

ABSTRACT : *Guduchi* (*Tinospora cordifolia* (willd) Miers.), is a well-known herbal drug used as a potent *Rasayana* (rejuvenating), *Raktashodhaka* (blood purifier), *Kushthaghna* (drug for skin diseases), *Medhya* (brain tonic) and *Tridoshahara* (pacify the three aggravated *Doshas*) drug in different dosage forms. *Guduchi taila* and *Guduchi ghrita* are examples of *Sneha kalpana* (Oleagenous formulations) described for the treatment of *Kushtha roga* (skin diseases) by *Acharya Chakradatta*. Thus in this study both *Guduchi taila* and *Guduchi ghrita* were prepared by utilizing *Guduchi kalka*, *Guduchi kwatha* and *Go-dugdha* along with *Murchhita tila taila* and *Murchhita go-ghrita*. All the samples were analyzed on various organoleptic, physicochemical and phytochemical parameters for developing the standards for the formulations. Total eight samples of *Guduchi taila* and five samples of *Guduchi ghrita* were prepared by following classical method to maintain process uniformity and to validate the standard procedure. Thin Layer Chromatography profile of the test formulations were also carried out to establish the chromatographic profile for the same. Thin Layer Chromatography study shows more number of spots in *Guduchi taila* in comparison to *Ghrita* preparation.

Key words : *Guduchi* (*Tinospora cordifolia* (Willd.) Miers), *Sneha kalpana*, *Murchhana*, *Guduchi Taila*, *Guduchi Ghrita*, Standardization.

INTRODUCTION

Sarpi, *Taila*, *Vasa*, and *Majja* are mainly four *Sneha dravyas* as described in *Ayurvedic* classics¹. *Go ghrita* and *Tila taila* are considered as the best *Sneha* among all *Jangam* and *Sthavar sneha* respectively². As per *Aacharya Sushruta*, *Sneha* is an indispensable constituent of living body³, thus he quoted various forms of *Sneha* along with different routes of administration for providing nourishment to the body⁴. *Sneha siddha* (fat soluble) drugs have better pharmacokinetic action (ADME) in comparison to other dosage forms because of the lipoid nature of the biomembranes, as lipid soluble substances readily permeate into the cells⁵. Introduction of *Sneha kalpana* into ayurvedic pharmaceuticals may be the resultant of the above mentioned facts. Classically the formulation is mentioned to be having a longer shelf life in comparison to other ayurvedic herbal dosage forms⁶. Broadly two main types of *Sneha kalpana* are described into the classics i.e. *Taila* and *Ghrita kalpana*⁷. *Guduchi taila* and *ghrita*, both the *Sneha kalpana*, are the outcome of the search for an effective formulation for the drug *Guduchi*⁸ i.e. *Guduchi taila*⁹

and *Guduchi ghrita*¹⁰ by expert seers for the treatment of various kinds of diseases like *Vatarakta*^{9,10}, *Kushtha*¹¹, *Ekakushtha*¹² etc. Thus for the present study various batches of both the formulations were prepared keeping uniformity in each batch and analyzed to develop the standards for the formulations through physico-chemical analysis and chromatographic profiling.

MATERIAL AND METHODS

Pharmaceutical study :

Pure and authentic ingredients as mentioned in *Chakradatta* 23/19 and 23/24 were utilized for the preparation of *Guduchi taila*⁹ and *Guduchi ghrita*¹⁰ respectively following classical method of preparation.

Procurement of ingredients of *Guduchi taila* and *ghrita* :

Authentic ingredients as mentioned in *Chakradatta*, were used for the preparation of *Guduchi taila* and *Guduchi ghrita* respectively. *Guduchi* is the main ingredient of the formulation. Stem of *Tinospora cordifolia* (Willd.) Miers (Family-*Menispermaceae*) were freshly collected from botanical garden after proper authentication in the pharmacognosy department of the institute. *Tila taila* (sesame oil) was collected from the Pharmacy, while *go-ghrita* (cow's ghee) and *go-dugdha*¹³ (cow's milk) of Amul brand were purchased from local market. R.O. water was used for the preparation of the test formulations as an ingredient wherever required in the study.

