PHYSICO-CHEMICAL STUDY OF PANCHATIKTA GHRITA PREPARED WITH MURCCHITA AND AMURCCHITA GHRITA

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Abstract: Swarasa (juice), Kalka (paste), Kwatha (decoction), Hima (cold infusion) and Phanto (hot infusion) are considered as five fundamental preparations mentioned in Ayurvedic pharmaceutics. The preparations like Avaloha Kalpana (confections), Vati Kalpana (tablet), Sneha Kalpana (fat preparation), Asava Arista (hydro-alcoholic preparation) etc. are considered as secondary preparations. Ghrita Kalpana (ghee) is one among secondary Ayurvedic dosage forms explained under the heading of Sneha Kalpana (fat preparations) in classical texts. Murechana Sanskara (fat processing) is one of the Sanskara (procedure) mentioned in Ayurvedic classical books. Murechana Sanskara is a unique process mentioned in Bhaishajya Ratnavali for both Taila (oil) and Ghrita (ghee) to reduce Amadosa (toxin), Durandhatha (bad odour) etc. and to enhance the Virya (potency) of Sneha. Now-a-days most of the Ayurvedic pharmaceutical companies do not follow the method of Murechana (procedure) as it increases the cost of preparation and time consumption will be more. In this study Panchatikta Ghrita is taken as one of the examples to prove the importance of Murechana (procedure). It is prepared with Murechita Ghrita (processed ghee) and with Amurechita Ghrita (unprocessed ghee) as per authentic text of Ayurvedic pharmaceutics. To know the significance of Murechana Sanskara (fat processing), all the four samples were subjected for the physico-chemical analysis. Increase in refractive index, specific gravity, saponification value, iodine value, loss on drying value, ester value, decrease in acid value and viscosity indicates better dissolution of medicaments in Murechita Ghrita (processed ghee). Results obtained from the analytical parameters are discussed and it gives scope for further study.

Keywords: Ghrita murechana (processing of ghee), Iodine value, Sneha kalpana (fat preparation), Sneha murechana (fat processing), Saponification value.

INTRODUCTION

Swarasa (juice), Kalka (paste), Kwatha (decoction), Hima (cold infusion) and Phanto (hot infusion) are the five fundamental preparations mentioned in Ayurvedic pharmaceutics [1]. Among these Swarasa (juice) is the most potent and heavy for digestion and Phanto (hot infusion) is the least potent and light for digestion. Kwatha Kalpana (decoction) is considered as one of the potent preparation and is lighter for digestion compared to Swarasa (juice) and Kalka (paste); it is the most widely used form of medicine in Ayurveda. Taila Paka (oil preparation), Ghrita Paka (ghee preparation), Kshira Paka (milk preparation), Avaloha (confections), Arishta (hydro-alcoholic preparation) re-considered as the Upakalpana (secondary preparations).

Sneha Kalpana (fatty preparations) is one of the commonly prescribed Ayurvedic dosage form in day to day practice. Although, lot of varieties of oils and fats are described in classical Ayurvedic texts, the most common amongst them are Taila (oil) and Ghrita (ghee) Kalpana (preparations). Sneha Kalpana (fatty preparations) is a pharmaceutical procedure to prepare oleaginous medicine from substances like Kalka (bolus of the drugs) and Drava (liquid material). They are prepared in specific...
proportions by subjecting them to uniform heating pattern and duration to fulfill certain pharmaceutical parameters as per the requirement of the therapeutics.

Among the Snehav (fat) mentioned in Ayurvedic classical texts, Ghrita (ghee) is the most easily available and is Satmya (wholesome) to all human beings, used extensively in the form of food and medicine. Any form of impurities present in the Ghrita (ghee) will be removed by the process of Ghrita Murchhana (processing of ghee). With this process, Ghrita (ghee) gets proper qualities, Varna (colour) and Gandha (odour) and it also ensures the therapeutic properties in Aushadhi Siddha Ghrita (medicated ghee) [2].

Before the preparation of Aushadhi Siddha Ghrita (medicated ghee), Ghrita (ghee) is supposed to undergo one particular Samskara (procedure) called Snehav Murchhana (processing of ghee or oil) as mentioned in Bhaishajya Ratnavali. It is applicable for both Ghrita (ghee) and Taila (oil). The main aim of Snehav Murchhana (processing of ghee) is to remove the Duangandha (bad odour), Amadosa (toxin), Ugrata (pungency), the bad characteristics of Snehav (fat) and enhance the Virya (potency) of Ghrita (ghee) and Taila (oil) [3].

