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PHARMACEUTICO ANALYTICAL STUDY OF MANJISHTADI ADITYAPAKA TAILA

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ABSTRACT

Standardisation of Ayurvedic drugs is vital for its identity, purity and for their global acceptance. Moreover, people in today's world are more concerned about the drug standards to assure safe and efficacious medicines. *Manjishtadi adityapaka taila* is an Ayurvedic oil preparation mentioned in *Chakradatta Kushtadhikara* for the management of *pama kushta*. The *yogam* is unique by its *Adityapaka* or *Suryatapi* method of preparation. But *Acharya* has not specified the duration required for *tailapaka*. So, the present study was undertaken to standardise the number of days required for *taila paka* as well as the formulation *Manjishtadi adityapaka taila*. In the study, two batches of *Manjishtadi adityapaka taila* were prepared by giving 7 days and 14 days of exposure to sunlight and all the batches were subjected for analysis as per the parameters given by API. On the basis of obtained parameter values, *Manjishtadi adityapaka taila* prepared in 14 days duration can be taken as a better one. The developed analytical profile can be used to determine the quality and safety of *Manjishtadi adityapaka taila* available in the market.

Keywords: *Manjishtadi adityapaka taila, Suryatapi*, Analytical parameters, Standardisation

INTRODUCTION

The Ayurvedic system of medicine is prevalent in India since the Vedic period and many formulations are being prepared from plants, animal products, metals and minerals for treating various illnesses. Medicines are available in different dosage forms such as *kashaya, churna, gutika, taila, ghrtha, avaleha, arishta* etc. and each one differs in its method of preparation, properties and shelf life. But a major issue faced by the practitioners of this system is a lack of standardisation of formulations, as a result of which variations may exist in the same medicine prepared by different pharmaceutical companies. According to WHO, it is vital to implement measures to regulate herbal medicines to assure quality control of herbal products using current analytical techniques, appropriate standards, and good manufacturing practices[1].

Sneha kalpana is a pharmaceutical process to prepare oleaginous medicaments from the substances like *kalka, sneha, kwatha* or any other *dravadravya* like milk, self-expressed juice, meat juice, curd etc taken in specific proportion and by subjecting them to unique heating pattern and duration to fulfil certain pharmaceutical parameters, according to the need of therapeutics. When *taila* is used as *sneha dravya*, it is called *taila kalpana*. For the preparation of *taila kalpana*, generally two methods are found in classics, *Agnitaapi* method (*paka* with fire) and *Suryatapi* method (*paka* with sunrays). Agnitapi method of taila preparation is detailed in the classical texts of Ayurveda like *Sarngadhara samhitha*[2]. But we cannot find a detailed description on *Suryatapi tailapaka* method in the classics.

Manjishtadi adityapaka taila is a herbomineral *taila yoga* mentioned in *Chakradatta Kushtadhikara* for treating *pama kushta*. The ingredients of the formulation are *manjishta, triphala, laksha, haridra, gandhaka, haratala, manasila* and *tila taila*. *Acharya* has advised preparing the *taila* in *adityapaka* or *suryatapi* method[3]. To develop an analytical profile for the *taila* was found necessary as it is used in the management of skin disease, a low quality of it may influence the disease badly.

While describing the *yoga*, *Acharya* makes no mention of the duration up to which the *taila* should be exposed to sunlight or any other *siddha lakshana*. So, there is a need to standardise the process and to fix the duration of *taila* preparation. In some other *adityapaka yogas* like *adityapaka ghrtha*[4]*, kuranda nasana ghrtha*[5] etc. the duration is specified as 7 days and in the description of *erasa taila*[6] the duration told is 14 days. So in the present study an attempt was made to standardise the process by fixing the duration of exposure to sunlight as 7 days or 14 days and to develop an analytical profile for the same according to the specifications given by Ayurvedic Pharmacopoeia of India for fixing the duration.

OBJECTIVES OF STUDY

To standardise the process and to develop analytical profile for *Manjishtadi adityapaka taila* prepared with 7 days and 14 days of exposure to sunlight as per the specifications given by Ayurvedic Pharmacopoeia of India.

