



Research Article

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PHYSICOCHEMICAL ANALYSIS OF MURCHHITA YASHTYADI GHRITA

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ABSTRACT

Background: According to the WHO, malnutrition is estimated to contribute to more than one-third of all child deaths, although most often, it is not listed as the direct cause. Nutrition-specific interventions, which address the immediate causes of undernutrition, have been proven to deliver among the best value for money of all development interventions. Ayurvedic literature has numerous herbal preparations in the form of medicines that need validation in today's perspectives; Yashtyadi ghrita is one of those classical herbal formulations used in the management of Balsosha, mentioned in the famous textbook Ashtanga Samgraha Uttarasthan under the Balaupcharaniya chapter. Yashtyadi ghrita was prepared as per textual reference under the heading of sneha kalpana in Sharangdhara Samhita. To date, no research has been carried out on Yashtyadi ghrita. Therefore, the present study was planned to evaluate the physicochemical analysis of Yashtyadi ghrita. Aims and objectives: The aim was to prepare Yashtyadi ghrita and evaluate its pharmaceutical and analytical parameters. Materials and methods: Yashtyadi ghrita was prepared as per Sharangdhara Samhita, while murchhana of ghrita was done as per API. Result: All the physicochemical parameters of Yashtyadi ghrita are found within the reference range explained in API for ghrita kalpana. Conclusion: Physicochemical parameters of Yashtyadi ghrita explained that no heavy metals, aflatoxins, or active microbes were detected. Therefore, it was a safe preparation for internal administration.

Keywords: Ashtanga Samgraha, Balsosha, Marasmus, Murchhana Samskara, Murchhita Ghrita.

INTRODUCTION

Malnutrition, though frequently not recorded as a direct cause of death for children, is thought to be a factor in more than one-third of all child fatalities, according to the WHO.¹ One of the best values for money among all development initiatives has been demonstrated for nutrition-specific interventions, which target the direct causes of undernutrition. The National Family Health Surveys (NFHS) are nationwide surveys conducted with a representative sample of households nationwide. The Ministry of Health and Family Welfare (MOHFW), Government of India (GOI), initiated this survey to provide data on the high-quality population and health indicators. The National Family Health Surveys are a significant landmark in developing India's demographic and health database. The National Family Health Survey (NFHS-3) was done in 2005-2006.² The NFHS-3 data shows that 48% of children under 5 years are stunted, and 20% of children under 5 years are wasted. 43% of children under the age of 5 years are underweight for their age. Most children suffering from undernutrition (80%) are the mild and the moderate forms that go unnoticed.³ According to recently released NFHS-4 carried out in 2015-2016, 43% of India's children under the age of five are underweight, 38.4% are stunted, and 21% are wasted. A recent report reveals that in Rajasthan, 36.7% of children under the age of five are underweight, 39.1% are stunted, and 23.0% are wasted.⁴ Balsosha in Ayurveda is such a disease which can be correlated with malnutrition. The complete management of Balsosha was described in the ancient text, and the most effective

preparations were also described. Yashtyadi ghrita is one of those traditional herbal formulations used in the management of Balsosha and is mentioned in the well-known textbook Ashtanga Samgraha Uttarasthan⁵ under the Balaupcharaniya chapter and Ashtanga Hridaya Uttarasthan under the Balamya Pratisadiya chapter respectively.⁶ Many herbal preparations in the form of ghrita are mentioned in Ayurvedic literature, but now it needs a scientific perspective. Yashtyadi ghrita preparation in accordance with the textual reference has been described under the name of a sneha kalpana in the Sharangdhara Samhita. In Bhaishajya Ratnavali, it is explicitly stated that murchhana samskara must be done prior to the preparation of medicated ghrita.⁷ Murchhana purifies the ghrita by removing impurities like aam dosha and gandha dosha. Along with this, ghrita improves the medicinal qualities of medicated ghee.⁸

No research work has been reported on Yashtyadi ghrita to date. Therefore, research work was planned to evaluate the efficacy of Yashtyadi ghrita in the management of Balsosha with particular reference to marasmus. In this direction, the first and foremost thing to prepare for the Yashtyadi ghrita formulation as per textual reference and need to physicochemical analysis to validate its utilisation and safety among humans.

Aims and Objectives

- To prepare Murchhita Yashtyadi ghrita as per textual reference.

- To study the physicochemical parameters of Murchhita Yashtyadi ghrita as per API.
- To determine microbial count, heavy metals and aflatoxins in Murchhita Yashtyadi ghrita.

