



Research Article

ASSESSMENT OF SIGNIFICANCE OF SAMSKARA IN THE PREPARATION OF SUKUMARA GHRI TA BY PHYSICO-CHEMICAL ANALYSIS

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ABSTRACT

Ghrita (ghee) preparations are used internally for Shamana (alleviating treatment), Shodhana (purification treatment) and Netratarpana (eye rejuvenation method) type of treatments. There is a misconception among the masses that Ghrita (ghee) need to be used carefully as it increases the lipid profile. Many Samskara (process) are mentioned in the Ayurvedic classics for drugs to modify or reduce the undesired effects. Murchana Samskara (processing of ghee) is one among these Samskara (process) mentioned by Bhaishajya Ratnavali for Ghrita (ghee) and Taila (oil) to reduce the undesired effects and add beneficial effects. As this method is an additional process to Ghrita (ghee) preparation, most of the Ayurvedic pharmaceutical companies do not follow this method as it adds up to the cost and is time consuming. To evaluate the significance of Murchana Samskara (processing of ghee), Sukumara Ghrita is taken as one of the examples as it is used as Shamana (alleviating treatment) Aushadhi (medicine) and in Purvakarma (preceding procedure) of Virechana (purgation therapy) or Vamana (emesis therapy) for Snehapana (oleation therapy). Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) and Murchita Ghrita (processed ghee) samples were subjected for physico-chemical parameters which has shown increase in the refractive index, specific gravity, saponification value, Iodine value, Ester value, and decrease in acid value, Viscosity, Density, Total fatty acids. Murchana process (processing of ghee) imparts changes in colour, odour, minimizing rancidity and increasing stability, facilitates better dissolution of bio constituents and unsaturated fatty acids in Ghrita (ghee).

Keywords: Sukumara Ghrita, Murchita Ghrita (processed ghee), Amurchita Ghrita (unprocessed ghee), Ghrita Murchana (processing of ghee), Murchana (process), Physico- chemical Analysis

INTRODUCTION

Different media like water, fat, etc. are mentioned in Ayurvedic classics to extract active principles of the drugs. Ghrita (ghee) and Taila (oil) are major fat media used for extraction of active principles mentioned in classics. Ghrita (ghee) preparations are used internally and externally in Ayurvedic treatments. Majority of Ghrita (ghee) preparations are used internally for Shamana (alleviating treatment), Shodhana (purification treatment) and Netratarpana (eye rejuvenation method) type of treatments. Ghrita (ghee) is also used as cooking as well as food supplement in Indian diet. Ghee means the pure clarified fat derived solely from milk or curd or from desi (country cooking) butter of Cow to which no coloring matter or preservative has been added.

Many Samskara (procedures) are mentioned in the Ayurvedic classics for drugs to modify or reduce the undesired effects. Murchana Samskara (processing of ghee) is one among these Samskara (procedure) mentioned for Ghrita (ghee) and Taila (oil) to reduce undesired effects and add beneficial effects. Murchana Samskara (processing of ghee) is first mentioned by Bhaishajya Ratnavali in the context of Jwara Chikista (treatment of fever) to reduce Amadosha (product of impaired digestion), Durgandhata (bad odour), other doshas (undesired properties) and this process

also enhances the Viryata (potency) unsaturated fatty acids of the Sneha (fat)¹.

Sukumara Ghrita is one of the Ghrita (ghee) preparation mentioned in Ghrita Prakarana of Sahasra Yoga², Ayurveda Formulary of India³, and The Ayurvedic Pharmacopoeia of India⁴. Sukumara Ghrita is indicated in Vibandha (constipation), Udara (diseases of abdomen / enlargement of abdomen), Gulma (abdominal lump), Pleeha roga (splenic disease), Vidradhi (abscess), Shopha (oedema), Yonisula (pain in female genital tract), Arsha (Haemorrhoids), Vriddhi (Hydrocele), Vatavyadhi (diseases due to Vata Dosha), Vatarakta (gout) and also as a Snehapana (oleation therapy) in Purvakarma (preceding procedure) for Virechana (purgation therapy) or Vamana (emesis therapy). Sukumara Ghrita is one of the examples for Yamaka (combination of two Sneha (fat)) type of Sneha (fat) which contains Ghrita (ghee) and Eranda Taila (castor oil) as ingredients.

Physicochemical analysis of drugs will provide some standards to assess its quality and helps to understand pharmacokinetics and pharmacodynamics of the drug. Physicochemical analysis, standardization of drugs and final product will provide some significant outcome of Murchana (process).

