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Comparative analytical evaluation of *Pruthvisara taila* prepared by two different methods

Research Article

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Abstract

Background: *Pruthvisara taila* is *Niragni snehapaka* (*Aditya paka taila*). It is indicated in *Kushta* and *Vruna,* mentionedby classical text *Chakradatta*. AIM: An attempt was made to prepare *Pruthvisara taila* by two methods and analyse the difference between both the samples on the basis of organoleptic characters and physico-chemical parameters. Methodology: In pharmaceutical study, the *Pruthvisara taila* was prepared by both methods; *Niragni (Aditya paka*-sunlight as source of heat)and *Sagni)* using fire as source of heat*)* & in analytical study both the samples were subjected for physicochemical analysis like pH, Viscosity, Refractive index, Specific Gravity, Acid Value, Iodine value, Saponification Value, Unsaponifiable matter,Peroxide value and Rancidity. Results: Results of the study on the parameters assessed on the samples after preparation by both the methods;duration required for the preparation of *Aditya paka Pruthvisara taila* is 24 days and for *Sagni Pruthvisara taila* is 5 days.Viscosity of *NPT(Niragni Pruthvisara taila)* was 127.1497 and SPT (*Sagni Pruthvisara taila*) 89.3996, refractive index was 1.47807 w/w and 1.47607 w/w respectively. The specific gravity of *NPT* and *SPT* were 0.9142w/w and 0.8866 w/w respectively. Acid value is more in *SPT* (108.46 w/w) as compared to *NPT* (62.76w/w). Iodine value is more in *SPT* (245.34w/w) as compared to NPT (58.37).The *SPT*(222.75 w/w) sample has got more saponification value than *NPT* (200.75w/w). The unsaponifiable matter in *NPT* has 1.84% and *SPT* has 4.80%. Conclusion: Acid value indicates about the short shelf life of the drug, which was comparatively more in *Sagni Pruthvisara taila* than *Niragni Pruthvisara taila,* hence the early chances of rancidity are more in SPT.Percentage of saturated and long chain fatty acids are more in *Niragni Pruthvisara taila* when compared to *Sagni Pruthvisara taila* which was revealed through iodine value and saponification value. Hence the NPT is less susceptible to oxidation and rancidity.

Keywords: *Sneha Kalpana, Pruthvisara taila*, *Agnipaka*, *Aditya paka*, Analytical.

Introduction

Sneha Kalpana is one of the important procedures among secondary preparations in *Ayurveda*, which is widely used and preferred dosage form for both internal and external application. In classics,two different methods mentioned for *Snehapaka* based on the source of heat used. *Niragnipaka (Aditya paka)* preparation of the medicine through sunlight)and *Sagni paka (*preparation of the medicine by using fire as source of heat) methods are mentioned. *Adityapaka* comes under *Niragni paka*, it is also known as *Bhanupaka* or *Suryapaka.* It is a *Sneha kalpana* where the *Sneha* is subjected to intense heat of Sun until the *Siddhi Lakshana* (Tests for completion of preparation) are observed, it is mainly used in the treatment of skin diseases. *Pruthvisara Taila* is one such a classical formulation mentioned in Chakradatta which is indicated in *Kushta* and *Vrana chikitsa* as topical application (1). It comprises of *Shuddha Chitraka (Plumbago zeylanica* Linn*), Nirgundi (Vitex negundo* Linn*), Shuddha Karaveera (Nerium indicum* Mill*), Nadibeeja (Corchorus olitorius* L.*), Shuddha Vatsanabha (Aconitum ferox Wall. ex Ser), Kanji and Karanja taila (*oil extracted from the seeds of *(Pongamia pinnata* Linn. Merr) as base.

Aditya paka method is practiced to prepare *Snehapaka* from the drugs which are having volatile property andare heat sensitive in nature.It is economical as there is no usage of fuel but preparation requires preferably the summer season and time required for the preparation is more compared to *Sagni paka*. This method is not suitable for all the places as some places have more seasonal variations.Hence to overcome this drawback, in the present study the *Pruthvisara taila* was

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prepared by two methods by using two source of heat; *Sagni paka and Aditya paka* and analytical study was carried out to observe the changes seen in both the methods.

