*	*Vateria indica* Linn.	Resin	1/4th Part	50g
4.	*Madhuchchhishta*	Bees wax	Wax	1/4th Part	50g
Sneha Dravya					
5.	*Tila Taila*	*Sesamum indicum* Linn.	Oil	4 Part	800ml
Drava Dravya					
6.	*Jala*	Water	----	16 Part	3200ml

Procedure

- Pure raw material were weighted and procured.
- Raw material was properly dried and *Yavakuta* (coarse powder) was done.
- *Kalka* was prepared with help of water and bolus was prepared.
- Measured *Tila Taila* was taken in clean steel vessel and heat for a while.
- *Kalka dravya* (*Manjishtha, Sariva*, *Rala)* added into previously heated *Taila* (below95^{0}C) and heated over mild heat (below 95^{0}C).
- Then prescribed quantity of RO water was added into it.
- *Snehapaka* was continued until *Sneha Siddhi Lakshana* was obtained.
- Material was filtered with cotton cloth immediately (in warm state).
- After that beeswax was added in oil with continuous stirring till dissolved properly and again filtered through cotton cloth.
- Finally, smooth *Pinda Taila* with butter like consistency was obtained.
- Prepared *Pinda Taila* was stored in well closed and clean container.
- Finally, 750g & 700g *Pinda Taila* is obtained.

Note:

A. *Sarjarasa* should be added into *Taila* with *Kalka dravya*.

B. Bees wax should be added into *Taila* after *Sneha Siddhi Lakshanas* are obtained

C. Continuous stirring should be done until it gets butter like consistency.

Table 2: Comparative Observations of Two Batches of *Pinda Taila*

Observations	**Duration (min./hr.)**	
	Sample A	**Sample B**
Temperature observed when *Taila* was free of moisture	59-63	60-64
Temperature at the time of addition of *Kalka*	78-22	79-83
Temperature at the time of addition of *Drava*	60-62	62-64
Temperature observed after heating 30 min	70-73	71-74
Average Temp. obtained during *Taila paka*	85-90	88-93
Temp at which separation of *Taila* from *Kalka* occurs	86-88	87-90
Temp. obtained at the time of *Phenodgama* stage	95-98	96-99
Temp. obtained at the time of *Mridupaka* stage	85-88	87-90
Temp. obtained at the time of *Madhyampaka* stage	93-97	94-98
Temp. obtained at the time of filtration	72-78	72-80

Temperature was in between 93 to 98 at the time of *Madhyampaka* stage**.**

Table 3: Comparative observations of two batches of *Pinda Taila*

Observations	**Duration (Time)**	
	Sample A	**Sample B**
Total time required for the moisture free condition (Hrs)	10.00	8.00
Kalka added at (Min)	14.60	15.00
Drava dravya added at(Min)	20.00	22.00
Separation of *Taila* from *Kalka* (hrs)	6.00	5.10
Phenodgama (hrs)	9.45	7.45
Mridupaka stage observed (hrs)	8.00	6.00
Madhyamapaka stage observed(hrs)	9.00	7.00
Filtration start (hrs)	11.00	9.00
Addition of *Madhuchchhishta* (hrs)	11.15	9.15
Melting time of *Madhuchchhishta* (min.)	10.00	9.30
Consistency obtained (hrs)	12.30	11.00
Total hours of *Taila paka*	12.30	10.30
Total days required for *Taila paka*	2	2

It was observed that, total time required for the moisture-free condition, *Kalka* and Liquid media and *Madhuchchhishta* addition time for obtaining proper consistency.

Table 4: Comparative organoleptic characters of *Pinda Taila*

S.No.	**Organoleptic characters**	**Sample A**	**Sample B**
1.	Colour	Dark Reddish Brown	Dark Reddish Brown
2.	Odour	Pleasant	Pleasant
3.	Consistency	Butter like	Homogeneous liquid
4.	Touch	Smooth	Smooth
5.	Other character	Free from any kind of stain when applied to skin	Free from any kind of stain when applied to skin

Colour of sample A & B were reddish due to *Manjishtha*. Consistency of two samples was semi solid like butter.

Table 5: Comparative percentage loss in two batches

Samples	Sample A	Sample B
% Yield	750 Ml	700 Ml
% loss	6.25	12.50

Average 6 to 12.5% loss was observed. This may be due to more absorbance of oil in residual *Kalka*.

Analytical Study

Organoleptic evaluation of a drug refers to the evaluation by colour, Odour, taste and special features including touch, texture, etc. with the help of *Gyanendriya* (sense organs). The obtained results for the samples are shown in the tables below.