MATERIALS AND METHODS

Collection and identification of the raw drugs

The raw drugs *manjishta, triphala, laksha, haridra, gandhaka, haratala* and *manasila* were purchased from authentic source. Macroscopic and microscopic identification of herbal raw drugs was done at Department of Dravyaguna vinjana, Government ayurveda College, Tripunithura and Physico chemical parameters were analysed at Analytical laboratory, Department of Rasashastra and Bhaishajya Kalpana, Government ayurveda College, Tripunithura.

AGMARK standard *tila taila* was collected from market and tested at Sreedhariya Farmherbs pvt. Ltd. Koothattukulam.

XRD was done at Sophisticated Test and Instrumentation Centre, CUSAT for the identification and quality determination of mineral drugs.

Pharmaceutical study

The *taila* was prepared in the Department of Rasashastra and Bhaishajya Kalpana, Government Ayurveda College, Tripunithura. The pharmaceutical study was carried out as mentioned below.

Table No. 1: Ingredients and Quantity of *Manjishtadi Adityapaka Taila* prepared in 7 days and 14 days duration

Sl. No.	Ingredients	Scientific name	Part used	Quantity
1	*Manjishta*	*Rubia cordifolia* Linn	Stem	8.3 g
2	*Amalaki*	*Emblica officinalis* Gareth.	Dried fruit	8.3 g
3	*Vibhitaki*	*Terminalia bellerica* Roxb.	Dried fruit	8.3 g
4	*Haritaki*	*Terminalia chebula* Retz.	Dried fruit	8.3 g

5	*Laksha*	*Laccifer lacca*	Resin	8.3 g
6	*Haridra*	*Curcuma longa* Linn.	Rhizome	8.3 g
7	*Gandhakam*	Sulphur	-	8.3 g
8	*Haratalam*	Orpiment	-	8.3 g
9	*Manasila*	Realgar	-	8.3 g
10	*Tila taila*	*Sesamum indicum* Linn.	-	300 ml

The prepared samples were named as

1. *Manjishtadi Adityapaka Taila* 7-1 (MAT7-1)
2. *Manjishtadi Adityapaka Taila* 7-2 (MAT7-2)
3. *Manjishtadi Adityapaka Taila* 7-3 (MAT7-3)
4. *Manjishtadi Adityapaka Taila* 14-1 (MAT14-1)
5. *Manjishtadi Adityapaka Taila* 14-2 (MAT14-2)
6. *Manjishtadi Adityapaka Taila* 14-3 (MAT14-3)

Processing of raw materials

Manjishta, Amalaki, Haritaki, Vibhitaki, and *Haridra* were separately powdered and sieved through sieve no. 85 and stored in separate bottles. *Laksha* was crushed and filtered through sieve no. 60 to remove any unwanted particles if present. Then it was made into fine powder and filtered through sieve no. 85.

The minerals *gandhaka, haratala* and *manasila* require *sodhana.* So they were purified as per classical reference and then made into fine powder.

Gandhaka sodhana[7]

100 ml ghee was taken in an iron vessel and heated in low flame. On melting of ghee, it was added with 500 g *gandhaka* and continued heating until whole *gandhaka* become liquid. Soon it was filtered through a clean piece of cloth into a vessel containing cow's milk. The solidified *gandhaka* was taken from milk and washed with warm water. Again, *gandhaka* was powdered and the process was repeated for 6 more times. After 7 *dhalana*, *gandhaka* was dried well and stored. 446g of *sudha gandhaka* was obtained.

Haratala sodhana[8]

Kushmanda phala was cut into small pieces and juice was extracted with the help pf mixer. The juice was filtered through cloth and was collected in a steel vessel. 250 g *asudha haratala*

was made into small pieces and tied into a *pottali*. The *pottali* was then tied to glass rod and hanged in *dola yantra* in a fashion which does not touch the bottom. *Kushmanda swarasa* was filled in the *dola yantra* and heated on gas stove in *mandagni* for 3 hours. More *swarasa* was added to the *dola yantra* when the quantity got reduced. After 3 hours, *pottali* was taken out and *haratala* was washed with hot water and dried well. 240 g of *sudha haratala* was obtained.