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Procurement of drugs for Sneha Murchhana^{14, 15}:

Powders of the associated drugs like roots of *Manjistha* (*Rubia cordifolia* Linn.), rhizomes of *Haridra* (*Curcuma longa* Linn.), stem barks of *Lodhra* (*Symplocos racemosa* Roxb.), stem bark of *Nalika* (*Cinnamomum zeylanicum* Blume.), dried pericarp of *Amalaki* (*Embllica officinalis* Gaertn.), dried pericarp of *Haritaki* (*Terminalia chebula* Retz), dried pericarp of *Vibhitaki* (*Terminalia belerica* Roxb.), Inflorescence of *Ketaki* (*Pandanus odoratissimus* Linn.), rhizopores and tender buds of *Vata* (*Ficus bengalensis* Linn.), whole plant of *Hrivera* (*Valeriana hardwickii* Wall.), *Swarasa* (expressed juice) of *Matulunga* (*Citrus medica* var. *acidica*), rhizomes of *Musta* (*Cyprus rotundus* Linn.), were procured from the pharmacy after authentication from pharmacognosy department of the institute.

Preparation of test formulations : The test formulations i.e. *Guduchi Taila* and *Guduchi Ghrita* were prepared from *Murchhita Tila taila* and *Murchhita Go ghrita* as per the reference given in *Bhaishajya Ratnavali* respectively^{14, 15} followed by *Sneha paka*¹⁶ done as per the mentioned reference of *Chakradatta* for developing a standard for the formulation.

Murchhana Sanskar of Sneha : The quantity of drugs and water taken for the *Murchhana* of 1.0 l of *Taila* and *Ghrita* are given in Table 1. In the process of *Murchhana*, *Sneha dravya* was kept in a vessel and heated till removal of water content of the oil or *ghrita*, then bolus of powders of mentioned *Murchhana Dravya* were prepared with the help of sufficiently required quantity of water, and added in the same vessel followed by mentioned quantity of water. Again the mixture was heated till the complete evaporation of water on mild heat. The heating duration is adjusted so as to complete the *Snehapaka* by 5 nights. After confirming the moisture free state of the *Sneha*, it was strained and further utilized for *Sneha paka*.

Preparation of Guduchi taila (Group A) and Guduchi ghrita (Group B) : Besides *Murchhita sneha*, *Guduchi kwatha* and *kalka* are also required as ingredient for the *sneha paka* along with *Go-dugdha*. For this purpose, each time before the *sneha paka*, freshly procured stems of the main drug *Guduchi*, was thoroughly washed, dried, chopped and pounded up to *kalka*¹⁷ (paste) stage obtained. The *kwatha*¹⁸ (decoction), used for the *Sneha paka* was also prepared with fresh *kalka* of *Guduchi*. Both groups of formulations i.e. *Guduchi taila*⁹ (Gr-A) and *Guduchi ghrita*¹⁰ (Gr-B), were prepared on mild heat as per the classical reference. The heating was stopped after attaining of the *Sneha siddhi lakshan*¹⁹

and *Madhyama Paka* stage²⁰. Total eight batches of *Guduchi taila* and five batches of *Guduchi ghrita* were prepared keeping uniformity in the quantity and method of preparation to develop standards.

Process validation of Guduchi Kwatha²¹ preparation:

Principles : *Kwathan* (evaporation on mild heat)

Ingredients : Freshly collected *Guduchi* stem 1 part i.e. 6 kg & water 4 parts i.e. 24 l for each batch.

Procedure : It was prepared by reducing the amount of liquid up to 1/4th of the initial quantity on mild heat (80-92°C) following standard method of preparation and strained through a non reacting double layered cotton cloth.

Process validation of Guduchi Kalka²² preparation :

Principles : Chopping & pounding

Ingredients : Freshly collected *Guduchi* stem (dia. 0.8-1.5 cm), 250 gm for each batch.