Table 6: Showing Organoleptic characters of *Pinda Taila* A & B

S.No.	Organoleptic Parameters	*Pinda Taila* - A	*Pinda Taila* - B
1	Colour (*Rupa*)	Dark Reddish Brown	Dark Reddish Brown
2	Touch (Sparsha)	Greasy	Greasy
3	Odour (*Gandha*)	Aromatic	Aromatic
4	Consistency	Liquid	Liquid
5	Texture	Smooth	Smooth

Table 7: Showing the Analytical Parameter of *Pinda Taila*

S.No.	Organoleptic Parameters	*Pinda Taila*
1	Colour (*Rupa*)	Dark Reddish Brown
2	Touch (*Sparsha*)	Greasy
3	Odour (*Gandha*)	Aromatic
4	Consistency	Liquid
5	Texture	Smooth
6	Specific gravity[4]	0.9627
7	Refractive Index[5]	1.488
8	Iodine Value[6]	5.88
9	Acid Value[7]	0.15
10	Saponification Value[8]	233.31
11	Peroxide Value[9]	7.55
12	**Heavy Metals**	
	Lead	0.22
	Cadmium	BLQ(LOQ 0.1)
	Arsenic	BLQ(LOQ 0.1)
	Mercury	0.44
13	**Microbiological Analysis**	
	Total Bacterial Count	Cfu/g <10
	Total Fungal Count	Cfu/g <10
14	HPTLC[10]	UV254-15,14,16peaks UV366-16,15,19peaks UV510-15,17,19peaks

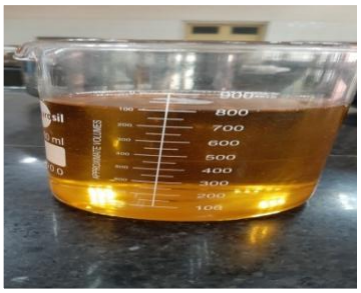
Fig.No.1: *Pinda Taila* Ingredients & Preparation