If medicated Ghrita (ghee) is prepared without Ghrita Murchhana (processing of ghee), it may not contain standard qualities and not give expected results. Therefore to obtain standard qualities and anticipated effects, Ghrita Murchhana (processing of ghee) is required to get the physical stability, chemical and therapeutically useful properties in Aushadhi Siddha Ghrita (medicated ghee).

The term analysis means detailed examination of the drug. It reveals important aspects regarding the standardization of the drug. Without analytical study, research of a drug is incomplete. It provides some standards to judge its quality and also helps to interpret the pharmacokinetics and pharmacodynamics of the drug.

**MATERIALS AND METHODS**

**Materials - Ingredients**

The ingredients and their ratios for Ghrita Murchhana as per Bhaishajya Ratnavali are shown below in Table-1.

Raw drugs required for the preparation of Murchhita Ghrita (processed ghee) and Panchatikta Ghrita were collected from Teaching Pharmacy of Sri Dharmasthala Manjunatheshwara College of Ayurveda, Hassan. Preparation of Murchhita Ghrita (processed ghee) and Panchatikta Ghrita were conducted at Rasashastra and Bhaishajya Kalpana practical laboratory, Sri Dharmasthala Manjunatheshwara College of Ayurveda, Hassan as per the reference of Bhaishajya Ratnavali. Analytical study was conducted at S.D.M. Center for Research in Ayurveda and Allied Sciences, Udupi and Cerekalam, Koratty, Kerala, India.

For the preparation of Murchhita Ghrita, 250 g of each of Amalaki (Emblica officinalis), Haritaki (Terminalia chebula), Bibhitaki (Terminalia bellerica), Haridra (Curcuma longa), Mustaka (Cypinus rotundus), Matulunga (Citrus medica), were added in the form of Kalka (paste) to 6000 g of Ghrita (ghee) and 24 litres of water. The boiling was carried out on Mandagni (mild fire) for 17 hours in 2 days till confirmative tests like forming of wick when paste is rolled, absence of crackling sound when put on fire, subsiding of froth, characteristic odour, colour and taste were obtained. The final product of Murchhita Ghrita (processed ghee) obtained was 5280 g.

For the preparation of Panchatikta Kwatha (decocion), 800 g each of Vasa Patra (Adalodha vasica), Nimba Kwatha Curma (Azhardirakta indica), Guduchi Kwatha Curma (Tinospora cordifolia), Kantakari Kwatha Curma (Solanum sarattense) and Patola Kwatha Curma (Trichosanthus cucumerina) were added in 32 litres

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Latin name</th>
<th>Family</th>
<th>Part used</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amalaki</td>
<td>Emblica officinalis</td>
<td>Euphorbiaceae</td>
<td>Pericarp</td>
<td>1 pala (48 g)</td>
</tr>
<tr>
<td>Haridra</td>
<td>Curcuma longa</td>
<td>Zingiberaceae</td>
<td>Rhizome</td>
<td>1 pala (48 g)</td>
</tr>
<tr>
<td>Mustaka</td>
<td>Cypinus rotundus</td>
<td>Cypiceae</td>
<td>Rhizome</td>
<td>1 pala (48 g)</td>
</tr>
<tr>
<td>Haritaki</td>
<td>Terminalia chebula</td>
<td>Combretaceae</td>
<td>Pericarp</td>
<td>1 pala (48 g)</td>
</tr>
<tr>
<td>Bibhitaki</td>
<td>Terminalia bellerica</td>
<td>Combretaceae</td>
<td>Pericarp</td>
<td>1 pala (48 g)</td>
</tr>
<tr>
<td>Matulunga</td>
<td>Citrus Medica</td>
<td>Rutaceae</td>
<td>Fruit</td>
<td>1 pala (48 g)</td>
</tr>
<tr>
<td>Goghrita</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1 prastha (768 g)</td>
</tr>
</tbody>
</table>

*Table 1: Showing the ingredients and their ratios for Ghrita Murchhana by Bhaishajya Ratnavali*
Physicochemical Study of Ghrita