Procedure : *Guduchi kalka* was prepared by chopping the freshly collected washed *Guduchi* stem into small pieces and then converted into *Kalka* form by pounding it in an *Ulukhal yantra* (mortar & pestle).

Process validation of Guduchi taila / Guduchi ghrita preparation :

Principles : *Sneha Paka* (Mixing, Heat transfer, Mass transfer, Evaporation)

Ingredients : *Murchhita taila / ghrita* (1 part) i.e. 1.5 l, *Ksheera* (1 part) i.e. 1.5 l, *Guduchi kalka* (1/6th part) i.e. 250 g & *Guduchi kwatha* (4 part) i.e. 6.0 l.

Procedure : *Murchhita taila / ghrita* was heated over mild heat and the *Guduchi kalka* was added in it followed by *Guduchi kwatha*, and then after 15 minutes the *Ksheera* (Milk)¹³ and the whole mixture was heated over mild heat (approx 100 °C) till complete evaporation of water content and appearance of *Madhyampaka sneha siddhi lakshan*¹⁹ & filtered in its warm condition.

Analytical Study :

Analytical phase of the study includes the organoleptic and physico-chemical evaluation along with thin layer chromatographic (TLC) study. The organoleptic characters examined were *Rupa* (colour), *Rasa* (taste), *Gandha* (odour) and *Sparsha* (consistency), while the analyzed physico-chemical parameters were pH²³, specific gravity²⁴, loss on drying²⁵, refractive index²⁶, rancidity test²⁷, acid value²⁸, saponification value²⁹, unsaponifiable matter³⁰. These data of the formulations

were compared for evaluating the most suitable one among both.

TLC study³¹: T.L.C. study of the unsaponifiable matter of the samples was carried out to develop a chromatographic pattern. It was done with different methods to decide a suitable solvent system for this drug. Stationary phase was same but the ratio of solvents was changed in all the trials.

As a result of all these trials the suitable condition was decided and T.L.C. was carried out with this ratio pattern.

Sample : Ethereal solution of the unsaponifiable matter of the samples.

Stationary Phase: Silica Gel G precoated plates.

Mobile Phase : Hexane - Diethyl ether (8:2)

Visualization : Under Short & long wave U.V., in day light after spraying with 20 % methanolic sulphuric acid followed by heating at 110 °C for 10 min.

The details of the chromatograms obtained were noted.

Microbiological study³² was also carried out of both the groups for quality assurance.

OBSERVATIONS AND RESULTS

General observations :

During *murchhana*, the *Kalka* was added in both the media at temperature in between 80-90 °C, while water was added in between 70-80 °C. Average temp. maintained during process was 85-90 °C. The *Phenodgama* stage in *taila* and *Phenashanti* stage in *ghrita* was observed at 98-99 °C. *Murchhita taila* was having dark red colour and astringent taste, while *Murchhita ghrita* was having greenish yellow colour and same taste. The total loss during whole *Murchhana* process was found approximately 2% in *Taila* while in 4% in *ghrita*. Total yield of the *Guduchi kwatha* obtained was shown on an average of 6.0 l for each batch. The peak temperature maintained for the preparation of the *Kwatha* was in between 90-100 °C, average duration of heating was 4 hr and average pH of *Guduchi Kwatha* was also observed 4. Stable extensive froth with honeycomb like structure was appeared over the surface of the menstrum just after mixing of water with chopped pieces of *Guduchi kand* (stem). Evaporation of liquid started to appear on stirring at temperature above 70 °C. Total duration taken for the

preparation of 250 g of *Guduchi Kalka* was approx. 30 min. The observed temperature of various stages of *Sneha Paka* (*Guduchi taila* & *Guduchi ghrita*) are summarized and compared in Table 2.

