Physicochemical Screening and Shelf Life Evaluation of Kuṅkumādi Ghṛta Prepared using Kesara and Nāgakesara

Abstract

Introduction: Kuṅkumādi Ghṛta (KG) is an Ayurvedic formulation commonly recommended in skin disorders, especially Mukhadiśīkā (Acne vulgaris). Kesara (stigma of Crocus sativus Linn.) is a prime ingredient in the formulation. However, due to high cost and increased adulteration in Kesara, ‘Nāgakesara’ (Mesua ferrea Linn.) is suggested by Ayurvedic experts as a substitute. Nāgakesara is relatively lower in cost and possesses similar therapeutic attributes to that of Kesara. Recent studies have established standard manufacturing procedures and clinical efficacies of Kesarayukta (with Kesara) Kuṅkumādi Ghṛta (KKG) and Nāgakesara yukta (with Nāgakesara) Kuṅkumādi Ghṛta (NKG) in Mukhadiśīkā. In spite of wide utility of KG in Ayurvedic practice, no published work on its shelf life is available so far. Aims and Objectives: To establish the physicochemical profile and evaluate the shelf life of KKG and NKG. Materials and Methods: Total three batches of KKG and NKG each were prepared in the laboratory by adopting Ayurvedic classical guidelines and the findings were systematically recorded. Comparative differences in organoleptic characters (colour, odour, taste, touch) and values of different physicochemical parameters (Ash value, pH value, Total solid content, Specific gravity, Refractive index, Loss on drying, Acid value, Iodine value, Saponification value, Peroxide value and Rancidity tests) of raw materials [herbal ingredients, Go Ghṛta, Mārcchita Ghṛta (MG)] as well as finished products (KKG and NKG) were recorded. Long term (real time) shelf life testing was carried out at the intervals i.e., at 0, 3, 6, 9 and 16 months. High performance thin layer chromatography (HPTLC) analysis of samples was also carried out. Results and Conclusion: The average percentage loss in final product was 10.18% in KKG and 7.58% in NKG. The shelf life of MG, KKG and NKG is 16 months. After 16 months, Go Ghṛta showed negative rancidity test, while MG, KKG and NKG showed positive rancidity, indicative of onset of deterioration after 16 months. Present findings validate the Ayurvedic principles stipulating medicated Ghṛta to have a shelf life of 16 months. Chromatographic study showed few differences between KKG and NKG samples. Data obtained by present study may be considered as standard for future researches.

Keywords: Kesara, Kuṅkumādi Ghṛta, Nāgakesara, physicochemical, rancidity, shelf life, stability

Introduction

Quantification as well as qualitative knowledge about products are essential for quality assurance, which is crucial for global acceptance of herbal formulations and also ensure safety. To evaluate Shelf life, establishing and maintaining the organoleptic standards along with physicochemical parameters of raw material and finished product are necessary. Kuṅkumādi Ghṛta is a famous and commonly used Ayurvedic preparation in skin disorders especially Mukhadiśīkā (Acne vulgaris),[1] having Kesara as the prime ingredient, which makes the formulation costly.[2] Since Kesara possesses wide range of therapeutic attributes, it is in high demand and the demand far exceeds the production. Therefore, adulteration of this herb is common in herbal drug industry and makes it a challenging task for consumers to original the original Kesara.[3,4] Nāgakesara (Mesua ferrea Linn.) is another highly recommended herb in Ayurvedic medicines. Nāgakesara is comparatively cheaper than Kesara and can be used as a substitute of Kesara, as it is supposed to possess similar therapeutic qualities.[5,6]

Ghṛta Kalpanā (medicated ghee preparations) is one of the commonly used dosage form in Ayurvedic pharmaceutics. It has four fold aims (i) to dissolve/extract/hold the lipid soluble active therapeutic principles from the plants and minerals, (ii) to make use of therapeutic

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values of ghee, (iii) to preserve the drug/drugs for longer time (enhanced shelf life), and (iv) to enhance and hasten the absorption of drugs, when used topically in fatty medias.