Sariva

Manjishtha

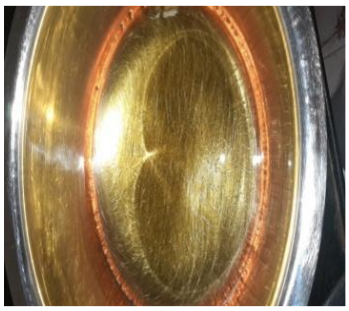
Sariaras

Bees Wax



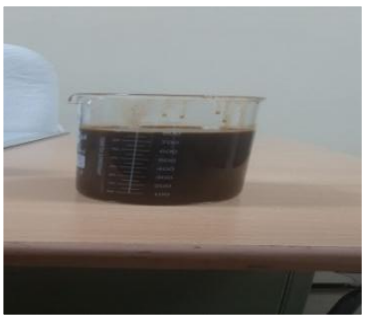
Tila Taila

Bolus of *Kalka*



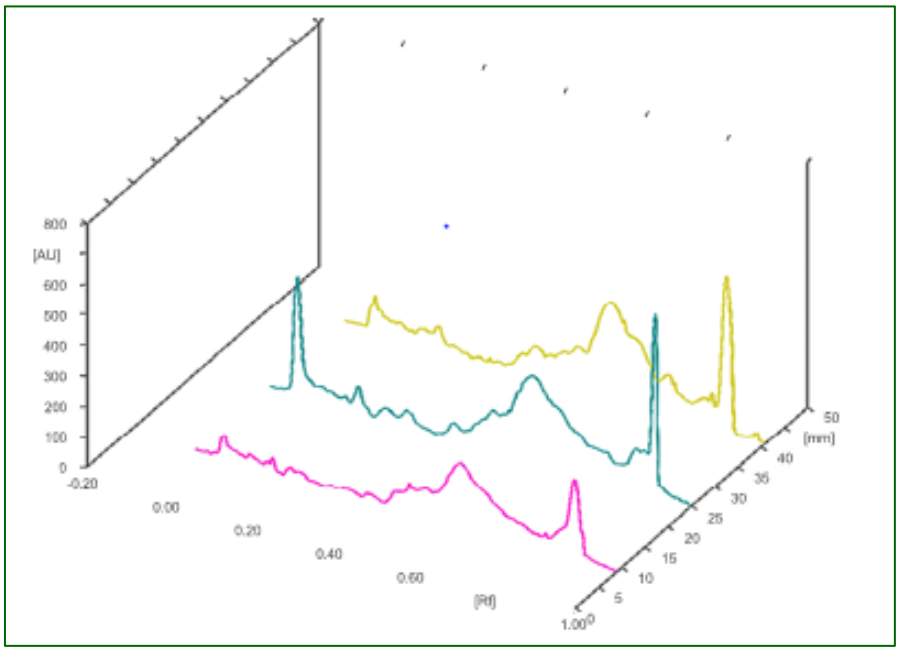
Hot *Tila Taila*

Phenodgam* in *Taila



Taila Pinda Taila

Fig.2 HPTLC Finger Print Analysis of *Pinda taila*: All tracks at 254nm

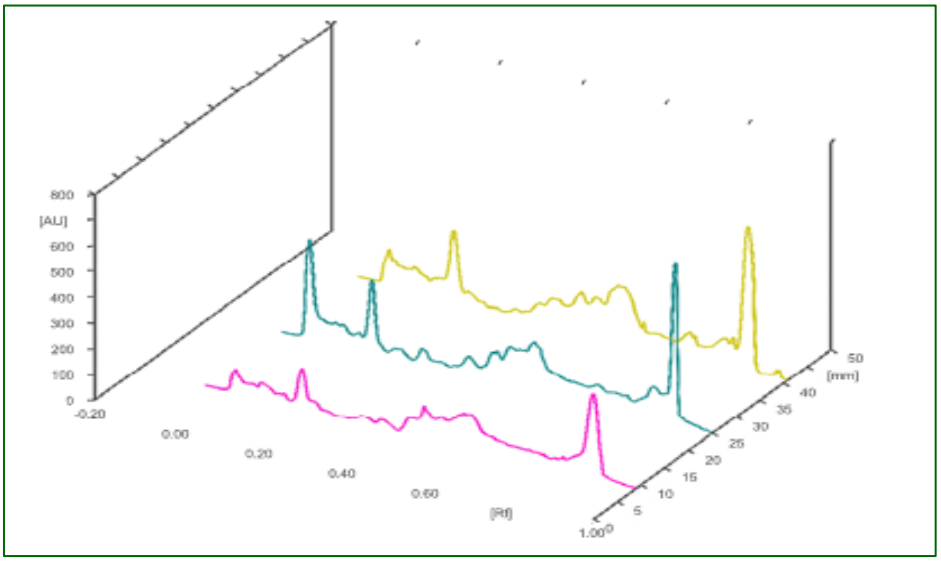


Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assignedsubstance
1	0.01	8.5	0.04	75.9	7.16	0.06	32.2	1725.8	3.83	unknown*
2	0.09	20.7	0.10	35.6	3.36	0.13	18.7	919.8	2.04	unknown*
3	0.13	16.2	0.14	29.7	2.81	0.15	24.9	376.0	0.84	unknown*
4	0.15	25.8	0.15	46.5	4.39	0.17	4.6	481.0	1.07	unknown*
5	0.18	2.3	0.20	32.3	3.05	0.21	20.3	590.1	1.31	unknown*
6	0.21	20.7	0.22	26.7	2.52	0.24	5.4	586.3	1.30	unknown*
7	0.28	0.4	0.30	12.0	1.14	0.30	5.9	128.8	0.29	unknown*
8	0.32	10.3	0.34	14.0	1.32	0.37	0.4	366.0	0.81	unknown*
9	0.37	3.0	0.39	17.2	1.63	0.42	0.1	453.6	1.01	unknown*
10	0.43	0.5	0.49	91.0	8.59	0.51	73.1	3580.2	7.95	unknown*
11	0.51	73.3	0.53	92.3	8.71	0.54	80.6	2759.7	6.13	unknown*
12	0.55	81.0	0.62	206.6	19.49	0.71	88.2	20727.5	46.03	unknown*
13	0.76	61.4	0.76	65.0	6.14	0.79	43.2	1896.1	4.21	unknown*
14	0.81	39.6	0.82	55.3	5.22	0.83	41.9	902.4	2.00	unknown*
15	0.83	42.1	0.90	259.5	24.49	0.96	6.1	9533.9	21.17	unknown*

Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assignedsubstance
1	-0.00	4.2	0.03	382.7	19.14	0.07	43.1	8194.5	11.32	unknown*
2	0.08	43.9	0.09	48.9	2.45	0.11	37.2	1109.1	1.53	unknown*
3	0.11	37.4	0.11	41.3	2.06	0.13	29.2	791.1	1.09	unknown*
4	0.14	28.4	0.15	38.3	1.91	0.16	21.8	688.1	0.95	unknown*
5	0.16	21.8	0.18	83.8	4.19	0.22	0.1	1805.7	2.49	unknown*
6	0.22	0.2	0.25	38.7	1.94	0.28	20.3	1304.2	1.80	unknown*
7	0.28	20.7	0.30	50.2	2.51	0.34	9.5	1635.4	2.26	unknown*
8	0.39	6.3	0.42	55.4	2.77	0.44	35.3	1661.9	2.30	unknown*
9	0.47	74.4	0.51	131.9	6.60	0.53	122.2	5427.9	7.50	unknown*
10	0.55	143.7	0.61	280.8	14.04	0.75	102.8	34303.3	47.38	unknown*
11	0.78	97.1	0.79	100.1	5.01	0.81	70.6	2321.3	3.21	unknown*
12	0.83	73.3	0.87	139.4	6.97	0.87	129.6	4571.0	6.31	unknown*
13	0.89	132.2	0.91	594.2	29.72	0.95	13.8	8418.6	11.63	unknown*
14	0.96	10.6	0.96	14.0	0.70	0.98	3.7	173.4	0.24	unknown*

Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assignedsubstance
1	0.02	1.2	0.04	114.8	5.97	0.06	48.1	2611.5	3.47	unknown*
2	0.09	37.5	0.10	47.7	2.48	0.11	29.9	813.9	1.08	unknown*
3	0.14	25.4	0.16	48.3	2.51	0.17	40.7	1308.5	1.74	unknown*
4	0.18	43.4	0.20	70.6	3.67	0.22	17.5	1514.1	2.01	unknown*
5	0.22	17.6	0.23	23.6	1.23	0.26	6.4	511.0	0.68	unknown*
6	0.31	3.9	0.32	17.6	0.91	0.33	5.4	127.5	0.17	unknown*
7	0.36	6.9	0.40	63.7	3.31	0.41	61.5	1526.4	2.03	unknown*
8	0.41	61.5	0.43	98.6	5.13	0.46	74.2	3618.5	4.81	unknown*
9	0.48	82.3	0.50	109.2	5.67	0.51	105.8	2875.1	3.82	unknown*
10	0.51	105.5	0.54	136.9	7.12	0.56	123.5	5013.4	6.67	unknown*
11	0.56	124.5	0.62	317.2	16.49	0.73	106.8	33332.3	44.33	unknown*
12	0.74	100.9	0.76	131.4	6.83	0.80	66.4	6194.6	8.24	unknown*
13	0.83	75.4	0.85	93.6	4.87	0.86	85.8	2078.3	2.76	unknown*
14	0.86	86.1	0.87	114.8	5.96	0.87	72.4	1339.9	1.78	unknown*
15	0.88	72.9	0.90	509.1	26.46	0.93	0.1	11963.8	15.91	unknown*
16	0.95	1.4	0.98	26.9	1.40	0.99	4.5	369.5	0.49	unknown*

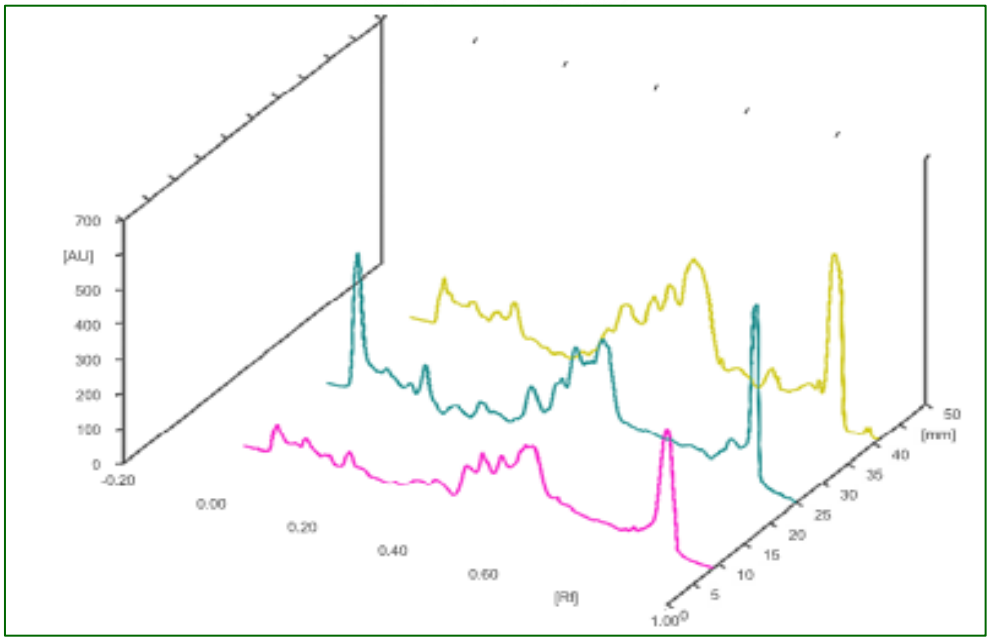
Fig.3 HPTLC Finger Print Analysis of *Pinda taila*: All tracks at 366nm



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assignedsubstance
1	0.01	1.9	0.04	91.9	6.43	0.06	44.9	2249.4	5.53	unknown*
2	0.09	41.4	0.10	63.1	4.42	0.13	30.9	1974.5	4.85	unknown*
3	0.15	34.0	0.15	41.4	2.90	0.16	21.5	530.1	1.30	unknown*
4	0.17	19.8	0.20	156.3	10.93	0.22	36.9	3570.4	8.78	unknown*
5	0.22	37.1	0.23	39.7	2.78	0.25	13.1	638.3	1.57	unknown*
6	0.25	13.4	0.25	14.8	1.04	0.27	4.4	233.4	0.57	unknown*
7	0.30	2.8	0.35	25.6	1.79	0.37	10.9	904.3	2.22	unknown*
8	0.37	11.3	0.39	29.6	2.07	0.42	0.2	834.1	2.05	unknown*
9	0.43	0.4	0.46	64.6	4.52	0.47	62.1	1672.0	4.11	unknown*
10	0.47	62.3	0.49	121.4	8.49	0.51	79.1	3450.3	8.48	unknown*
11	0.52	79.1	0.53	96.0	6.72	0.54	84.9	2204.5	5.42	unknown*
12	0.54	85.0	0.59	130.1	9.10	0.59	125.8	4463.1	10.97	unknown*
13	0.59	126.0	0.60	132.0	9.23	0.64	61.8	4586.0	11.28	unknown*
14	0.75	41.6	0.76	44.6	3.12	0.79	33.2	1437.9	3.54	unknown*
15	0.81	36.9	0.82	52.9	3.70	0.83	44.1	834.7	2.05	unknown*
16	0.83	44.1	0.90	325.5	22.77	0.95	5.3	11091.1	27.27	unknown*

Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assignedsubstance
1	-0.00	0.9	0.03	383.4	15.79	0.07	74.2	8884.3	14.78	unknown*
2	0.11	77.3	0.11	83.3	3.43	0.13	53.1	1814.5	3.02	unknown*
3	0.14	53.4	0.15	68.4	2.82	0.16	54.4	1274.5	2.12	unknown*
4	0.16	54.4	0.18	281.6	11.60	0.22	19.9	5491.7	9.14	unknown*
5	0.22	20.2	0.25	42.9	1.77	0.28	13.3	1654.2	2.75	unknown*
6	0.28	13.6	0.30	66.1	2.72	0.33	29.4	1710.0	2.84	unknown*
7	0.33	29.0	0.34	33.0	1.36	0.36	21.7	810.7	1.35	unknown*
8	0.39	28.9	0.41	80.2	3.30	0.44	44.4	2787.4	4.64	unknown*
9	0.45	56.0	0.48	123.5	5.09	0.49	98.8	3705.7	6.16	unknown*
10	0.50	99.7	0.51	154.5	6.37	0.53	144.4	4132.3	6.87	unknown*
11	0.55	150.5	0.57	194.8	8.02	0.62	88.7	8429.1	14.02	unknown*
12	0.70	66.9	0.73	84.7	3.49	0.75	63.5	3063.9	5.10	unknown*
13	0.78	66.3	0.79	70.5	2.90	0.81	53.1	1525.3	2.54	unknown*
14	0.81	53.3	0.86	127.8	5.26	0.88	107.0	5307.7	8.83	unknown*
15	0.89	112.7	0.91	633.0	26.07	0.95	16.5	9521.2	15.84	unknown*

Fig.4 HPTLC Finger Print Analysis of *Pinda taila*: All tracks at 510nm



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assignedsubstance
1	0.01	1.7	0.04	90.3	5.27	0.06	40.2	2116.7	4.13	unknown*
2	0.09	39.7	0.10	68.4	3.99	0.13	27.1	1915.1	3.74	unknown*
3	0.13	27.7	0.15	37.9	2.21	0.17	13.2	919.5	1.79	unknown*
4	0.17	13.2	0.20	60.8	3.55	0.24	7.0	1886.3	3.68	unknown*
5	0.29	3.2	0.30	11.1	0.65	0.30	4.1	92.4	0.18	unknown*
6	0.31	4.2	0.35	31.5	1.84	0.35	30.7	807.4	1.58	unknown*
7	0.37	25.3	0.39	47.3	2.76	0.42	13.1	1609.4	3.14	unknown*
8	0.43	13.2	0.46	112.2	6.55	0.47	97.3	3164.3	6.17	unknown*
9	0.47	97.9	0.49	157.0	9.16	0.51	108.4	4352.0	8.49	unknown*
10	0.51	108.6	0.53	163.5	9.54	0.55	137.4	4511.5	8.80	unknown*
11	0.55	137.9	0.59	211.0	12.31	0.59	207.3	6395.1	12.48	unknown*
12	0.59	207.5	0.60	215.5	12.58	0.64	78.1	6857.8	13.38	unknown*
13	0.65	78.4	0.66	82.9	4.84	0.70	55.3	2986.6	5.83	unknown*
14	0.81	41.7	0.82	56.5	3.30	0.83	48.7	915.4	1.79	unknown*
15	0.83	48.7	0.90	367.8	21.46	0.95	2.7	12723.3	24.82	unknown*

Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assignedsubstance
1	-0.01	0.2	0.03	394.4	14.07	0.07	68.4	9264.6	11.22	unknown*
2	0.08	69.0	0.10	84.2	3.00	0.13	42.7	2907.4	3.52	unknown*
3	0.13	42.8	0.15	60.5	2.16	0.16	36.3	1160.4	1.41	unknown*
4	0.16	36.4	0.18	124.2	4.43	0.22	0.8	2589.0	3.14	unknown*
5	0.22	0.9	0.25	30.8	1.10	0.28	10.0	981.4	1.19	unknown*
6	0.28	10.2	0.30	59.9	2.14	0.32	39.0	1583.8	1.92	unknown*
7	0.32	39.2	0.33	42.8	1.53	0.36	25.6	1339.9	1.62	unknown*
8	0.39	40.6	0.42	142.3	5.08	0.44	77.9	4922.1	5.96	unknown*
9	0.44	78.7	0.48	187.4	6.68	0.49	164.9	6084.8	7.37	unknown*
10	0.49	166.0	0.51	284.5	10.15	0.53	240.8	7841.5	9.50	unknown*
11	0.54	249.4	0.57	327.4	11.68	0.62	107.9	15989.1	19.37	unknown*
12	0.62	108.2	0.63	110.2	3.93	0.65	96.7	2708.0	3.28	unknown*
13	0.66	97.3	0.67	102.2	3.64	0.71	89.0	3841.5	4.65	unknown*
14	0.71	87.8	0.72	91.8	3.27	0.75	79.7	2491.0	3.02	unknown*
15	0.78	81.2	0.79	83.7	2.99	0.81	66.9	1998.1	2.42	unknown*
16	0.81	67.3	0.86	136.9	4.88	0.87	116.6	5829.5	7.06	unknown*
17	0.88	116.6	0.91	540.8	19.29	0.95	13.8	11024.9	13.35	unknown*

Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assignedsubstance
1	0.01	0.1	0.04	142.4	4.99	0.06	75.2	3472.1	3.61	unknown*
2	0.08	70.8	0.10	95.8	3.35	0.12	55.1	2913.8	3.03	unknown*
3	0.14	48.4	0.16	80.2	2.81	0.17	68.8	1863.4	1.94	unknown*
4	0.17	64.4	0.20	121.1	4.24	0.22	25.7	3104.0	3.22	unknown*
5	0.22	25.8	0.23	31.6	1.11	0.26	13.1	756.7	0.79	unknown*
6	0.26	13.1	0.27	15.5	0.54	0.28	4.5	207.2	0.22	unknown*
7	0.33	8.5	0.35	30.8	1.08	0.36	25.9	653.8	0.68	unknown*
8	0.36	26.6	0.40	115.3	4.04	0.41	111.2	3153.1	3.28	unknown*
9	0.41	111.4	0.44	197.7	6.92	0.48	151.5	9388.4	9.75	unknown*
10	0.48	151.6	0.50	245.5	8.59	0.52	205.6	7642.6	7.94	unknown*
11	0.52	206.8	0.54	290.7	10.18	0.56	235.3	9263.9	9.62	unknown*
12	0.56	235.8	0.59	381.8	13.36	0.65	98.3	22364.0	23.23	unknown*
13	0.65	101.4	0.65	116.5	4.08	0.67	84.2	1518.7	1.58	unknown*
14	0.67	84.6	0.69	99.7	3.49	0.73	61.2	4776.5	4.96	unknown*
15	0.73	61.3	0.76	125.1	4.38	0.78	71.3	4166.2	4.33	unknown*
16	0.80	72.8	0.85	111.4	3.90	0.86	99.3	4908.7	5.10	unknown*
17	0.86	100.7	0.87	126.6	4.43	0.87	94.4	1347.0	1.40	unknown*
18	0.87	94.5	0.90	499.8	17.50	0.93	0.2	14400.4	14.96	unknown*
19	0.95	1.7	0.98	29.2	1.02	0.99	4.2	365.8	0.38	unknown*

RESULTS AND DISCUSSION

There is a lot of hue and cry about the manufacturing procedures for the preparation of Ayurvedic formulations. Confusion exists on the method of preparation of different dosage forms. It should be noted that Ayurvedic formulations were never prepared in the initial days for commercial purposes. Changes in the formulation were introduced by the physician himself for the benefit of the patients. This is why specific formulations will be effective in specific conditions. It may not have a similar effect in other conditions.

The need of the scenario is to develop Standard Methods of Preparation (SMP) for different categories of Ayurvedic formulations. To introduce SMP, each step of the process or each unit operation is considered as independent itself. So each step is to be validated. And it is an international norm and rule

that the validation system should be thoroughly documented. That is the only proof of validation.

For the current study, it was planned to standardize the *Pinda Taila* prepared. Reference of *Pinda Taila* was found in nine classical texts. It was also found included in AFI. In AFI, a reference of *Ashtanga Hridaya* has been taken. A total of five methods of *Pinda Taila* were found in these texts after excluding the same methods. The method of preparation was the same but some difference was observed in ingredients in every method of *Pinda Taila*.

Pinda Taila- Sample A & B (First Method): *Pinda Taila* is found first in *Charaka Samhita* in the treatment of *Vatarakta*. Hence, it was taken as a basic method. Here, *Manjishtha, Sariva, Sarjarasa* and *Madhuchchhishta* were taken as *Kalka Dravya, Tila Taila* as base and water as a liquid media. The same method was followed by *Chakradatta*, *Yogaratnakara* and *Bhaishajya Ratnavali.* In *Chakradatta*, liquid media is not described, but as per *Anukta Paribhasha* of *Sneha Paka*, water was taken as a liquid media. The ingredients of the formulation were in the ratio of 1:4:16 of *Kalka: Taila: Water.* All ingredients of *Kalka* (Four ingredients) were in equal quantity (1/4th of *Taila* each).