01. Colour
02. Odour
03. Refractive index at 25°C
04. Specific gravity
05. Saponification value
06. Acid value
07. Iodine value
08. Loss on drying at 105°C
09. Viscosity
10. Ester value
11. Rancidity
12. Peroxide value

OBSERVATIONS AND RESULTS

Organoleptic evaluation

Organoleptic evaluation is used most effectively to resolve unsatisfactory product problems. It refers to evaluation of the drug by colour, odour, taste, consistency, size, shape, texture, etc. It is a technique of qualitative evaluation based on the study of sensory profiles of the drug. Organoleptic evaluation means conclusions drawn from studies resulted due to impressions on organs of senses. Organoleptic characters are very useful parameters to determine and compare the quality of the samples. In this study parameters like colour, taste and consistency were considered (Table-2).

PHYSICO-CHEMICAL ANALYSIS

The results of physico-chemical evaluation of Ghrita (ghee) samples are depicted in Table-3.

DISCUSSION

Murechhana Samskara (process) converts the yellow colour of Ghrita (ghee) into dark yellow in case of Murechita Ghrita (processed ghee). This colour is due to the drugs used in the Murechhana Samskara (processing of ghee) like Haridra (Curcuma longa) which contains Curcumin as a colouring agent. Yellow colour of the Ghrita (ghee)

Table 2: Showing organoleptic characteristics of Ghrita (Ghee) samples

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Ghrita (Ghee)</th>
<th>Murechita Ghrita (Processed Ghee)</th>
<th>Panchatikta Ghrita prepared with Amurechita Ghrita (unprocessed Ghee)</th>
<th>Panchatikta Ghrita prepared with Murechita Ghrita (Processed Ghee)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Light yellow</td>
<td>Dark yellow</td>
<td>Green</td>
<td>Dark green</td>
</tr>
<tr>
<td>Odour</td>
<td>Characteristic Odour of ghee</td>
<td>Aromatic odour</td>
<td>Bitter odour</td>
<td>Sour, astringent odour</td>
</tr>
<tr>
<td>Taste</td>
<td>Characteristic taste of ghee</td>
<td>Astringent Taste</td>
<td>Bitter</td>
<td>Sour, astringent taste</td>
</tr>
<tr>
<td>Consistency</td>
<td>Liquid</td>
<td>Viscous</td>
<td>Less viscous</td>
<td>Viscous</td>
</tr>
</tbody>
</table>
Table 3: Showing the results of physicochemical evaluation of Ghrita (Ghee) samples

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Ghrita (unprocessed Ghee)</th>
<th>Maruchita Ghrita (processed Ghee)</th>
<th>Panchatikta Ghrita prepared with Amuruchita Ghrita (unprocessed Ghee)</th>
<th>Panchatikta Ghrita prepared with Maruchita Ghrita (processed Ghee)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific gravity at 25[5]</td>
<td>0.90576</td>
<td>0.91096</td>
<td>0.91036</td>
<td>0.91046</td>
</tr>
<tr>
<td>Acid value[7]</td>
<td>2.256</td>
<td>1.046</td>
<td>2.472</td>
<td>1.469</td>
</tr>
<tr>
<td>Iodine value[8]</td>
<td>7.184</td>
<td>7.654</td>
<td>7.231</td>
<td>7.6</td>
</tr>
<tr>
<td>Loss on drying[9]</td>
<td>0.530</td>
<td>0.713</td>
<td>0.557</td>
<td>0.823</td>
</tr>
<tr>
<td>Viscosity at 29°C[10]</td>
<td>63.696</td>
<td>58.878</td>
<td>61.617</td>
<td>60.314</td>
</tr>
<tr>
<td>Ester value</td>
<td>241.196</td>
<td>294.584</td>
<td>253.328</td>
<td>293.733</td>
</tr>
<tr>
<td>Rancidity</td>
<td>Not rancid</td>
<td>Not rancid</td>
<td>Not rancid</td>
<td>Not rancid</td>
</tr>
<tr>
<td>Peroxide value</td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
<td>0.84%</td>
</tr>
</tbody>
</table>

was converted into green in case of Panchatikta Ghrita prepared with Amuruchita Ghrita (unprocessed ghee). The colour was imparted by Kwatha Dravya (drugs used for preparation of decoction) like Vasa (Adathoda vasica) and Nimba (Azhardirakta indica). Yellow colour of the Ghrita (ghee) was converted into dark green in case of Panchatikta Ghrita prepared with Murchita Ghrita (processed ghee). The colour was imparted by Murchita Ghrita (processed ghee) and Kwatha Dravya (drugs used for preparation of decoction) like Vasa (Adathoda vasica) and Nimba (Azhardirakta indica).