MATERIALS AND METHODS

Pharmaceutical Study

Procurement of Raw Drugs: Raw materials for the preparation and murchhana of Yashtyadi ghrita were procured from the local market of Jodhpur, India. Pharmacognostic examination of raw drugs was done by Postgraduate Department of Dravyaguna, Postgraduate Institute of Ayurveda, Dr. S. R. Rajasthan Ayurved University, Jodhpur, Rajasthan, India.

Ghrita Murchhana: To remove ama dosha and durgandhata (foul odour) from raw cow's clarified butter¹⁰ (go-ghrita)^{11,12} was the primary aim of the murchhana procedure. For this Amalaki (*Emblica officinalis* Gaertn), Haritaki (*Terminalia chebula* Retz), Vibhitaki (*Terminalia bellirica* Roxb), Haridra (*Curcuma longa* Linn), Musta (*Cyperus rotundus* Linn), and Matulunga (*Citrus medica* Linn) swarasa, cow's clarified butter (go-ghrita). Murchhana was taken. Except for Matulunga (*Citrus medica* Linn), the aforementioned murchhana herbs were dried in the sunlight until dry. Then, each 1.25 kg of the coarse powder of these substances was prepared, and 1.25 litre of Matulunga (*Citrus medica* Linn) swarasa (juice) was added.

All the material was transferred to the kadhai to make the kalka. Cow's clarified butter (go-ghrita) (20 litres) was placed into a stainless-steel container and cooked on a mridu agni (mild temperature 50–90 °C) to begin the murchhana process. To prepare sneha paka, kalka and four times as much water were added to the mixture. Ghrita, kalka, and water were all combined and heated very little till the stage of madhyama paka. The material was constantly stirred to keep kalka protected from burning and adhering to the bottom of the container throughout the entire process. The murchhana process took 16 hours and 35 minutes to complete. Thus, murchhita go-ghrita was taken out.⁹

Preparation of Yashtyadi ghrita: Firstly, the coarse powder was made of 630 gm each of clean and dried herbs like Madhuyesti (*Glycyrrhiza glabra* Linn.), Pippali (*Piper longum* Linn.), Lodhra (*Symplocos racemosa* Roxb.), Padamakha (*Prunus cerosides* D. Don.), Kamal (*Nelumbo nucifera* Gaertn), Rakta Chandan (*Santalum album* Linn.), Talispatra (*Abies webbiana* Lindle) and Sariva (*Hemidesmus indicus* R. Br.). Transferred this powdered ingredient to the wet grinder and grind with sufficient water to prepare 5.040 kg of kalka. Then, 20 litres of murchhita go-ghrita were taken and heated gently in a kadhai. Add increments of kalka in it. Heated for 3 hours with constant stirring, maintaining the temperature between 500 and 900 °C during the first hour of heating. Stopped heating and allowed standing overnight. Started the heating the next day, observed the boiling mixture for the subsidence of froth (phenashanti), and constantly checked the kalka for the formation of varti (madhyama paka lakshan). Exposed the varti to flame and confirmed the absence of a crackling sound, indicating the absence of moisture. Stopped heating when the kalka formed a varti¹³, and the froth subsided. Filtered while hot through a muslin cloth and allowed cooling. Then, packed it in tightly closed plastic containers to protect it from light and moisture.

Analytical Study

Analytical chemistry is one of the essential disciplines of science that deals with the qualitative and quantitative analysis of various substances. It is a series of processes to identify and authenticate or quantify a substance, the solution's or mixture's components. Analytical study of a drug also helps to interpret its pharmacokinetics and pharmacodynamics. Parameters for the various studies were taken according to API.¹⁴

Place of work for Analytical Study

Cultivator Phyto Lab Pvt. Ltd. Sonamukhi Nagar, Sangaria Fanta, Jodhpur, India.

Sample Registration No.- CPL 2023/00336

Sample Code- CPL 2023/47203

Date of Sample sent to Lab and Sample Registration- 26/5/2023

Date of start of analysis- 27/5/2023

Date of completion of Analysis- 05/6/2023

Duration- 10 days

OBSERVATION AND RESULTS

Table 1: Physicochemical Parameters of Murchhita Yashtyadi ghrita

Parameters	Murchhita Yashtyadi ghrita	Limits As per API for Murchhita Cow's Clarified Butter (Go-ghrita)	Test Methods for Murchhita Cow's Clarified Butter (Go-ghrita) as per API Standards
Appearance	Viscous	-	-
Colour	Algae Green	-	-
Odour	Pleasant	-	-
Taste	Bitter	-	-
pH Value	5.20	-	-
Refractive Index at 25 °C	1.4609	1.439	API Part II Vol.III--2010
Viscosity	36.0 mPas	38.0 mPas	CPL/STP/C/60
Iodine Value	33.59	100	API Part II Vol.III-2010
Saponification Value	227.87	229	API Part II Vol.III-2010
Acid Value	1.180	Not more than 2.8	API Part II Vol.III-2010
Peroxide Value	11.92	Not more than 1.7	API Part II Vol.III-2010