Kuṅkumādi Ghṛta (KG) is one such Ghṛta based widely used formulation in therapeutics. Ghṛta preparations are mentioned to have shelf life of 16 months as per Ayurvedic classics and shelf life notification of Government of India. Though no major difference is observed in comparative clinical efficacy of both KKG and NKG, NKG can be preferred over KKG by large scale industries, as it is more cost effective than KKG.

Stability is an essential criteria for development of a pharmaceutical product however, published information on shelf life and stability of KKG is still lacking. The present study has been planned to conduct long term (real time) shelf life testing by evaluating the physicochemical parameters of Kesara yukta (with Kesara) Kuṅkumādi Ghṛta (KKG) and Nāgakesara yukta (with Nāgakesara) Kuṅkumādi Ghṛta (NKG) at 0, 3, 6, 9 and 16 months.

Materials and Methods
Identification and authentication

The raw material was procured in coarse form from the Pharmacy, of the Institute and authenticated by Pharmacognosy laboratory. The crude drugs used in KKG preparation with their botanical identities and quantities are listed in Table 1. The study was carried out between January 2007 – December 2008.

Preparation of Kesara yukta (with Kesara) Kuṅkumādi Ghṛta

The whole pharmaceutical procedure is arranged in the following two unit processes: (1) Mūrcchita of Goghṛta (ghee of Indian cow- Bos Primigenius Indicus) and (2) Preparation of KKG from Mūrcchita Ghṛta. Mūrcchita was carried out as pretreatment of Ghṛta, before main process of KKG preparation. Both Mūrcchita Ghṛta and KKG were prepared by adopting Ayurvedic classical guidelines. The standard manufacturing procedure for preparation of Mūrcchita Ghṛta and KKG was established and maintained for future reference. Total 3 batches of KKG and NKG each were prepared by adopting classical method, and average results obtained during preparation are briefly presented in Table 2. The storage conditions applied were temperature 40°C ± 2°C and relative humidity 75 ± 5%.

Analytical study

Go Ghṛta, Mūrcchita Ghṛta. KKG and NKG were analyzed by employing various analytical parameters. Comparative differences in organoleptic characters (colour, odour, taste, touch) and values of physicochemical parameters such as ash value, pH value, total solid content, specific gravity at 40°C, refractive index, loss on drying at 110°C, acid value, iodine value (Wij’s method), saponification value, unsaponifiable value, peroxide value and Rancidity test (Kries test) of raw materials (herbal ingredients, Go Ghṛta, Mūrcchita Ghṛta) as well as finished products (prepared KKG and NKG) were evaluated. Long term (real time) shelf life study was carried out at the intervals i.e., at 0, 3, 6, 9 and 16 months.

High performance thin layer chromatography study

The samples subjected for chromatographic separation were as follows - 1: Unsaponifiable matter of Go Ghṛta, 2: Unsaponifiable matter of Mūrcchita Ghṛta, 3: Unsaponifiable matter of KKG, 4: Unsaponifiable matter of NKG, 5: Methanolic extract of crude Kesara, 6: Methanolic extract of KKG, 7: Methanolic extract of NKG. Initially sample solutions were prepared. The mobile phase used was a mixture of Petroleum Ether and Diethyl Ether in the ratio 70:30. Detection was carried out using Vanillin sulphuric acid. The plate was visualized under long UV and daylight radiation and density of the separated spots was recorded using scanner III. The Rf value of all the tracks were recorded and presented respectively [Figure 1].

Results and Discussion

The concepts of maturity of herbs, standard preparation methods, quality of final product and its mode of usage in a logical manner are highly emphasized in Ayurveda. Initially the raw materials were authenticated and analyzed

Table 1: Quantities of ingredients for both Kesara yukta (with Kesara) Kuṅkumādi Ghṛta and Nāgakesara yukta (with Nāgakesara) Kuṅkumādi Ghṛta

| Observations            | Latin name/English term          | Part used         | KKG*     | NKG*   |
|-------------------------|----------------------------------|-------------------|----------|--------|
| Mūrcchita Ghṛta (ml)    | Pretreated cow ghee              | -                 | 912      | 967    |
| Kalka (g)*              | Herbal paste                     | -                 | 228      | 241.66 |
| Kesara (g)              | Coccus sativus Linn              | Stigma            | 57       |        |
| Nāgakesara (g)          | Mesua ferrea Linn                | Flower bud        | -        | 60.40  |
| Haridrā (g)             | Curcuma longa Linn               | Rhizome           | 57       | 60.40  |
| Dāruharidrā (g)         | Berberis aristata DC.            | Stem              | 57       | 60.40  |
| Pippafi (g)             | Piper longum Linn                | Fruit             | 57       | 60.40  |
| Citrakāmila Kvātha (L)  | Plumbago zeylanica Linn          | Root              | 3.64     | 3.86   |