Manasila sodhana[9]

Fresh *ardraka* was collected from market, washed well and scraped off the outer covering. It was then crushed well to collect the juice. Swarasa was collected in a steel vessel. 200g of *asudha manasila* was taken in a *khalwa yantra*, powdered well and 75ml of *ardraka swarasa* was added for first *bhavana*. The mixture was triturated till it got dried completely. This completed first *bhavana*. Then again sufficient quantity of *ardraka swarasa* was added and mixture was triturated. The same process was repeated for 6 more times and total 7 *bhavanas* were given. After *sodhana*, 200g of *manasila* was obtained.

Preparation of *Manjishtadi Adityapaka Taila* in 7 days

Three stainless steel vessels were taken, washed and dried well. The fine powders of drugs were taken 8.3 g each in another vessel and mixed well to a homogeneous mixture. 300 ml of *tila taila* was taken in the stainless-steel vessel and to that 74.7 g of *dravya churna* was added and mixed well. Then the vessel was kept in sunlight from 10 am to 4 pm (during the peak hours of sunlight). By 4 pm the *taila* was removed from sunlight and kept properly closed. The process was repeated for 7 days. Each day morning the *taila* was stirred using a glass rod. Each day the changes were noted. After 7 days the *taila* was filtered through a clean piece of cloth, measured, and stored. *Dravya churna* was found mixed with oil and appeared like a paste.

Preparation of *Manjishtadi Adityapaka Taila* in 14 days

Three stainless steel vessels were taken, washed and dried well. The fine powders of drugs were taken 8.3 g each in another vessel and mixed well to a homogeneous mixture. 300 ml of *tila taila* was taken in the stainless-steel vessel and to that 74.7 g of *dravya churna* was added and mixed well. Then the vessel was kept in sunlight from 10 am to 4 pm (during the peak hours of sunlight). By 4 pm the *taila* was removed from sunlight and kept properly closed. The process was repeated for 14 days. Each day morning the *taila* was stirred using a glass rod. Each day the changes were noted. After 14 days the *taila* was filtered through a clean piece of cloth, measured, and stored. *Dravya churna* was found mixed with oil and appeared like a paste.

Figure No. 1: Preparation of *Manjishtadi adityapaka taila*

Tila taila

Dravya churnam

Dravya churna with *Taila taila*

Mixing of *dravya churna*

Kalka after 1st day

Filtered sample of MAT 7

Filtered MAT 14 samples

Analytical study

All the prepared samples were analysed for the parameters viz. Refractive Index at 25^{0}C, Specific Gravity, Viscosity, Iodine value, Saponification value, Acid value, Peroxide value, Identification using HPTLC, Determination of Arsenic content through AAS & Sulphur content through CHNS analysis and microbial contamination.

OBSERVATIONS AND RESULTS

The changes observed during the preparation of taila were noted and is tabulated below.

Table No. 2: Observations of *Manjishtadi adityapaka taila* prepared in 7 days and 14 days duration

MAT 7	MAT 14
On mixing of *churna* with taila, the golden yellow colour of *tila taila* changed to yellowish orange. *Churna* was found settled at the bottom of the vessel and there was a characteristic smell for the *taila*. On the second day, while stirring, the *dravya churna* found to be thicker in consistency and appeared like a paste. *Taila* was found viscous and bubbles appeared while stirring. The colour of the *taila* changed to orange. During filtration, the *taila* was viscous, *dravya churna* was paste like and soft to touch. Some amount of *churna* also got filtered through the cloth and was found settled down at the bottom.	The initial yellowish orange colour changed to orange colour on 2nd day There was a characteristic smell from 1st day onwards *Taila* became more viscous on keeping for 14 days Froth was present after stirring the mixture from 2nd day onwards. *Churna* was found settled at the bottom of the vessel mixed with *taila*. *Churna* was soft to touch, appeared like a paste Some *churna* was found settled at the bottom of filtered *taila* as well.