Aim

Pharmaceutico – Analytical Study of *Pruthvisara taila.*

Objectives

- Preparation of *Pruthvisara taila* as per Standard Operative procedures with *Niragni (Aditya paka) and Sagni* method.
- Physico-Chemical analysis and comparison of *Pruthvisara taila* prepared by *Niragni (Aditya paka)* and *Sagni* method.
- To compare the Physico- Chemical analysis of both the samples.

Materials and Methods

Pharmaceutical source

The raw drugs required for the preparation were collected from the market and authentication was done.Prior to the preparation of *Pruthvisara taila*; *Shodhana* (purification) of *Chitraka* (2)*(Plumbago zeylanica* Linn*), Karaveera shodhana (3) (Nerium indicum.*Mill*), Vatsanabha shodhana (4) (Aconitum ferox* Wall. ex Ser*)* were carried out according to classical methods. The *kanji* was prepared according to reference mentioned in Dravyaguna vignaneeya (5).Preparation of *Taila*a ccording to *Niragni paka (Aditya paka)* and *Sagni paka* method was carried out in *Rasashastra and Bhaishajya Kalpana* practical laboratory, Sri Dharmasthala Manjunatheshawara College of Ayurveda and Hospital, Hassan.

Table 1: Ingredients of *Pruthvisara taila*

Sl no	Name of drug	Part used	Botanical name	Quantity
1	*Chitraka*	*Moola* (Root)	*Plumbago zeylanica* Linn	40gm
2	*Vatsanabha*	*Khanda* (Rhizome)	*Aconitum ferox Wall. ex Ser*	40gm
3	*Karaveera*	*Moola* (Root)	*Nerium indicum.* Mill	40gm
4	*Nirgundi*	*Moola* (Root)	*Vitex negundo* Linn	40gm
5	*Nadibeeja*	*Beeja* (Seed)	*Corchorus olitorius* L.	40gm
6	*Kanji*			490ml + 40ml
7	*Karanja taila*		*Pongamia pinnata* Linn. Merr)	1000ml

Method 2

Niragni Snehapaka (Aditya paka) (6)

Shodhita (purified) *Chitraka moola Shodhita* (purified) *Karaveera moola, Shodhita* (purified) *Vatsanabha khanda*, *Nirgundi* and *Nadibeeja* were pounded in *Khalva yantra* (Mortar) to form into fine powder and added in chronological order and *mardana* (trituration) was done. After homogeneous mixture of all the drugs, *Kanji* (sour gruel) was added and made into *Kalka* (Bolus). In vessel *Karanja taila* (oil extracted from (*Pongamia pinnata* Linn. Merr) *Kalka* and *Kanji* were added in specified quantity then it is transferred to enamel tray and it was covered with thin cotton cloth and kept under sun light daily from morning to evening (9am-5pm).The oil was stirredthrice in a day and temperature of both atmosphere and *Taila* was noted at the same time. Procedure was carried out till evaporation of water portion from *Taila* which was confirmed through *Agni pariksha* (flame test*)*.The *Taila* was filtered and stored in air tight container.

***Sagni SnehaPaka* (7)**

Shodhita (purified) *Chitraka moola*), *Shodhita* (purified) *Karaveera moola, Shodhita* (purified) *Vatsanabha khanda,Nirgundi* and *Nadibeeja* were made into fine powder and added in chronological order and *mardana* (trituration) was done. After homogeneous mixture of all the drugs, *Kanji* (sour gruel) was added and made into *Kalka* (Bolus).In a vessel *Karanja taila* (oil extracted from *Pongamia pinnata* Linn. Merr)), *Kalka* and *Kanji* were added mixed well and the vessel was subjected for heating on gas stove over mild temperature.Heating was carried out every day till boiling point of *Taila*. Daily the temperature of both flame and oil was noted.The procedure was carried out for 5 days when it attained *Taila siddhi laksahana* (confirmatory test for *Taila* preparation) the *Taila* was filtered, cooled and stored in closed container.