Both of the *Sneha Kalpana* (*Guduchi Taila* and *Ghrita*) were processed up to the achievement of all the classical *Siddhi lakshana* (completion characteristics) like *Gandha varna - rasotpati* (desirable smell, colour and taste), *Shabdahina* (no cracking sound), *Phenodgama* (frothing), *Vartivat kalka* (the paste of herbal drug can be rolled in between fingers), fire test in *Kalka* and *Taila* (when *sneha* or *kalka* kept on fire there must no be any cracking sound) etc. All above characters found at the end of *sneha paka*, which were advocated different levels of moisture and extraction. On an average, total duration for *Taila paka* and yield for each batch of *Guduchi Taila* was observed to be approximately 10 hr and 1.475 l respectively, while for each batch of *Guduchi ghrita* was approximately 9 hr, 30 min and 1.472 l respectively in 2 days. Out of the total duration taken for heating, 5 hr of continuous heating were provided on first day and rest of the heating were completed on the subsequent day.

Specific observations :

Organoleptic Characters : The organoleptic characters of different samples of *Guduchi taila* and *Guduchi ghrita* are presented in the Table 3 and 4.

Physico-chemical parameters : Comparative physico-chemical parameters of *Guduchi Taila* and *Guduchi ghrita* samples with different stages are described in Table 5 and 6 respectively. The rancidity test was found negative in all the test formulations including the raw *Tila taila* and *Go ghrita*.

Chromatographic study : The Rf values from the chromatograms of the *Guduchi taila* and *Guduchi ghrita* under short U.V., long U.V. and in the day light after spraying with 20% Methanolic sulphuric acid are presented in Table 7. The comparative T.L.C. chromatograms of *Tila taila*, *Murchhita taila*, *Guduchi taila* and *Murchhita guduchi taila* are shown in fig. 1 and of *Go-ghrita*, *Murchhita ghrita*, *Guduchi ghrita*, *Guduchi ghrita* with *Murchhana*, *Murchhita Guduchi taila*, *Murchhita Guduchi ghrita* are shown in fig. 2.

Microbial count analysis found no any gram positive or negative bacteria in any samples of *Guduchi taila* and *Guduchi ghrita*.

TABLE NO. 1 : INGREDIENTS AND THEIR QUANTITIES FOR TAILA & GHRITA MURCHHANA :

<i>Taila Murchhana</i>		<i>Ghrita Murchhana</i>	
Ingredients	Quantity	Ingredients	Quantity
<i>Tila taila</i>	1.0 l	<i>Go-ghrita</i>	1.0 l
<i>Manjistha</i>	62.5 g	<i>Haritaki, Vibhitaki,</i>	62.5 g (each)
<i>Haridra, Lodhra, Nalika,</i> <i>Amalaki, Haritaki, Vibhitaki,</i> <i>Ketaki, Vatankura, Hrivera</i>	15.6 g (each)	<i>Amalaki, Haridra,</i> <i>Matulunga swarasa,</i> <i>Musta</i>	
Water	4.0 l	Water	4.0 l

TABLE NO. 2 : TEMPERATURE RECORDED AT DIFFERENT STAGES OF GUDUCHI TAILA AND GUDUCHI GHRITA PREPARATION:

Observation	<i>Guduchi taila</i>	<i>Guduchi ghrita</i>
Taila became free of moisture	120°C	142°C
When <i>kalka</i> added	100°C	102°C
When <i>kwatha</i> added	90°C	95°C
When milk added	45°C	45°C
Maximum temperature during <i>paka</i>	100°C	98°C
Average temperature	93°C	90°C
When separation occurs	80°C	75°C
When <i>Madhyam paka</i> observed	96°C	95°C

TABLE NO. 3 : ORGANOLEPTIC CHARACTERS OF PLAIN TILA TAILA, MURCHHITA TAILA AND THE INITIAL THREE BATCHES OF GUDUCHI TAILA SAMPLES :

Test	Plain <i>Tila taila</i>	<i>Murchhita taila</i>	<i>Guduchi taila</i>		
			1 st batch	2 nd batch	3 rd batch
Colour	Dark yellow	Red	Dark red	Dark red	Dark red
Opalescence	Translucent	Translucent	Translucent	Translucent	Translucent
Clarity	Not clear	Not clear	Not clear	Not clear	Not clear
Touch	Oily	Oily	Oily	Oily	Oily
Taste	Sweet-bitter	Slight bitter	Bitter	Bitter	Bitter