The characteristic odour of Ghrita (ghee) was converted into aromatic odour in case of Murchita Ghrita (processed ghee) due to the drugs used in Murchchan (processe (ghee) like Musta (Cyperus rotundus) and Haridra (Curcuma longa). The characteristic smell of Ghrita (ghee) was converted into bitter in case of Panchatikta Ghrita prepared with Amuruchita Ghrita (unprocessed ghee) due to the incorporation of Kwatha Dravya (drugs used for preparation of decoction) like Vasa (Adathoda vasica), Nimba (Azhardirakta indica) and Patola (Trichosanthus cucumerina). The characteristic smell of Ghrita (ghee) converted into sour, astringent odour in case of Panchatikta Ghrita prepared with Murchita Ghrita (processed ghee) is due to the incorporation of drugs used in Murchita Ghrita (processed ghee) and Kwatha Dravya (drugs used for preparation of decoction) Vasa (Adathoda vasica), Nimba (Azhardirakta indica) and Patola (Trichosanthus cucumerina).

The characteristic taste of Ghrita (ghee) was converted into astringent in case of Murchita Ghrita (processed ghee) due to the drugs used in Murchchan Sanskara (process) like Musta (Cyperus rotundus) and Haridra (Curcuma longa). The characteristic taste of Ghrita (ghee) was converted into bitter in case of Panchatikta Ghrita prepared with Amuruchita Ghrita (unprocessed ghee) due to the contact of Kwatha Dravya (drugs used for preparation of decoction) like Vasa (Adathoda vasica), Nimba (Azhardirakta indica) and Patola (Trichosanthus cucumerina). The characteristic taste of Ghrita (ghee) was converted into sour, astringent taste in case of Panchatikta Ghrita prepared with Murchita Ghrita (processed ghee) due to the contact of drugs used in Murchita Ghrita (processed ghee) and Kwatha Dravya (drugs used for preparation of decoction) like Vasa (Adathoda vasica), Nimba (Azhardirakta indica) and Patola (Trichosanthus cucumerina).

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

Refractive index of Ghrita (ghee) depends on the chain length. With increase in chain length, refractive index of Ghrita (ghee) increases. There was no change in the refractive index of Ghrita (ghee) and Murchita Ghrita (processed ghee), as ghee is denser than air, refractive index is always more than one. This is confirmed from the present study.

Increase in refractive index of Panchatikta Ghrita prepared with Murchita Ghrita (processed
ghee) indicates the increase of its density. It is due to the dissolution of bio constituents in the Murechita Ghrita (processed ghee). It also suggests increase in the degree of unsaturation indicating the essential role of unsaturated fatty acids on the health of an individual, especially in reducing the cholesterol and Low Density Lipoprotein levels (LDL).

Specific gravity of Murechita Ghrita (processed ghee) and Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) was more compared to Ghrita (ghee) and Panchatikta Ghrita prepared with Amurechita Ghrita (unprocessed ghee).

Specific gravity of Ghrita (ghee) determines the solid to liquid ratio in Ghrita (ghee). Increase in specific gravity after Murechana (process) indicates addition of some bio constituents from the drugs used for Murechana (process).

Saponification value indicates breaking down of oil into glycerol and free fatty acids by treatment with alkali. The higher saponification values of Murechita Ghrita (processed ghee) and Panchatikta Ghrita prepared with Murechita 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 Ghrita (ghee), leading to the increased efficacy of the Aushadhi Siddha Ghrita (medicated ghee).

Analytical values have shown increase in the saponification values of Murechita Ghrita (processed ghee) and Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) which is suggestive of beneficial effect of Murechana Samskara (process) in increasing the degree of unsaturation indicating the essential role of unsaturated fatty acids on the health of an individual.

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 processing of fats.

Analytical parameters shows decreased acid values in Murechita Ghrita (processed ghee) and Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) indicating that Murechana (process) has beneficial effect in processing of ghee and decrease in the degree of rancidity, ultimately reducing the undesirable effects of Ghrita (ghee).