Table 2: Micro bacterial Contamination in Murchhita Yashtyadi ghrita

Biological	Value	Limit As per API	Test Methods for Normal Cow's Clarified Butter (Go-ghrita)
Total Aerobic Microbial Count	<10 cfu/ml	10 ⁵ cfu/gram	API Part II Vol.III-2010
Total Yeast and Mould Count	<10 cfu/ml	10 ³ cfu/gram	API Part II Vol.III-2010
<i>Escherichia coli</i>	Absent	Absent/gram	API Part II Vol.III-2010
<i>Salmonella species</i>	Absent	Absent/gram	API Part II Vol.III-2010
<i>Staphylococcus aureus</i>	Absent	Absent/gram	API Part II Vol.III-2010
<i>Pseudomonas aeruginosa</i>	Absent	Absent/gram	API Part II Vol.III-2010

Table 3: Heavy Metals in Murchhita Yashtyadi ghrita

Heavy Metals	Value of Heavy Metals	Limit As per API	Test Methods for Normal Cow's Clarified Butter (Go-ghrita)
Lead	0.018 mg/kg	NMT 10 ppm	CPL/STP/C/16
Cadmium	BLQ (LOQ-0.010)	NMT 0.3 ppm	CPL/STP/C/16
Mercury	BLQ (LOQ-0.010)	NMT 1.0 ppm	CPL/STP/C/16
Arsenic	0.019 mg/kg	NMT 3.0 ppm	CPL/STP/C/16

Note- BLQ- Below limit of Quantification, LLQ- Limit of Quantification (1 mg/kg- 1ppm, 1ppt= 1000 mg/kg)

Table 4: Aflatoxins in Murchhita Yashtyadi ghrita

Aflatoxins	Value of Aflatoxin	Limit As per API	Test Methods for Normal Cow's Clarified Butter (Go-ghrita)
B1	Not detected (LOQ-0.50)	Absent	CPL/STP/C/19
B2	Not detected (LOQ-0.50)	Absent	CPL/STP/C/19
G1	Not detected (LOQ-0.50)	Absent	CPL/STP/C/19
G2	Not detected (LOQ-0.50)	Absent	CPL/STP/C/19

Note- BLQ- Below limit of Quantification, LLQ- Limit of Quantification

Table 5: Fats and Protein content in Murchhita Yashtyadi ghrita

Particulars	Value	Test Methods for Normal Cow's Clarified Butter (Go-ghrita)
Fat Content	99.50%	FSSAI Lab Manual Dairy and Dairy Products (Method No.FSSAI-01.082:2022) ¹⁵
Protein Content	0.27%	IS 7219:1973

DISCUSSION

Yashtyadi ghrita is one of the ghrita preparations mentioned in the management of Balsosha in Uttarasthan of Ashtanga Samgraha. Before Yashtyadi ghrita was prepared, murchhana sanskara of cow's clarified butter (go-ghrita) was done to remove aam dosha and foul odour. After the murchhana sanskara, Yashtyadi ghrita was prepared under the keen guidance of the director of Ayurveda pharmacy of Postgraduate Institute of Ayurveda, Jodhpur, India.

The organoleptic study of Murchhita Yashtyadi ghrita showed algae green colour, pleasant odour, bitter taste and 5.20 pH value, as shown in Table 1.

The viscosity of the liquid is the resistance to the flow of a liquid. All liquids appear resistant to flow change from one liquid to another; the water flows faster than glycerine; subsequently, the viscosity of water is less than glycerine at the same temperature. Viscosity occurs because of contact between liquid layers with each other. The Ostwald viscometer measures the viscosity. Relative Viscosity is the ratio of the fluid's absolute viscosity to water's viscosity at a specific temperature. In the present study, the viscosity of Murchhita Yashtyadi ghrita was observed at 36.0 mPas by adopting API Part II Vol.III--2010 methodology shows Yashtyadi ghrita was less viscous and easily absorbable in the gastrointestinal tract. (Table 1)