TABLE NO. 4 : ORGANOLEPTIC CHARACTERS OF COW'S GHEE, MURCHHITA GHRITA AND THE INITIAL THREE BATCHES OF GUDUCHI GHRITA SAMPLES :

Test	Cow's <i>ghee</i>	<i>Murchhita ghrita</i>	<i>Guduchi ghrita</i>		
			1 st batch	2 nd batch	3 rd batch
Colour	Yellow	Dark yellow	Dark yellow	Dark yellow	Dark yellow
Opalescence	Translucent	Translucent	Translucent	Translucent	Translucent
Clarity	Not clear	Not clear	Not clear	Not clear	Not clear
Touch	Oily	Oily	Oily	Oily	Oily
Taste	Slightly sweet	Slight bitter	Bitter	Bitter	Bitter

TABLE NO. 5 : COMPARATIVE PHYSICO-CHEMICAL EVALUATION DATA OF PLAIN TILA TAILA, MURCHHITA TAILA AND THE INITIAL THREE BATCHES OF GUDUCHI TAILA SAMPLES :

Group	Specific Gravity	Loss on drying	Refractive Index	Acid Value	Sap. Value	Un-sap. Value
<i>Tila Taila</i>	0.9172	0.02	1.4730	4.5570	178.16	2.044
<i>Murchhita Tila Taila</i>	0.9148	0.00	1.4725	6.6265	176.56	1.866
<i>Guduchi Taila - I</i>	0.9151	0.20	1.4720	7.5623	156.05	1.6516
<i>Guduchi Taila - II</i>	0.9166	0.00	1.4720	7.5518	155.15	1.6549
<i>Guduchi Taila - III</i>	0.9181	0.38	1.4720	7.6890	156.58	1.6714

TABLE NO. 6 : COMPARATIVE PHYSICO-CHEMICAL PARAMETERS OF COW'S GHEE, MURCHHITA GHRITA AND THE INITIAL THREE BATCHES OF GUDUCHI GHRITA SAMPLES :

Group	Specific Gravity	Loss on drying	Refractive Index	Acid Value	Sap. Value	Un-sap. Value
<i>Goghrita</i>	0.9112	0.15	1.4620	0.5859	255.70	1.266
<i>Murchhita Guduchi ghrita</i>	0.9181	0.25	1.4610	0.7024	286.74	0.259
<i>Guduchi Ghrita - I</i>	0.9129	0.17	1.4720	0.7309	288.99	1.253
<i>Guduchi Ghrita - II</i>	0.9125	0.16	1.4720	0.7267	287.56	1.314
<i>Guduchi Ghrita - III</i>	0.9143	0.39	1.4720	0.7339	289.74	1.290

TABLE NO. 7 : RF VALUES FROM THE DIFFERENT CHROMATOGRAMS OF THE *GUDUCHI TAILA* AND *GUDUCHI GHRITA* :

Types of Chromatograms	Rf values of the samples	
	<i>Guduchi taila</i>	<i>Guduchi ghrita</i>
Short U.V.	0.12, 0.18, 0.26, 0.37	0.14, 0.24, 0.36, 0.48, 0.75
Long U.V.	0.12, 0.22, 0.30, 0.43	0.13, 0.22, 0.35, 0.57
After spraying with 20% sulphuric acid	0.12, 0.14, 0.20, 0.26, 0.34, 0.45, 0.97	0.13, 0.21, 0.47, 0.77

FIGURE 1 : TLC OF MURCCHITA GUDUCHI TAILA :



Fig. 1 (a)

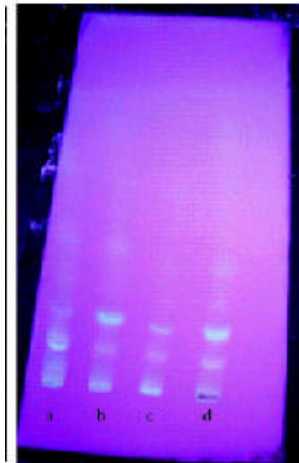


Fig. 1 (b)