Analytical parameters shows that Iodine value of Ghrita (ghee) was increased after Murechana (process) in case of Murechita Ghrita (processed ghee) and Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) which is suggestive of beneficial effect of Murechana Samskara (process) in increasing the degree of unsaturation indicating the important role of unsaturated fatty acids in reducing the cholesterol and LDL cholesterol levels.

Loss on drying is indicative of moisture content of the preparation present. The higher the value more will be the amount of moisture and Ghrita (ghee) will be more susceptible for rancidity.

Loss on drying values of Murechita Ghrita (processed ghee) and Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) have increased after Murechana (process) and this is due to the addition of water in the preparation.

Viscosity of Murechita Ghrita (processed ghee) and Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) has decreased after Murechana Samskara (process) and it is due to addition of the Drava Dravya (liquids) like water as these are less viscous than Ghrita (ghee).

Esters are the fatty acids with glycerol. As the esters increase, the chances of rancidity decrease.

Ester values of Murechita Ghrita (processed ghee) and Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) has increased after Murechana Samskara (process) indicating that the chances of rancidity have reduced.

All the four samples of Ghrita (ghee) have shown no 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 flavors and odour 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.

The most common cause of milk fat deterioration is rancidity which is due to oxidation, thereby affecting its flavor and quality. The acceptability of ghee largely depends on the extent to which the oxidative deterioration has occurred. It
is generally considered that the first product formed by oxidation of an oil or fat is hydro peroxide. The peroxides further decompose to secondary oxidation products i.e., aldehydes and ketones which impart off flavor in ghee.

Peroxide value is an indicator of products of primary oxidation and thus measures the rancidity or degree of oxidation but not the stability or shelf-life of a fat. Fresh ghee has a peroxide value equal to zero. According to its Peroxide value, ghee is graded as follows Table 4.

In this study, peroxide values of Ghrita (ghee), Murechita Ghrita (processed ghee), Panchatikta Ghrita prepared with Amurechita Ghrita (unprocessed ghee) were zero and Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) was 0.84%.

As the normal peroxide value ranges in ghee is below 4 that is within the permissible limits of unrancification. But more peroxide value signifies its higher tendency for rancification. Above values of all four samples indicates that they are free from rancidity.

Previous study conducted by Haldar Pronab, Mahapatra B.N, Agrawal D.S and Singh A.K on Panchatikta Ghrita shows similar values on Physico-chemical analysis. Author has mentioned in detail about procedures of parameters [12].

**CONCLUSION**

Increase in refractive index of Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) indicates the increase of its density, better dissolution of medicaments and increase in the chain length. Increase in the specific gravity of Murechita Ghrita (processed ghee) and Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) indicates addition of some bio constituents from the drugs used for Murechana (process). Increased saponification values of Murechita Ghrita (processed ghee) and Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) indicates the content of low molecular weight fatty acids, increase in the degree of unsaturation suggesting important role of unsaturated fatty acids in reducing the cholesterol and LDL cholesterol level. Decreased acid values of Murechita Ghrita (processed ghee) and Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) indicates that the Murechana (process) has beneficial effect in processing of ghee and decrease in the degree of rancidity, ultimately reducing the undesirable effects of Ghrita (ghee).

Increased iodine values of Murechita Ghrita (processed ghee) and Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) suggests the beneficial effect of Murechana (process) in increasing the degree of unsaturation. Increased loss on drying values of Murechita Ghrita (processed ghee) and Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) indicates the addition of water in the preparation. Decreased viscosity of Murechita Ghrita (processed ghee) and Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) indicates the addition of Drava Dravya (liquids) like water.

Increased Ester values of Murechita Ghrita (processed ghee) and Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) indicates the reduction in chances of rancidity.

All the four samples show negative result for rancidity. This indicates all the samples are devoid of free radicals which are known to cause cellular damage, digestive distress and deplete the body of vitamins B and E.

As the three samples have peroxide value zero and another sample has the value below one, which is within the permissible limits of unrancification. This indicates that all four samples are free from rancidity which is due to oxidation and is cause for imparting off flavor.

Organolectic changes in Murechita Ghrita (processed ghee) and Panchatikta Ghrita prepared with Murechita Ghrita (processed ghee) are because of the drugs employed in the process of Murechana (process).

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