Analytical study

Analytical Study was carried out at S.D.M. Research centre for Ayurveda and Allied sciences, Udupi, Karnataka, India. The Samples of prepared medicine were analysed using following parameters as per the references available in protocol for testing published by Central Council for Research in Ayurvedic Sciences (CCRAS) (8).

Organoleptic Characters

The drug is examined by means of the sense organs, and the difference in the samples which are observable at a macroscopic level was appreciated, it includes following tests. Colour, Odour, Appearance, Touch and Consistency.

Physico-Chemical Analysis

It includes following tests; pH (9) , Viscosity (10), Refractive index (11), Specific Gravity (12), Acid Value (13), Iodine value (14), Saponification Value (15) Unsaponifiable matter (16), Peroxide value (17) and Rancidity (18).

Observations and Results

Pharmaceutical study

Table 2: Observation and results of pharmaceutical of both the Samples

Sl no	Parameters	*NPT* *(Niragni Pruthvisara taila)*		*SPT* *(Sagni Pruthvisara taila)*	
1	Colour	Brownish-black		Brownish	
2	Odour	*Karanja taila*		*Karanja taila*	
3	Touch	Thick		Viscous	
4	Appearance	Oily		Oily	
5	Consistency	More viscous		Viscous	
6	Time taken for preparation	24 days		5 days	
7	Maximum temperature	Oil	Climate	Oil	Flame
		54^{0}C	36^0 C	74.8^0 C	480^0 C
		Taila	***Kalka***	***Taila***	***Kalka***
8	Initial quantity	1000ml	625 gm	1000ml	625 gm
9	Final quantity	645 ml	730 gm	800ml	683gm
10	Loss	355 ml loss	105 gmgain	200ml loss	58 gm gain
11	% of Loss	35.5%	16.08 % gain	20% loss	9.28% gain

Table 3: Results of Physicochemical Analysis of both the Samples

Sl no.	Parameter	*SPT* *(Sagni Pruthvisara taila)*	*NPT* *(Niragni Pruthvisara taila)*
1	pH	6.0	6.0
2	Viscosity	89.3996	127.1497
3	Refractive index	1.47607	1.47807
4	Specific gravity	0.8866	0.9142
5	Acid value	108.46	62.76
6	Iodine value	245.34	58.37
7	Saponification value	222.75	200.75
8	Unsaponifiable matter (%)	4.80	1.84
9	Peroxide value	2.39	7.74
10	Rancidity	Fat is not oxidised	Fat is not oxidised

Discussion

Sneha Kalpana is a pharmaceutical procedure in which active principles (Fat soluble and water soluble) are absorbed into the *Sneha* from the raw drugs. *Sneha Paka* can be done with the help of *Agni* or with the help of *Sunlight*. *Pruthvisara taila* is mainly prepared by *Aditya paka* method, During this *Aditya paka* method, the *sneha* absorbs UV rays from sun and it is found that UV rays are more effective in treatment of skin disorders because they penetrate more and helps for rapid skin shedding and helps to reduce the infammation of skin (19) this is the main reason it is prepared under sunlight. But the demerits of making *Taila* using *Aditya paka* method is that it is very time consuming and has to be prepared in specific seasons. Here, the *Pruthvisara taila* prepared by *Niragni* (preparation of the medicine using sunlight as source of heat) and *Sagni* (preparation of the medicine by using fire as source of heat) methods.During the preparation of *Aditya paka* method, it is observed that the morning and evening temperature was less and mid-day there was peak temperature i.e., there was temperature variation according to diurnal changes.

In case of *SPT* (*Sagni Pruthvisara taila)*constant temperature was maintained and procedure was completed in short period i.e.,5days.The maximum climatic temperature observed in *NPT* was 36^{0}C and oil was 54^{0}C the temperature difference between oil and climate was 18^{0}C.In *SPT*, the maximum temperature in flame and *Taila* was 480^0 C and 85^{0}C respectively, even though the flame temperature was more, *Taila* temperature was maintained to 85^0 C- 90^0 C by increasing the distance between flame and *Taila* containing vessel with the help of the stand.