Fig. 1 (c)

FIGURE 2 : TLC OF MURCCHITA GUDUCHI GHRITA :



Fig 2 (a)

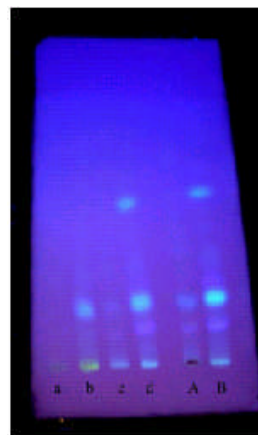


Fig. 2 (b)

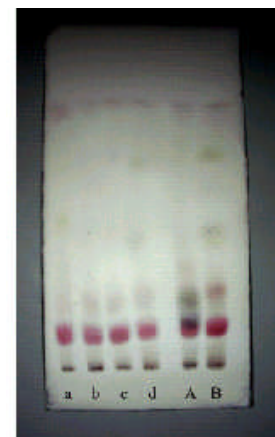


Fig. 2 (c)

Fig. 1: Comparative T.L.C. Chromatograms of *Tila taila*, *Murchhita taila*, *Guduchi taila* and *Murchhita Guduchi taila*, under short UV (Fig. 1.a), long UV (Fig. 1.b) and in day light after spraying with 20% methanolic sulphuric acid followed by heating at 110°C for 10 minutes (Fig. 1.c).

a : *Tila taila*; **b :** *Murchhita taila*; **c :** *Guduchi taila*; **d :** *Murchhita Guduchi taila*.

Fig. 2 : Comparative T. L. C. Chromatograms of *Go-ghrita*, *Murchhita ghrita*, *Guduchi ghrita*, *Murchhita Guduchi ghrita*, *Murchhita guduchi taila*, *Murchhita guduchi ghrita* under short UV (Fig. 2.a), long UV (Fig. 2.b) and in day light after spraying with 20% methanolic sulphuric acid followed by heating at 110°C for 10 minutes (Fig. 2.c).

a : Go-ghrita; **b** : Murchhita ghrita; **c** : Guduchi ghrita; **d** : Murchhita Guduchi ghrita; **A** : Murchhita guduchi taila; **B** : Murchhita guduchi ghrita.

DISCUSSION

Sneha Kalpana is one of the commonly prescribed Ayurvedic dosage form in day to day practices. Although a lot of varieties of oils and fats are described in classical texts, but the most common amongst them are *Taila* and *Ghrita Kalpana*. As per *Acharya Sushruta*, *Tila taila* is the best among all the *taila* while *Go-ghrita* among of *ghrita*. *Guduchi taila* and *ghrita* are the two preparations of the same drug *Guduchi* mentioned in *Chakradatta* in context of the same disease. Thus in this study these two preparations were taken for the study to evaluate the most suitable amongst them with reference to *Ekakustha* (psoriasis).

During the preparation of the formulation, fresh *Guduchi* stem (6kg) was taken in this study as per the quotation given by Sharangadhara³³. It is considered as *Mridu dravya*, thus the quantity of water taken for *Kwatha* preparation was four times to the drug and reduced up to one fourth to the original quantity by evaporation providing mild heat in an open vessel. Regular stirring is also required during preparation to avoid degradation of the product at the bottom due to excessive heat and it also will prevent deposition of solids. Stirring also helps in better extraction as it produces a continuous circulation in the media and thus reduces the concentration of the media which ultimately reduces the external osmotic pressure compare to the inner side of the cells of the herbal material.