The refractive index of a substance with reference to air is the ratio of the sine of the angle of incidence to the sine of the angle of refraction of a beam of light passing from air into the substance. The refractive index is an intrinsic property showing the substance's purity. In the present study, it was found 1.4609 by adopting API Part II Vol.III-2010 methodology. (Table 1)

The acid value is the amount of potassium hydroxide (KOH) required to neutralise the free acids in 1 gm of the substance. The acid value shows the free fatty acids in the ghrita sample. The free fatty acid causes the compound's rancidity. They get increasingly rancid as free fatty acid levels rise. A smaller percentage of free fatty acids or the absence of free fatty acids reduces the likelihood of the substance becoming rancid and adopting API Part II Vol.III-2010 methodology observed the acid value of Murchhita Yashtyadi ghrita was 1.180, as shown in Table 1.

The peroxide value is the number of milliequivalents of active oxygen that expresses the amount of peroxide contained in 1000 gm of the substance. The percent of oxidation of ghrita is indicated by the peroxide value. It aids in our quest to determine the sample's stability. The likelihood of developing rancidity increases with increasing peroxide levels, which indicates more oxidation. The peroxide value of Murchhita Yashtyadi ghrita was found to be 11.92 by adopting API Part II Vol. III-2010 methodology, which was higher than the standard value. (Table 1) It showed that it was more stable and not easily oxidised.

The iodine value of a substance is the weight of iodine absorbed by 100 parts by weight of the substance. The iodine value quantifies the degree of oil unsaturation. The iodine is absorbed into the fatty acid chain, wherever double bonds exist. As a result, the amount of iodine that ghee absorbs determines the degree of unsaturation or recodification. The shelf-life of ghrita is negatively correlated with its iodine content. The iodine value of Murchhita Yashtyadi ghrita was found to be 33.59 by adopting API Part II Vol.III-2010 methodology. (Table 1). This indicated that Murchhita Yashtyadi ghrita had a more extended shelf than normal ghrita; however, a stability study was required to know the exact shelf life of Murchhita Yashtyadi ghrita.

The saponification value is the number of mg of KOH required to neutralise the fatty acids resulting from the complete hydrolysis of 1gm of fat. A high saponification value indicates the presence of fatty acids with low molecular weights (molecules in simple form). The molecules are in a complex structure when the saponification value is low. Higher saponification value medicated ghee absorbs more effectively. The saponification value of Murchhita Yashtyadi ghrita was found to be 227.87, adopting API Part II Vol.III-2010 methodology. (Table 1). This indicated that Murchhita Yashtyadi ghrita had a higher saponification value, which was helpful to its easy absorption and digestion.

Total microbial count and total yeast count in Murchhita Yashtyadi ghrita were found in less than 10 cfu/ml by adopting API Part II Vol.III-2010 methodology (Table 2), which was far away from the limit of API. *Escherichia coli*, *Salmonella species*, *Staphylococcus aureus* and *Pseudomonas aeruginosa* were not seen in Murchhita Yashtyadi ghrita, which showed its better shelf life.

Murchhita Yashtyadi ghrita was analysed for heavy metals (Lead, Cadmium, Mercury and Arsenic) in them. The method used for analysis was CPL/STP/C/16. In the present study of Murchhita Yashtyadi ghrita, Cadmium and Mercury were not detectable, while Arsenic and Lead were seen in trace amounts that were far away from the permissible limit as per API. (Table 3)

Aflatoxins are metabolites created by toxic mould strains. Murchhita Yashtyadi ghrita was analysed for the presence of Aflatoxins (B1, B2, G1, and G2) in them. No aflatoxins were detected in Murchhita Yashtyadi ghrita by adopting the CPL/STP/C/19 methodology, which showed that ghrita was safer for human use.

Fat and protein content of Murchhita Yashtyadi ghrita was observed at 99.50% by FSSAI lab manual dairy and dairy products¹⁵ (Method No.FSSAI-01.082:2022) methods and 0.27% by IS 7219:1973.

CONCLUSION

An analytical study of Murchhita Yashtyadi ghrita showed that all physicochemical parameters of ghrita were found within the standard limit as API for regular cow's clarified butter (go-ghrita). Minute levels of total microbial and yeast contamination were seen in Murchhita Yashtyadi ghrita, whose value was far from the permissible value per API. Lead and Arsenic were seen in very trace amounts in Murchhita Yashtyadi ghrita, which was also far from the permissible value per API. Cadmium, Mercury and aflatoxins were not detected in Murchhita Yashtyadi ghrita. The present study concluded that Murchhita Yashtyadi ghrita was a safe and effective formulation with a long shelf life.

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