Table No. 3: Yield of *Taila*

Sl. No.	Sample name	Quantity of raw material taken	Yield of *taila*
1.	MAT7-1	*Tila taila*- 300 ml *Dravya churna*- 74.7 g	240 ml
2.	MAT7-2	*Tila taila*- 300 ml *Dravya churna*- 74.7 g	232 ml
3.	MAT7-3	*Tila taila*- 300 ml *Dravya churna*- 74.7 g	245 ml

4.	MAT14-1	*Tila taila*- 300 ml *Dravya churna*- 74.7 g	225 ml
5.	MAT14-2	*Tila taila*- 300 ml *Dravya churna*- 74.7 g	225 ml
6.	MAT14-3	*Tila taila*- 300 ml *Dravya churna*- 74.7 g	227 ml

Organoleptic characters

The organoleptic characters like appearance, colour and odour were studied for all the samples. Irrespective of the difference in number of days of preparation, all the samples of *taila* were orange in colour with a characteristic smell. The *taila* appeared to be viscous, but MAT14 samples were more viscous.

Physico-chemical Parameters

Table No. 4: Results of Specific gravity, Refractive index at 25^0C and Viscosity

Sl. No.	Sample	Specific gravity	Refractive index at 25^0C	Viscosity (cps)
1.	MAT 7-1	0.931	1.467	70.03
2.	MAT 7-2	0.930	1.467	70.33
3.	MAT 7-3	0.930	1.467	70.33
4.	MAT 14-1	0.938	1.469	111.56
5.	MAT 14-2	0.938	1.469	111.13
6.	MAT 14-3	0.938	1.469	111.20

Table No. 5: Results of Acid value and Peroxide value

Sl. No.	Sample	Acid value	Peroxide value
1.	MAT 7-1	4.14	92.43
2.	MAT 7-2	3.28	90.30

3.	MAT 7-3	2.87	94.69
4.	MAT 14-1	4.67	69.65
5.	MAT 14-2	4.13	72.85
6.	MAT 14-3	3.79	74.20

Table No. 6: Results of Iodine value and Saponification value

Sl. No.	Sample	Iodine value	Saponification value
1.	MAT 7-1	110.91	174.83
2.	MAT 7-2	111.45	185.68
3.	MAT 7-3	115.09	206.63
4.	MAT 14-1	111.17	182.61
5.	MAT 14-2	106.74	202.12
6.	MAT 14-3	114.49	192.15

Table No. 7: Results of Arsenic and Sulphur content in oil

Sl. No.	Sample	Arsenic (mg/300ml)	Sulphur (% in 5mg)
1.	MAT 7-1	11.25	0.66
2.	MAT 7-2	12.17	0.77
3.	MAT 7-3	13.21	0.69
4.	MAT 14-1	20.75	1.13
5.	MAT 14-2	21.12	1.09
6.	MAT 14-3	20.72	1.45

Table No. 8: Results of Microbial contamination

Sl. No.	Sample	Total aerobic bacterial count	Total yeast and mould count
1.	MAT 7-1	< 10^5 CFU/g	< 10^3 CFU/g
2.	MAT 7-2	< 10^5 CFU/g	< 10^3 CFU/g
3.	MAT 7-3	< 10^5 CFU/g	< 10^3 CFU/g
4.	MAT 14-1	< 10^5 CFU/g	< 10^3 CFU/g
5.	MAT 14-2	< 10^5 CFU/g	< 10^3 CFU/g
6.	MAT 14-3	< 10^5 CFU/g	< 10^3 CFU/g

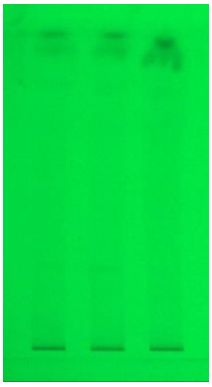
Table No. 9: Standard analytical parameters of *manjishtadi adityapaka taila* prepared by 7 days and 14 days exposure to sunlight

Sl. No.	Parameters	*Tila taila*	MAT 7	MAT 14
1.	Refractive index	1.460	1.467	1.469
2.	Specific gravity	0.917	0.930	0.938
3.	Viscosity (cps)	-	70.33	111.29
4.	Iodine value	114.21	112.48	110.80
5.	Saponification value	192.99	189.04	192.29
6.	Acid value	1.85	3.43	4.19
7.	Peroxide value	3.88	92.47	72.23
8.	Arsenic content	-	12.21 mg/300 ml	20.86 mg/300 ml
9.	Total Sulphur	-	0.706% / 5 mg	1.22% / 5 mg
10.	Microbial contamination			
	Total aerobic bacterial count	-	< 10^5 CFU/g	< 10^5 CFU/g
	Total fungal count	-	< 10^3 CFU/g	< 10^3 CFU/g

Identification using HPTLC

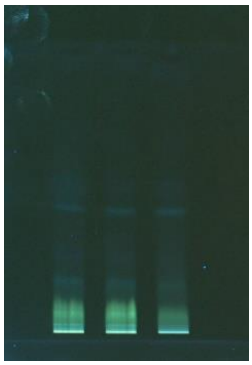
Under 254 nm, 7 peaks were obtained for MAT 7-1, 8 peaks for MAT 7-2 and 7 peaks for MAT 7-3. 11 peaks, 13 peaks and 12 peaks were obtained respectively for 3 samples of MAT 7-14. 3 peaks were obtained for MAT 7 samples under 366nm. MAT 14-1 had 5 peaks, MAT 14-2 had 6 peaks and MAT 14-3 had 4 peaks under 366 nm.

Figure No. 2: HPTLC plate view of MAT 7 and MAT 14 samples under 254 nm and 366 nm

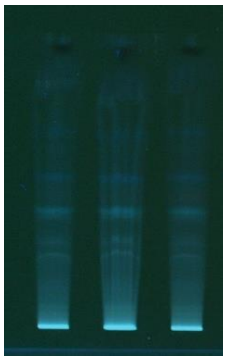


HPTLC plate view of MAT7-1, MAT7-2, MAT7-3 under 254nm.

HPTLC plate view of MAT14-1, MAT14-2, MAT14-3 under 254nm.



HPTLC plate view of MAT7-1, MAT7-2, MAT7-3 under 366nm.



HPTLC plate view of MAT14-1, MAT14-2, MAT14-3 under 366nm.

DISCUSSION

The name *Adityapaka taila* was given to the formulation in *Chakradatta* owing to the method of preparation, *suryatapi* i.e., to keep the taila with all the ingredients under sunlight. As no standard protocol was available regarding the preparation and analytical parameters of

Manjishtadi Adityapaka Taila, the *taila* was prepared in 7 days and 14 days duration and an analytical profile was developed.

The *taila* was exposed to sunlight 6 hours a day owing to the availability of intense sunlight. Thus, for the *taila* prepared in 7 days duration, the total hours of sun exposure were 42 hours and the same for MAT 14 was 84 hours.

On analysis, the specific gravity and refractive index values of *taila* prepared in both durations did not show much difference. But comparatively lesser for the one prepared in 7 days. The viscosity of *adityapaka taila* prepared over the course of 7 days and 14 days varied significantly. MAT 7 had an acceptable value of viscosity because a substance with lower viscosity will penetrate more readily into the skin. Iodine value determines the degree of unsaturation in oils and acid value determines the amount of free fatty acids formed as a result of hydrolysis of fat. There was only a negligible difference in the iodine and acid values among MAT 7 & MAT 14 and were within normal limit. Saponification value did not have direct influence on the stability of oil. Saponification value was also in the rage of that of *tila taila*. When coming to the peroxide value, which determine the oxidative deterioration of oil, it was high for both the batches. Compared to 7 days samples, peroxide value was low for MAT 14 samples. The reason for high peroxide value may be due to the oxidation of sulphur compounds to sulphur oxides upon contact with the atmospheric oxygen and sunlight. High peroxide value will affect the shelf life of the formulation. In the AAS and CHNS analysis, amount of As & S was low in MAT 7 samples. On HPTLC identification, a greater number of peaks were obtained for *Manjishtadi adityapaka taila* prepared in 14 days duration.

All the parameters except viscosity showed better values for MAT 14 batch which signifies the role of sunlight in the proper *paka* of *Manjishtadi adityapaka taila.*

CONCLUSION

The present study reveals that *Manjishtadi adityapaka taila* can be prepared in 14 days duration of exposure to sunlight considering the values of analytical parameters like peroxide value, acid value, iodine value and the peaks obtained in HPTLC. Also, it is obvious that the *taila* is least stable and probably have less shelf life as the peroxide value is high. Compared to the one prepared in 7 days, MAT 14 had a lower peroxide value suggesting it's stability over MAT 7 sample. But we cannot be sure that, if the high peroxide value has any impact on the therapeutic aspect of the medicine. For those, further clinical studies have to be conducted.

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