Smaller the size of the drug more will be the surface area available for the processing of the external media to extract its content³⁴. Therefore the drug was cut into small pieces of 1-1.5 inches and ease in the preparation of the decoction. After over night soaking the drug was heated. It was also observed that froth formation occurred during *Kwatha* preparation, so continuous stirring was needed in the starting stage of heating. Frothing may be appeared due to starch content of *Guduchi*. The colour of the *Kwatha* found to be greenish brown, which suggests the effect of heat on chlorophyll particles of *Guduchi* stem. As fresh *Guduchi* have a major portion of fibrous material thus it was difficult to completely convert it into paste form. The *Guduchi kalka* was greenish yellow in colour due to chlorophyll, bitter in taste and was having sticky touch due to presence of starch.

Guduchi taila was prepared as per the reference of *Chakradatta*³⁵. *Ksheera* (milk) was taken equal to

the *Sneha dravya* as mentioned in the text and added in the *sneha* in the initial stage of *paka* after one boiling. Milk was added by maintaining the temperature around 45°C to avoid spoiling of milk. It was generally observed in the pilot batch preparation that if the milk was added at a different temperature than that of the oleogenous media or at >50 °C, it got spoiled and the casein particles were aggregated. Thus in the present study, it was ensured that during the addition of milk in the *Sneha drava*, the temperature of both the media i.e. milk and oil were remained below 50 °C. The scientific explanation is, at the temperature above the boiling point casein micelles are aggregated and due to this temperature, the acidic pH of the media also accelerates the process. Due to heating the buffer capacity of milk salt is also changed, carbon dioxide is released, organic acids are produced and casein phosphate may precipitate with release of hydrogen ions. This is the reason behind maintaining the temperature^{36, 37}.

There was a specific observation found that after 7 hrs of heating the mixture turned to completely in a homogenous semi solid stage, after some times processed *Taila* was start to get separated from that mixture at the temperature around 80°C. At this stage continuous stirring and low temperature was required to avoid the burning of the *Kalka* material.

Loss of the *taila / ghrita* may also be reduced due to the addition of milk from which milk fat was released during heating and mixed in to the oleaginous media. After straining of *Ghrita* the quantity of rest of the *Kalka* was found to be approximately double by weight to that of the taken quantity, this may be due to absorption of oily matter and precipitation of remaining part of milk protein.

The lipids having amphiphilic nature may be converted in the micelle form due to heating, which is very easily absorbed through epithelial membrane lying all over the human body surface. *Sneha dravya*, having triglyceride when processed with water in presence of heat converts into di-glyceride form and some free fatty acids are found. All the free fatty acids have one hydrophobic and one hydrophilic end, out of which water soluble extractives attach with hydrophilic end and converted in micelle form which are supposed to be most easily absorbable form.

Moisture free stage appeared in the *Ghrita* after 10 min of mild heating at the temperature around 140°C, than *Taila*, it suggests more moisture content in *Ghrita*. Homogenous mixture stage observed after 7.30 hr of the heating and after some times at internal temperature around 80°C, the medicinal *Ghrita* get separated from

that mixture and the whole mixture appears like a semi solid confectionary, it was due the complete mixture of lipids and proteins with water. After separation confirmative test was found in *Ghrita* preparation, was *Phenashanti* (subsidence of frothing) instead of *Phenodgama* (appearance of frothing), which was observed in *Taila* preparation.

Organoleptic tests are very important because palatability of a drug depends upon these characters. These parameters are also indicative of finished product i.e. *Ishtagandha varna rasotpatti*. Here, both the samples were bitter in taste; while red colour of *Guduchi taila* is contributed by *Manjistha* and yellow colour of *Guduchi ghrita* is due to colouring matter of *Haridra* during *Murchhana* process. Specific gravity of *Guduchi Taila* and *Guduchi ghrita* as found decreased in comparison to *Tila taila* and *Go ghrita*, may be due to conversion of long chain fatty acids to short chain fatty acids. Loss on drying of *Guduchi taila* was 0.20 w/w while *Guduchi ghrita* 0.16% w/w, suggest very less or no moisture in the samples. Refractive Index of *Guduchi taila* found decreased while in *Guduchi ghrita*, it was increased in comparison to raw drugs. Acid value increased in both the samples suggestive of increased free fatty acids. Saponification value is a measure of the mean molecular weight of the fatty acids originally bound as tryglicerides. It was decreased in *Guduchi taila* sample, while in *Guduchi ghrita*, it was increased. Unsaponifiable matter is the fraction of substances in oil and fats which decreased in both the media i.e. *taila* and *ghrita* after processing.