Aims and Objectives

- To analyze the changes of Sukumara Ghrita prepared with Murchita Ghrita (processed ghee)
- To know the significance of Murchana (process) by comparing the analytical results of Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) and Murchita Ghrita (processed ghee)

MATERIALS AND METHODS

Raw drugs required for Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) and Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) were collected from the Teaching pharmacy. Ghrita Murchana (processing of ghee) was conducted at Rasashastra and Bhaishajya Kalpana practical laboratory of Sri Dharmasthala Manjunatheshwara College of Ayurveda, Hassan as per the reference of Bhaishajya Ratnavali under the guidance and supervision of guide through webinar. Analytical study was conducted at Sri Dharmasthala Manjunatheshwara Center for Research in Ayurveda and Allied Sciences, Udipi and Care Keralam, Koratty.

OBSERVATIONS AND RESULTS

The samples of Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) and Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) were subjected for analysis as per the references available in protocol for testing published by CCRAS⁵.

Table 1: Parameters followed for analytical study

Sl. No	Parameters
1.	Organoleptic characters
2.	Refractive index
3.	Specific gravity at 25 °C
4.	Saponification value
5.	Acid value
6.	Iodine value
7.	Loss on drying at 105°C
8.	Viscosity
9.	Ester value
10.	Weight per milliliter
11.	Rancidity
12.	Peroxide value
13.	Free fatty acids
14.	Total fatty acids
15.	Solubility

Table 2: Organoleptic characters of Ghrita (ghee) samples

Parameters	Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee)	Sukumara Ghrita prepared with Murchita Ghrita (processed ghee)
Colour	Golden Yellow	Dark golden yellow
Odour	Bitter, astringent odour	Sour, astringent odour
Taste	Bitter, astringent	Sour, astringent taste
Consistency	Less viscous	Viscous

Table 3: Results of Physico chemical parameters

Sl. No	Parameter	Sukumara Ghrita with Amurchita Ghrita (unprocessed ghee)	Sukumara Ghrita with Murchita Ghrita (processed ghee)
1.	Refractive index	1.46383	1.46433
2.	Specific gravity at 25°C	0.9121	0.9226
3.	Saponification value	170.97	171.59
4.	Acid value	2.51	1.73
5.	Iodine value	10.385	10.454
6.	Loss on drying	0.297	0.099
7.	Viscosity at 29°C	96.95	70.48
8.	Ester value	168.46	169.86
9.	Weight/ml	0.857g/ml	0.852g/ml
10.	Rancidity	Not rancid	Not rancid
11.	Peroxide value	0.58%	0.57%
12.	Free fatty acid	1.24	0.33
13.	Total fatty acid	2.46	0.66
14.	Solubility	83.02%	72.34%

DISCUSSION

Murchana process (processing of ghee) converted the golden yellow colour of the Ghrita (ghee) to dark golden yellow colour of the Sukumara Ghrita. The colour is due to the Kwatha Dravya (drugs used for decoction) like Dashamoola, Trinapanchamoola and Guda (jaggery).

The characteristic smell of Ghrita (ghee) converted into bitter, astringent odour in case of Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee). It is due to the contact of drugs like Dashamoola, Trinapanchamoola, etc. The characteristic smell of Ghrita (ghee) converted into sour, astringent odour in Sukumara Ghrita prepared with Murchita Ghrita (processed ghee), it is due to the contact of drugs used in

Murchita Ghrita (processed ghee) and drugs like Dashamoola, Trinapanchamoola, etc.

The characteristic taste of Ghrita (ghee) converted into bitter, astringent taste in Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) is due to contact of drugs like Dashamoola, Trinapanchamoola, etc. The characteristic taste of Ghrita (ghee) converted into sour, astringent taste in Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) is due to contact of drugs used in Murchita Ghrita (processed ghee) and Dashamoola, Trinapanchamoola, etc.

Viscous consistency of Sukumara Ghrita is due to dissolution of bio constituents into Ghrita (ghee) from the drugs used for preparation and removal of water.

Refractive index⁶ of Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) was 1.46383 and Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) was 1.46433. There is no significant change in the refractive index of Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) and Murchita Ghrita (processed ghee).

As ghee is denser than air, refractive index is always more than one. That it is confirmed in this study. Increase in refractive index of Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) indicates the increase of its density. It is due to the dissolution of bio constituents in the Murchita Ghrita (processed ghee). Refractive index of ghee also depends on the chain length. With increase in chain length, refractive index of ghee increases.

Little increase in Refractive index of Sukumara Ghrita was observed when it was prepared with Murchita Ghrita (processed ghee), suggesting increase in the degree of unsaturation indicating the essential role of unsaturated fatty acids on the health, especially in reducing the cholesterol and Low-Density Lipids (LDL) levels.

Specific gravity⁷

Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) was 0.9121 and Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) was 0.9226. Increase in specific gravity after Murchana (procedure) indicates addition of some bio constituents from the drugs used for Murchana (procedure).

Saponification value^{8,9}

Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) was 170.97 and Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) was 171.59. Saponification value indicates breaking down of oil into glycerol and free fatty acids by treatment with alkali. The higher saponification values of Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) indicates the content of low molecular weight fatty acids. It suggests that the increased low molecular weight fatty acid content is much beneficial in the increased rate of absorption of the ghee, leading to the increased efficacy of the Sukumara Ghrita prepared with Murchita Ghrita (processed ghee).

Analytical values have shown increase in the Saponification values of Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) which is suggestive of the beneficial effect of Murchana (procedure) in increasing the degree of unsaturation indicating the essential role of unsaturated fatty acids on the health.

Acid value^{10,11}

Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) was 2.51 and Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) was 1.73.

Acid value normally reflects the amount of acidity which is due to free fatty acids, acid phosphates and amino acids. This acidity is neutralized by treating with alkali which is known as refining of fats. Analytical parameters have shown decreased acid value in Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) indicating that Murchana process has beneficial effect in refining of ghee and decrease in the degree of rancidity, reducing the toxic properties of Ghrita (ghee).

Iodine value¹²

Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) was 10.385 and Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) was 10.454. Analytical parameters have shown increase in iodine value of Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) which is suggestive of beneficial effect of Murchana (procedure) in increasing the degree of unsaturation indicating the important role of unsaturated fatty acids in reducing the cholesterol and LDL (Low Density Lipids) cholesterol levels.

Loss on drying^{13,14}

It is indicative of moisture content of the preparation. The higher the value more will be the amount of moisture and ghee will be more susceptible for rancidity. Loss on drying value of Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) was 0.099 and Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) was 0.297. Loss on drying values of Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) was increased after Murchana process is due to addition of water in the preparation.

Viscosity¹⁵

Viscosity at 29^oC of Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) was 96.95 and Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) was 70.48. Viscosity of Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) was decreased after Murchana process is due to the addition of Drava Dravya (liquid materials) like water, milk, etc. as these are less viscous than Ghrita (ghee).

Ester value¹⁶

Saponification value- acid value. Esters are the fatty acids with glycerol. As the esters are increased rancidity chance is decreased. Ester value of Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) was 168.46 and Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) was 169.86. Ester values of Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) was increased after Murchana process indicating the less chances of rancidity.

Weight /ml at 25^oC¹⁷

Density of Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) and Murchita Ghrita (processed ghee) was 0.857 g/ml and 0.852 g/ml respectively. Density of Sukumara Ghrita slightly decreased when prepared with Murchita Ghrita (processed ghee). With this result it can be assumed that Murchana process facilitates better dissolution of bio constituents in Sukumara Ghrita. Hence slight reduction in the molecular weight can be suspected.

Rancidity¹⁸

Both samples of Ghrita (ghee) have not shown any rancidity, which shows the presence of tocopherols as natural antioxidant. Oxidative rancidity arises from the decomposition of peroxides. Peroxides are the result of the oxidation of unsaturated fats. The products resulting from the decomposition of peroxides include aldehydes, ketones and hydrocarbons. These help to produce the flavours and odours associated with oxidative rancidity. The abnormal characteristics of a product that has undergone

oxidative rancidity are paint like or acrid (burning) odour and an abnormal (rancid) taste. The colour of a food item is not normally changed due to this deteriorative process. The texture of a food product is not affected by the deteriorative condition.

It is a known fact that the rancid fat form harmful free radicals in the body that cause cellular damage and have been associated with diabetes, Alzheimer's disease, etc. It is also known to cause depletion in the body of vitamins B and E. Though the rancid fat tastes bad, it does not cause illness in a short term. But the free radicals present in it increase the risk of developing diseases such as cancer, heart disease, damage DNA in cells. The chemicals such as peroxides and aldehydes can damage cells and contribute to atherosclerosis. Malonaldehyde is found in rancid foods and it is a decomposition product of polyunsaturated fatty acids. This chemical has been reported to be carcinogenic and a potential health hazard.