In *NPT*, separation of oil from *Kalka* was a bit difficult as the *Kalka* was very fine and both the oil and *Kalka* were compactly mixed with each other. In *SPT* separation of oil from *Kalka* was found easy. In *NPT* 35.5 % oil loss and 16.08 % gain in weight of *Kalka* was found because separation of *Taila* from *Kalka* was difficult because the *Kalka* turned into finer particles due to longer duration of heat and hence the loss in the

percentage of oil as it was difficult to filter the entire oil from *Kalka.*

In *SPT* 20% loss of oil and 9.28% increase in weight of the *Kalka*; the percentage of loss is lesser due to easy filtration. The *NPT Taila* sample was in brownish black in colour, the *SPT* was brownish in colour, this variation is probably due toextent of extraction of active constituents from the *Kalka* to *Taila*. The time taken for the preparation of *NPT Taila* was longer and the *Kalka* was mixed with *Taila* for longer duration. Hence the colour was altered to brownish black due to oxidation.The odour of the *NPT* and *SPT* was of *Kanji* for initial 10 days and 3 days respectively later it was mild in the *NPT* than *SPT* and at the end of preparation the odour of *Kanji* was masked by *Karanja taila* in both the samples.The change in the odour is due to exposure to heat.The consistency of *NPT* was more viscous than *SPT*. In *NPT* the *Kalka* was in contact with *Taila* for longer duration under atmospheric temperature hence the consistency was more viscous.

Viscosity is the resistance of a liquid to flow. Higher the value indicates the more the solutes or the concentration of that liquid. Viscosity of *NPT* was 127.1497 and SPT 89.3996, In *NPT* the *Kalka* was in contact with *Taila* for longer duration than the *SPT* which led to higher concentration of solutes into *Taila.*

The heat reduces the viscosity and moisture increases the viscosity, The *NPT* was prepared under sunlight where the intensity of the heat is less and it was exposed to atmosphere; this has led to the absorption of the moisture from the atmosphere.Hence the increase in viscosity.

The refractive index value indicates the factors which are responsible for the refraction of light through oil sample. The variation in the refractive index indicates the concentration of active principles dissolved in the oil.Refractive index values of *NPT* and *SPT* were almost similar i.e., 1.47807 w/w and 1.47607 w/w respectively. The slight variation in the values might be because of loss of contents due to increased temperature used in the preparation of *SPT*.

The specific gravity indicates about the relative density of the oil that depends on dissolved and suspended particles present in the oil. The specific gravity of *NPT*and *SPT* were 0.9142w/w and 0.8866 w/ w respectively. The presence of sedimentation in the base of the container was more in *NPT*. This indicates that the percentage of suspended particles were more in *NPT* than *SPT.*

The acid value indicates the presence of free fatty acids in the oil sample. The increase in the acid value is due to the hydrolysis or oxidation of oil which leads to formation of free fatty acids.The free fatty acids are responsible for the rancidity of the oil. Higher the free fatty acids content of oils makes rancid faster.Heat plays a contributing factor for accelerating the oxidation of the oil.The Acid value is more in SPT (108.46 w/w) as compared to *NPT* (62.76w/w); the heat applied in processing of *SPT* is more compared to *NPT.* It indicates the *SPT* is more susceptible for rancidity than *NPT*.

Iodine value is a measure of the amount of unsaturation in fatty acids and double bonds present in the oil. It is directly proportional to the content of unsaturated fatty acids. Greater the iodine value of the oil, greater the degree of unsaturation.The saturated fat takes up no iodine so their iodine value is said to be of value zero.But the unsaturated fats have double or triple bonds which are generally very reactive towards the iodine. The lower value indicates lower degree of unsaturation.