*Ingredients 3-7 are Kalka materials, 8 is Kvātha material, *Average composition in all three batches. KKG: Kesara yukta (with Kesara) Kuṅkumādi Ghṛta, NKG: Nāgakesara yukta (with Nāgakesara) Kuṅkumādi Ghṛta
before processing as the good quality products mainly depend upon genuine raw materials. Go Ghṛta was used, as it is said to be best among all lipids to prepare Ghṛta preparations, and it possess Samskārānuvartana (the quality of a substance which when added with another substances does not change its original property and also improves the quality of added substances) and other highly nourishing properties.\cite{29} Ghṛta Mūrcchana and subsequent Ghṛta Pāka (main cooking procedure of Ghṛta) was carried out by following classical reference.\cite{30} Mūrcchana helps in refinement of Ghṛta, and is aimed at removing un-dissolved solids, moisture content/factor causing rancidity (Āma doṣa), undesirable odour (Gandha doṣa), free fatty acids, phosphatides etc., in the crude Ghṛta, which may alter its physico-chemical characters.\cite{31,32}

The process as per Ayurvedic texts potentiates the Ghṛta, induces antioxidant properties, inhibits lipid-peroxidation, makes it lighter for digestion and greatly improves drug absorbability, assimilability and shelf life.\cite{33-35} Comparative clinical data on Mūrcchita and Amūrcchita samples are required to establish the claims about Mūrcchana. Average loss in final product was 10.18% in KKG and 7.58% in NKG.

Organoleptic characters were documented at two stages of preparation [for Mūrcchita Ghṛta, and KKG and NKG], Table 3 because these parameters can change at different stages. Significant difference was found in color of finally prepared KKG and NKG (dark orange and dark yellow respectively). Prior to subjecting Kesara to pharmaceutical processing, few tests were conducted [Table 4] for determination of adulteration/exhausted sample (viz. H₂SO₄ test, loss on drying, microscopy, and colour test). Kesara which was used in KKG was found to not be adulterated nor exhausted and to be of adequate quality.\cite{36} Table 5 shows that the inorganic content and moisture content levels present in the raw materials comply with official standards. The comparative physicochemical values of different samples viz. Go Ghṛta, Mūrcchita Ghṛta as well as finished products (KKG and NKG) at 0, 3, 6, 9 and 16 months have been presented in Tables 6 and 7.

Table 6 reveals that Mūrcchita Ghṛta has higher specific gravity in comparison to plain Go Ghṛta. This may be due to solid extractives in Ghṛta from the herbs added during the Mūrcchana process. Specific gravity and refractive index remained unchanged for both samples during 16 months. It indicates that no drastic changes occur to the Ghṛta and Mūrcchita Ghṛta even after 16 months. Acid value is defined as the number of milligrams of potassium

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**Table 2: Results obtained during Kesarayukta (with Kesara) Kuṇkumādi Ghṛta preparation**

| Observations                       | KKG        | NKG        |
|-----------------------------------|------------|------------|
| Initial quantity of Mūrcchita Ghṛta (ml) | 912        | 967        |
| Quantity of Ghṛta obtained (ml)    | 819        | 893        |
| Quantity of Ghṛta obtained (%)     | 89.78      | 92.40      |
| Loss of Ghṛta (ml)                 | 92.7       | 73.33      |
| Loss of Ghṛta (%)                  | 10.18      | 7.58       |

\(^{a}\)Average results of all three batches. KKG: Kesarayukta (with Kesara) Kuṇkumādi Ghṛta, NKG: Nāgakesara yuṣṭa (with Nāgakesara) Kuṇkumādi Ghṛta