Peroxide value^{19,20}

It is said that the foremost common cause of milk fat weakening is rancidity which is due to oxidation, subsequently influencing its flavor and quality. The off flavor in ghee is because of the aldehydes and ketones that are generated as a result of the breakdown of hydrogen peroxide.

Peroxide value of ghee indicates the degree of rancidification. It is said that the Peroxide value is an indicator of products of primary oxidation and measures the rancidity of oxidation but not the stability of a fat. Ghee is graded as very good (Peroxide value below 1.5), good (1.6 to 2.0), fair (1.1 to 2.5), poor (2.6 to 3.5) and not acceptable (3.6 to 4.0) based on the peroxide value²¹. An increase in peroxide value shows that the ghee has turned rancid. Ghee with a high degree of unsaturation is most susceptible to auto-oxidation and this auto-oxidation is a free radical reaction involving oxygen that leads to deterioration of ghee which imparts off flavours.

In this study peroxide value of Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) was 0.58% and Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) was 0.57%. As the normal peroxide value ranges in ghee is below 4 that is within the permissible limits of unrancidification. But more peroxide value signifies its higher tendency for rancidification. In case of Sukumara Ghrita, the chances of rancidity reduce when prepared with Murchita Ghrita (processed ghee).

Free fatty acids²²

Free fatty acids (FFA) are unattached fatty acids present in the fat. Some unrefined oils may contain as much as several percent free fatty acids. The levels of free fatty acids are reduced after refining. The acidity (free fatty acid) of a fat is normally a measure of the extent to which hydrolysis has liberated the fatty acids from their ester linkage with the parent glyceride molecule. Partly for this reason, acidity of ghee is extensively quoted as a free fatty acid content percent (% FFA). The FFA (Free fatty acids) content of fresh ghee varies from 0.09 to 0.28% with an average of 0.16%. The sensory quality of ghee deteriorates with increase in FFA (Free fatty acids) content. As per Standards, ghee should not contain FFA (Free fatty acids) more than 3%.

In this study free fatty acid of Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) was 1.24 and Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) was 0.33. It shows both samples have permissible percentage of free fatty

acids i.e., 3%. In Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) it has decreased significantly. It indicates quality of ghee increases after Murchana process. The free fatty acid ratio is an important quality characteristic. The lower it is, the better the storage and shelf life of the respective oil or fat will be. Crude pressed oils usually have a ratio of 0.1 or 3% and refined oils have 0.01 to 0.1%.

Total fatty acid²³

Total fatty acid of Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) was 2.46 and Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) was 0.66.

Solubility²⁴

It is one of the parameters to judge the purity, percentage composition of Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) and Murchita Ghrita (processed ghee). Both the samples were very soluble in hexane, indicative of good miscibility of samples with these organic solvents. Solubility of Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee) was 72.34%; Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) was 83.02%. Solubility has increased in Sukumara Ghrita prepared with Murchita Ghrita (processed ghee).

CONCLUSION

There was a golden yellow colour, bitter astringent odour and taste to Sukumara Ghrita prepared with Amurchita Ghrita (unprocessed ghee). Dark golden yellow colour, sour astringent odour and taste of Sukumara Ghrita prepared with Murchita Ghrita (processed ghee) are imparted by the drugs used for preparation. There was an increase in Specific Gravity, Saponification Value, Iodine Value, Refractive Index, Loss on Drying value and Ester value of Sukumara Ghrita prepared with Murchita Ghrita (processed ghee). There was a decrease in Acid Value, Density, Viscosity, Total fatty acid value and Free Fatty Acids of Sukumara Ghrita prepared with Murchita Ghrita (processed ghee). There was no rancidity in Sukumara Ghrita. Murchana (process) of Ghrita certainly plays an effective role in maintaining the stability of the lipid preparations and also it is important in increasing the therapeutic effect of the formulation. The parameters also aid in clearing the misconception of increase in the lipid profile after consumption of Ghrita (ghee) in Snehapana (oleation therapy) as a Purvakarma (preceding procedure) for Panchakarma therapies (purification therapy) and also for other Shamana Chikitsa (alleviating treatment) where Ghrita Kalpas (formulations of ghee) are used for therapeutic purpose. All these results of standard parameters contribute towards the evidence base to the reference mentioned as "Aadourmurchayetsneha" (Murchana as a pre requisite for lipid preparations) in Bhaisajya Ratnavali. From these analytical reports, it can be ascertained that Murchita Ghrita (processed ghee) when used in the preparation of Sukumara Ghrita, certainly attributes better quality of absorption, distribution, bioavailability, metabolism and therapeutic action.

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