With the increase in double or triple bonds in carbon, the reactivity with iodine increases and it consumes more iodine in reaction and so has a higher iodine value which reflects the susceptibility of oil to oxidation so the unsaturated fatty acids are less stable than saturated fatty acids. This makes them more vulnerable to rancidity. Iodine value is more in *SPT* (245.34w/w) as compared to *NPT* (58.37). It indicates the percentage of Saturation is more in *NPT* when compared to *SPT,* hence the *NPT* is less susceptible to oxidation and rancidity.

The saponification value indicates the average molecular weight or chain length of all the fatty acids present. It is inversely proportional to the average molecular weight or chain length of the fatty acids hence long chain of fatty acids have a low saponification value and the short chain length has higher saponification value.This property will aid in the therapeutic efficacy as shorter chain fatty acids have faster rate of absorption than longer chain fatty acids.An increase in saponification value in oil enhances the quality of the oil because it shows the presence of lower molecular weight components or contain high proportion of lower fatty acids and increases the volatility of the oil. Saponification value is also a measure of oxidation, Saponification value is directly related to rancidity factor as it is the hydrolysis and autoxidation of fats into short-chain aldehydes and ketones. The *SPT* (222.75 w/w) sample has got more saponification value than *NPT* (200.75w/w).

The unsaponifiable matter is that fraction of oil and fat, which is not saponified. The post saponification products may either be hydrophilic (water soluble) or hydrophobic (water insoluble). Here in unsaponifiable, the materials remain water insoluble after the saponification reaction is completed.The *NPT* has 1.84% and SPT has 4.80% which indicates the percentage of insoluble material was more in SPT sample.

The peroxide value determines the auto oxidation i.e., oxidative rancidity. Oils with a high degree of unsaturation are most susceptible to autoxidation.The high peroxide value shows that the oil can easily go rancid and therefore has short shelf life because of lipolytic hydrolysis and oxidative deterioration.The peroxide value decreases with an increase in temperature. The decrease can be attributed to the fact that the peroxides are formed on heating are unstable compounds towards high temperatures and transforming them to carbonyl and aldehyde compounds.

The Peroxide value of *NPT* sample is 7.74 and *SPT* sample is 2.39 where the heat applied in the

preparation of *SPT* was more as compared to *NPT* hence the decrease in the peroxide value in *SPT* sample was observed .High degree of unsaturation which are present in *NPT* sample may lead to rancidity earlier and may have less shelf life as compared to *SPT*.In both the samples the fat is not oxidised hence this indicates the samples are not rancid.

Conclusion

Sneha Kalpana is the procedure where both oil soluble and water soluble active principles are extracted.Based on the sources of heat used in the preparation of the sneha, it is classified into two, i.e., *Niragni Snehapaka (Aditya paka)* and *Sagni Snehapaka, Pruthvisara taila* is *Aditya Snehapaka,* where source of heat is used is sun light. Contents of *Pruthvisara taila* are; *Shuddha chitraka, shuddha vatsanabha, shuddha karaveera, nirgundi moola, nadibeeja, kanji and karanja taila* is the base. Duration required for the preparation of *Adityapaka Pruthvisara taila* is 24 days and for *Sagni Pruthvisara taila* is 5 days. The *Niragni Pruthvisara taila* was viscous than *Sagni Pruthvisara taila.*

Acid value indicates about the short shelf life of the drug, which was comparatively more in *Sagni Pruthvisara taila* than *Niragni Pruthvisara taila,* hence the early chances of rancidity are more in *SPT*. Percentage of saturated and long chain fatty acids are more in *Niragni Pruthvisara taila* when compared to *Sagni Pruthvisara taila* which was revealed through iodine value and saponification value. Hence the *NPT* is less susceptible to oxidation and rancidity. Increase in Parameters like, saponification value and acid value are directly related to rancidity, the *SPT* shows higher values in both parameters than *NPT.* The high peroxide value shows that the oil can easily go rancid and therefore has short shelf life, the *SPT* has less peroxide value than *NPT* which indicates *NPT* is more susceptible for rancidity.

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