**Table 3: Organoleptic characters of Mūrcchita Ghṛta and Kesarayukta (with Kesara) Kuṇkumādi Ghṛta**

| Parameters                  | Mūrcchita Ghṛta | KKG | NKG            |
|-----------------------------|-----------------|-----|----------------|
| Rūpa (colour)               | Dark yellow     | Dark orange | Dark yellow   |
| Rasa (taste)                | Slight bitter and astringent | Slight bitter and astringent | Bitter and astringent |
| Gandha (odour)              | Aromatic like turmeric | Specific smell | Aromatic like turmeric |
| Sparśa (touch)              | Like Ghṛta      | Like Ghṛta    | Like Ghṛta    |

**Figure 1: Chromatographic visualization of samples at long ultraviolet and day light**

**Figure 2: Photograph of Kesarayukta (with Kesara) Kuṇkumādi Ghṛta**

**Figure 3: Photograph of Kesarayukta (with Kesara) Kuṇkumādi Ghṛta**

KKG: Kesarayukta (with Kesara) Kuṇkumādi Ghṛta, NKG: Nāgakesara yuṣṭa (with Nāgakesara) Kuṇkumādi Ghṛta
hydroxide required to neutralize the free fatty acids present in 1 g of sample of Ghṛta, while saponification value is the number of milligrams of potassium hydroxide required to neutralize the fatty acids results from complete hydrolysis of 1 g of sample of Ghṛta. Generally, rancidity causes free fatty acid liberation; hence acid value and saponification value are used as indications of rancid state. Thus, more the saponification and acid value, more will be the rancidity factor and less will be the shelf life and therapeutic value. [34] In the present study, their values were found lesser in Mūrcchita Ghṛta than plain Go Ghṛta. The herbal ingredients used during the Mūrcchana process may be playing a significant role in decreasing the saponification value and acid value in Mūrcchita Ghṛta. These may also cause increase in the therapeutic values by adding many water soluble and fat soluble extractives to the initial Ghṛta. Heating or boiling the oil is also an ancillary part which may cause decreasing of the rancidity factors because heating by itself causes the evaporation of moisture. Ultimately Mūrcchana process reduces degree of saturation of oils and enhances degree of unsaturated fat which is beneficial for human health [35] Hence the medicated Ghṛta should be prepared by taking the Mūrcchita Ghṛta as base, rather than crude Ghṛta.

Loss on drying suggests moisture contents were slightly increased after 9 months in both samples. The Iodine value of an oil or fat is the weight of iodine absorbed by 100 parts by weight of the sample. It indicates the degree of unsaturated fat. Greater degree of unsaturation indicates the possibility of the oil becoming rancid due to atmospheric oxidation. [38] But the degree of changes was not pronouncedly more in Ghṛta and Mūrcchita Ghṛta after various time intervals. Peroxide value, which is responsible

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### Table 4: Parameters for determination of adulteration/exhausted sample of Kesara

| Observations                          | Results          |
|--------------------------------------|------------------|
| Test for moisture                    | Negative         |
| Loss on drying (105°C to constant weight, about 4 h) | 12.3 (%w/w)      |
| H₂SO₄ test                           | Positive         |
| Microscopy for selected sample       | Positive         |
| Colour of stigma                     | Orange red       |

### Table 5: Physicochemical parameters of raw materials

| Observations | Ash value (% w/w) | Loss on drying at 110°C (% w/w) | pH value | Specific gravity | Total solid content (%) |
|--------------|-------------------|---------------------------------|----------|------------------|------------------------|
| Kesara       | 4.52              | 5.50                            | -        | -                | -                      |
| Nāgakesara   | 4.18              | 2.18                            | -        | -                | -                      |
| Haridrā      | 3.15              | 2.50                            | -        | -                | -                      |
| Dāruharidrā  | 4.25              | 1.25                            | -        | -                | -                      |
| Pippalī      | 3.48              | 2.00                            | -        | -                | -                      |
| Citrakāmīla  | 4.50              | 1.00                            | -        | -                | -                      |

### Table 6: Physicochemical parameters of Go Ghṛta and Mūrcchita Ghṛta

| Tests                  | Samples | 0 month | 3 months | 6 months | 9 months | 16 months |
|------------------------|---------|---------|----------|----------|----------|-----------|
| