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Chemical Analysis: A Common Medicated Oil Base use in Ayurveda

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***Abstract*- Medicated oil preparation process is named as Sneha Kalpana in Ayurveda and they are used to treat wide range of diseases. Medicated oils are prepared by prolonged cooking with coconut/ king coconut oil, sesame oil, different crude oils like castor oil, mustard oil, ghee and substances like, Kalka (herbal paste prepared by different parts of botanicals), Kvatha (specifically prepared decoction in accordance of Ayurvedic principles) or Drava Dravya (any other liquid such as milk, self-expressed juices, etc.). A considerable amount of sesame oil and ghee is present in many medicated oils such as Dashamooladi Ghrita, Chitrakadi Ghrita, Baladi Ghrita, Nirghundi Taila, Ashwandha Ghrita, Vipadikahara Ghrita, Moolaka Taila, Sacharadi Taila, Swandranstha Taila and Rasna Taila. Therefore, it is very important to assess the quality of the base consist of sesame oil and ghee. The objective of the present study was to evaluate the quality in terms of specific gravity, refractive index, acid value, saponification value and development of TLC profile of the base consists of sesame oil and ghee in a ratio of 1:1 w/w by using standard protocols. Results revealed that specific gravity, acid value, saponification value, peroxide value and iodine value were 0.91± 0.00, 2.00 ± 0.06 KOH/g, 431.57 ± 1.43 mg/g, 1.33 ± 0.06 Meq/kg and 56±1.04 g I_2/100g respectively. TLC fingerprint profiles were developed using 3 solvent systems. In conclusion, present study will help to establish quality control parameters of base of medicated oils which consist of sesame oil and ghee in a ratio of 1:1 w/w.**

***Index Terms*- ghee, medicated oil, sesame oil, quality assessment.**

I. INTRODUCTION

In traditional and Ayurveda medicinal systems, different types of medicated oils are prescribed for various ailments. Medicated oil preparation process is named as Sneha kalpana in Ayurveda and they are used to treat very wide range of diseases and for cosmetic purposes among the patients of all age groups. Medicated oils are prepared by prolonged cooking with coconut/king coconut oil, sesame oil, different crude oils like castor oil, mustard oil, ghee and occasionally both sesame oil and ghee use as the base. Substances like, Kalka (herbal paste prepared by different parts of botanicals), Kvatha (specifically prepared decoction in accordance of Ayurvedic principles) or Drava Dravya (any other liquid such as milk, self expressed juices, meat juice, etc.) are also added to enhance the therapeutic properties [1].

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Most of the medicated oils are used externally. However, some medicated oils are taken internally also.

A considerable amount of sesame oil and cow's ghee are present in the Vipadikahara ghrita taila [2] and combination of those two ingredients is used as a base when preparing many medicated oils such as Dashamooladi Ghrita, Chitrakadi Ghrita, Baladi Ghrita, Nirghundi Taila, Ashwandha Ghrita, Vipadikahara Ghrita, Moolaka Taila, Sacharadi Taila, Swandranstha Taila and Rasna Taila. Among these medicated oils quality assessments were carried out for Chitrakadi Ghrita [3], Nirghundi Taila [4], Ashwandha Ghrita [5] and Vipadikahara Ghrita [2]. Therefore, it is very important to assess the quality of the base consist of sesame oil and cow's ghee in a ratio of 1:1. The objective of the present study was to evaluate the quality of the base in terms of specific gravity, refractive index, acid value, saponification value and development of TLC profile using the standard protocols.

II. MATERIALS AND METHODS

A. Preparation of the base

Base was prepared by mixing equal amounts of sesame oil and ghee in a ratio of 1:1 (w/w).

B. Evaluation of Physico-chemical parameters

Physicochemical parameters such as colour, smell, appearance, specific gravity, saponification value, peroxide value, acid value and iodine value were determined in oil base according to the standard techniques.

C. Determination of specific gravity

Firstly empty specific gravity bottle was weighed, and then filled with oil base mixture and weighed again. After that, specific gravity bottle was well cleaned, dried, filled with distilled water and weighed. The difference in weights was divided by the weight of an equal volume of water to give the specific gravity of oil base [6].

D. Acid value

Acid value was determined according to SLS [7] guidelines. Phenolphthalein was used as an indicator.

E. Saponification value

Saponification value was determined according to SLS [7] guidelines and phenolphthalein was used as an indicator.

F. Peroxide value

A starch solution was used as indicator and followed the method as described in SLS [7].

G. Determination of iodine value

A starch solution was used as indicator and followed the method as described in [8].