The herbal raw materials, *Manjishtha, Sariva, Madhuchchhishta, Sarja Rasa* and *Tila Taila* were purchased from the local market of Jaipur. The dried raw drugs were fragmented in the mixer grinder and then they were sieved with sieve no.60.

Pharmaceutical procedures were the same for all the samples. *Kalka Dravya* was taken in *Yavakuta* (Coarse Powder) form. Physical impurities were removed from raw material. The raw material was properly dried and *Yavakuta* (coarse powder) was done. An equal quantity of water was added to a coarse powder (#60) of *Kalka* to form a bolus of *Kalka.* By this, the surface area of *Kalka* that comes in contact with *Taila* was reduced so *Kalka* didn't burn. The use of fine powder in *Kalka* reduces the final yield of the *Taila* as it absorbs more quantity of *Taila* and passes through the sieve while filtering and increases the turbidity of *Siddha Taila*. This may result in rancidity and decrease the shelf life of *Siddha Taila*. Hence, dry ingredients were powdered and passed through sieve 60.

Pinda Taila was prepared with *Tila Taila.* It was heated till it became moisture-free over a mild flame. After the removal of moisture, the color of *Taila* became darker because of the shifting of chemical bonds due to thermal power. During this period, a popping sound was perceived along with slight bubbling. The popping noise denoted the water leaving the *Sneha*. After it became moisture-free, increments of *Kalka* were added to the oil. Mild frothing was observed during the addition of *Kalka*. The bubbling in *Taila* was because of the water inside the *Kalka Dravya* being rapidly vaporized when in contact with the very hot *Taila*. Water is heavier than *Taila* and so it sank to the bottom and then boiled. The steam hence produced made bubbles rise to the surface which can splash the hot *Sneha*. The mixture of *Taila* and *Kalka* became thicker in consistency due to the amount of fine *Kalka*.

The *Kalka* was made into bolus to decrease the surface area which came in direct contact with hot *Taila.* The bolus of *Kalka* was added when the temperature reduced to 70-80 0C to prevent the burning of *Kalka* and induce maximum extraction of active principles. During the addition of *Kalka,* foaming occurred. The foaming is a result of two simultaneous occurrences i.e., the colder surface of the *Kalka* being fried and the amount of liquid in the *Kalka* bolus. The liquid i.e. water instantly turned into steam and was briefly trapped in the *Sneha* which gave a quick big rise in the *Sneha* level. This may lead to the overflowing of the contents. Hence, vessels of appropriate size were used. The contents were well stirred to ensure equal dissipation of heat. The Liquid media was added after that and *Paka* was continued. As the *Paka* came to a boil, the smell of *Kalka Dravya* was perceived. Excessive frothing occurred during preparation. *Phenodgama* occurred due to the presence of unsaturated fatty acids in *Taila*.

The *Taila* was heated till the *Paka Lakshanas* were obtained. Boiling causes several oxidative and thermal reactions bringing about a change in the physicochemical, nutritional and therapeutic properties of the *Sneha*. During the preparation of *Pinda Taila*, Bee wax was added after filtration of oil because it mainly increases the consistency of oil.

The temperature was maintained at around 95°C during this stage. *Kalka* was examined at regular intervals. *Mridu Paka* stage was observed after boiling it for 8 hours. At this stage, *Taila* was free from moisture, but *Kalka* was too soft, indicating the possibility of some moisture content in *Kalka*. After boiling for some more time, *Madhyama Paka* was observed. The consistency of *Kalka* became a little harder and was able to roll into a *Varti*. *Madhyama Paka* of *Siddha Sneha* was done to extract maximum active chemical constituents. *Khara Paka* though has been advised for external application, was not done as, there are chances for charring of *Kalka* leading to undesirable odor and may hamper the therapeutic efficacy of the drug. The consistency of *Kalka* became soft and *Kalka* could be separated from the ladle after *Sneha Siddhi Lakshanas* were attained.

The *Siddha Taila* was filtered in hot condition to get maximum yield. *Taila* was filtered without squeezing to avoid the addition of moisture content from *Kalka*. The smell of *Kalka Dravya* was perceived from the *Taila*.

The analytical study was carried out to know the particular chemical configuration of the raw and final product and to point out the physicochemical changes and effects of different *Samaskaras* during the pharmaceutical processing. The colors of sample A & B were reddish. The reddish color was due to *Manjishtha*, as it was. The consistency of the two samples was semi-solid like butter.

This study aimed to lay down quality parameters for *Pinda Taila* prepared. Keeping this in mind each process was standardized and analysed step by step. Detailed analysis of the finished product of *Pinda Taila* was carried out in terms of Organoleptic, physicochemical analysis, HPTLC profile.