The change that a lipid undergoes leading undesirable flavour and odour is known as rancidity. This is brought about in two ways: hydrolysis and oxidation. The ester linkages of lipids are hydrolyzed to yield fatty acids. Hydrolysis is catalyzed by acids, bases, enzymes or thermal effects. When a base is the hydrolyzing agent, the liberated fatty acids are converted into their salts, of soaps and the hydrolysis is termed saponification. The other agents release free fatty acids and the reactions brought about by them are collectively known as lipolysis, "lipolytic rancidity" or "hydrolytic rancidity". Oils and fat when come in contact with air, react with oxygen producing products with undesirable characteristics, ultimately leading to higher degree of unsaturation and pick up oxidative rancidity. This type of rancidity is promoted by heat, light, ionizing radiations, catalysts and enzymes (lipoxygenases). Volatile products which are produced by complex chemical changes due to high peroxide level are responsible for rancid taste and odour. Although in the present test preparations, various external

measures were enforced over the *taila* and *ghrita*, but did not show any sign of rancidity. It may be due to the specific methodology followed for the *Sneha paka*.

TLC study (Fig. 1 & 2) under short UV light, showed total 4 spots in *Guduchi taila* and 5 spots in *Guduchi ghrita*. Rf values 0.12, 0.25, 0.36 is common in both the samples. Under long UV, both the samples shows 4 spots out of them Rf 0.43 in *taila* and 0.61 in *Murchhita guduchi ghrita* are different and other spots were found on common i.e. at Rf values 0.12, 0.23, 0.36. Chromatograms after spraying with 20% Methanolic sulphuric acids, it reveals that *Guduchi Taila* and *Guduchi Ghrita* shows common spots on Rf values 0.13, 0.21 and 0.47. While *Guduchi Taila* contains four different spots at Rf values 0.14, 0.26, 0.34 and 0.97 than *Guduchi Ghrita*. Besides these *Guduchi Ghrita*, also contains one extra spot at Rf 0.77. May be this is the reason for better therapeutic efficacy of *Guduchi taila*. It may also be suggestive of extraction of more active principles in *Guduchi taila* in comparison to *Guduchi ghrita*. These results were also supported by the clinical trial on *Ekakustha*, in which *Guduchi taila* group found more effective in comparison to *Guduchi ghrita*³⁸.

CONCLUSION

The present preparation module of both the formulations i.e. *Guduchi taila* and *Guduchi ghrita* and the analytical data generated here may be considered as the standard parameters for the formulation. A detail further study is needed for the validation and scientific establishment of the data. A separate study is also required to develop the standards of *Murchhana* process for the *Sneha*.

Scanning the analytical data and TLC patterns of the formulations it may be suggested that *Guduchi taila* may have better extraction than that of the *Guduchi ghrita*.

APPENDIX :EQUIPMENT SPECIFICATIONS :

- 1) For Kwatha Preparation: Food grade stainless steel vessel of 9.7 inch depth, diameter 19.5 inches, circumference 57 inches and capacity of 50 L with suitable stainless steel ladle.
- 2) For Kalka Preparation: Food grade stainless steel vessel of 2.0 inch depth, diameter 20 inches, Cutter, Ulukhal Yantra, Mortar and Pestle: This is classical and simplest equipment for grinding. In this method, material is crushed by application of attrition and pressure. suitable stainless steel ladle.
- 3) For Taila and Ghrita preparation: Food grade stainless steel vessel Diameter-13.5 inch, Depth- 7.5 inch, Measuring cylinder 2l, Thermometer range of 0-200°C, suitable stainless steel ladle
- 4) Gas burner with L.P.G. cylinder (14.5 kg capacity)
- 5) Non reacting cotton cloth of size 1 m²