H. Thin Layer Chromotography (TLC) fingerprint for the oil base

In brief, oil sample was accurately weighed (5.0 g) into a round bottom flask and distilled water (100 mL) was added and refluxed for 1 h. Then using a separatory funnel water layer was separated and sequential fractionation was carried out using dichloromethane and ethyl acetate. Finally, dichloromethane fraction and ethyl acetate fraction were concentrated using a rotovapour (Buchi, B-480) separately and spotted on TLC plates. TLC fingerprint profile was determined using following conditions:

Solvent system for dichloromethane fraction
Methanol: Cyclohexane: Dichloromethane (0.2: 1.0:3.8 v/v/v)
Solvent system for ethyl acetate fraction
Methanol: Cyclohexane: Dichloromethane (0.25: 1.5: 3.75 v/v/v)
Absorbent
Silica gel-GF_{254}pre- coated plate
Detection
Direct visualization: Under UV (π at 254 nm and 366 nm)
After spraying : Vanillin sulphuric acid was sprayed to the TLC plate and heated at 105 °C for 5 min

III. RESULTS AND DISCUSSION

In this study specific gravity, iodine value, acid value and some other chemical analysis on mixture of sesame oil and ghee was determined (Table 1). The acid value which is an index of free fatty acid content due to enzymatic activity in the medicated base was found to be low (2.00 ± 0.06 mg KoH/g). Acid value of the medicated base is below the minimum acceptable value of 4.0% for sesame recommended by the Codex Alimentarius Commission for oil seeds [9] and higher than that of ghee 0.374 ± 0.02 mg KoH/g [10].

Table 1. Physico-chemical parameters of sesame oil and ghee in a ratio of 1:1 (w/w)

Physicochemical parameters	Results
Colour	Light brown
Smell	Fragrant
Appearance	Viscous
Touch	Oily
Clarity	Not clear in room temperature and clear when melting
Specific gravity	0.91± 0.00
Acid value (mg KoH/g)	2.00 ± 0.06
Saponification value mg/g	431.57 ± 1.43
Peroxide value Meq/Kg	1.33± 0.16
Iodine value(g I_2/100g)	56±1.04

Peroxide value is a measure of the active oxygen in the oil and high starting levels of peroxide values indicates the low quality of the oil. According to the SLS [7] standard, upper limit of the peroxide value of oil is 10 Meq/kg. In general, peroxide levels higher than 10 Meq/kg means that stability of the oil is less and has a shorter shelf life. When the peroxide value is in the range of 30-40 Meq/kg is generally associated with a rancid taste [11]. In this oil base, peroxide value is 1.33± 0.16 Meq/Kg and it

is comparatively very low. Therefore, it is clear that the oils prepared with base of ghee and sesame oil is having long shelf life.

Saponification value of an oil or fat is defined as the number of milligrams of KOH required to neutralize the fatty acids resulting from the complete hydrolysis of 1 g of sample [12]. It depends on the kind of fatty acid contained in the fat. The long chain fatty acids found in fats have a low saponification value because they have a relatively fewer number of carboxylic functional groups per unit mass of the fat as compared to short chain fatty acids. Saponification value of the base prepared with ghee and sesame oil was 431.57 ± 1.43 mg/g. Saponification values of sesame oil [13] and ghee [10] are 188-195 mg/g and 224.5 ± 0.14 mg/g respectively. Once we have mixed both sesame oil and ghee in a ratio of 1:1 (w/w), saponification value of the mixture was increased up to 431.57 ± 1.43 mg/g.

There are different methods to evaluate or checking the unsaturation level in fatty acids, one among them is by determining the iodine value of fats. Iodine value is the number of grams of iodine consumed by 100 g of fat. A higher iodine value indicates a higher degree of unsaturation. If the iodine number is between 0 - 70 g I_2/100g, it will be a fat and if the value exceeds 70 g I_2/100g it is an oil [14]. If the iodine value is higher,

stability of the oil is less and vulnerable to oxidation and free radical formation. Oxidization and polymerization readily occurred when using oils with high iodine value. Polymerization is an irreversible process which causes the fatty acids to become hard, insoluble, plastic-like solids [15]. Iodine value of the base oil prepared using ghee and sesame oil was found to be a moderate (56±1.04 g I_2/100g) value. Therefore, it exists as semisolid form at room temperature and not too much hard in texture. Thin Layer Chromatography fingerprints of dichloromethane fraction and ethyl acetate fraction were developed and recorded the R_f values for ghee and sesame oil mixture using 2 solvent systems (Table 2).

Table 2. R_f values of Thin Layer Chromatography fingerprints of sesame oil and ghee in a ratio of 1:1 (w/w)

Solvent Systems	At 254 nm	At 366 nm	After Spraying
Solvent System 1	0.40,0.75	0.75	0.40,0.75
Solvent System 2	0.10,0.61,0.78	0.10,0.61,0.78	0.10,0.25, 0.40,0.61, 0.78

In conclusion, present study was able to established quality control parameters for the first time for the base of medicated oil which consist of sesame oil and ghee in a ratio of 1:1 (w/w).

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