The Iodine value of an oil or fat is the weight of Iodine absorbed by 100 parts by the weight of the sample. It indicates the degree of unsaturation. A greater degree of unsaturation indicates the possibility of the oil becoming rancid due to atmospheric oxidation. Increased iodine value signifies increased unsaponifiable matter, more unstable with ore tendencies to rancidity.

Acid value can be defined as the number of milligrams of potassium hydroxide required to neutralize the free fatty acids present in 1gm of sample of *Taila*. Saponification value can be defined as the number of milligrams of potassium hydroxide required to neutralize the fatty acids which result from complete hydrolysis of 1gm of the sample of *Taila*. Generally, rancidity results in free fatty acid liberation; hence acid value along with saponification value is used as marker of rancid state. Low saponification value of long-chain fatty acids found in fats is due to fewer number of carboxylic functional groups per unit mass of the fat as compared to short-chain fatty acids. High saponification values of fats and oils are due to the predominantly high proportion of shorter carbon chain lengths of the fatty acids. Shorter chain fatty acids (high saponification value) have a faster rate of absorption than longer chain fatty acids. It points out that the absorption of *Pinda Taila* may be quicker than *Tila Taila*.

Lipid oxidation is a main deteriorative process that has an important implication in stipulations of the quality and value of fats and oils, particularly concerning the off-flavors that develop as an outcome of autoxidation. Oxidative stability of oils is the resistance to oxidation during processing and storage. The primary oxidation products that develop in triacylglycerol are hydro-peroxides May later break down to produce lower molecular weight compounds, such as free fatty acids, alcohols, aldehydes, and ketones, eventually leading to a rancid product *Pinda Taila* samples indicate a more stable form after *Sneha Paka* process.

In the HPTLC profile, variable numbers of spots were found. In short UV (254nm), 15, 14 and 16 peaks were observed in *the Pinda Taila* sample in tracks 1, 2 and 3 respectively. At 366nm 16, 15 and 19 peaks were observed in tracks 1, 2 and 3 respectively. At 510nm 15, 17 and 19 peaks were observed in track 1, 2 and 3 respectively. In all three wavelengths, few similar peaks having maximum area were found. However, the chemical constituent could not be identified in the absence of a standard marker compound.

There was a significant difference in the degree of unsaturation reflected by Iodine value and saponification reflected by saponification value among samples prepared from *Sesame oil*.

Analytical parameters Refractive index, Acid value, Iodine value and Saponification values of the sample were less than its base *Taila* (*Tila*) This suggests the significance of the process of *Snehapaka*. This supports the possibility of several chemical interactions among secondary, tertiary derivatives of fat media along with derivatives of formulation ingredients and their complexes like oxidation, peroxidation, rancification, hydrolysis, saturation, unsaturation, autolysis, saponification and intermittent formation-deformation of chains of fatty acids into short and long chains, esterification and degradation into several derivatives of fats as mentioned above. Thus, *Snehapaka* is not merely a process of extraction but it is unique Ayurvedic pharmaceutical processing and *Siddha Sneha* is not merely a fat-soluble extract but a unique Ayurvedic dosage form with unbeatable therapeutic potentials as it is widely practiced clinically and described in classics. It is applicable through all classical routes of administration.

CONCLUSION

Pinda Taila was found described first in *Charaka Samhita Chikitsa Sthana* (29/123) for external application in the management of *Vatarakta / Vatashonita*. Later it was found described in nine different classics. Total five methods of its preparation are mentioned with slight modifications in ingredients their proportion or type of *Sneha*. In all the methods, the standard ratio of ingredients, i.e., 1:4:16 for *Kalka: Taila*: Liquid media was followed. *Manjishtha, Sariva*, *Sarjarasa* and *Madhuchchhhishta* are commonly used as *Kalka Dravya*, while *Tila Taila*

is used as *Sneha Drava* and water was used as liquid media.

Pharmaceutically, the adopted method for the preparation of *Pinda Taila* can be considered as standard. Total Two samples were prepared classical method. Average 87.5 to 93.75% yield (12.5 to 6.25% losses) of *Pinda Taila* prepared by two methods was obtained on processing 800g of *Tila* with 200g of *Kalka Dravya*. The consistency of all samples was semi-solid like butter.

Despite similar formulation ingredients, there was a significant change in color of prepared *Pinda Taila* with the change of *Sneha dravya*, i.e., *Tila taila.* There are more than15 dissimilar peaks among all formulation ingredients as that of similar peaks (only three). There is a significant change in percent extraction of formulation ingredients with the change of *Sneha dravya* i.e. more extraction while preparing *Pinda Taila*. In HPTLC fingerprint analysis of *Pinda Taila*, in all three wavelengths, few similar peaks having maximum area were found. However, the chemical constituent could not be identified in the absence of a standard marker compound.

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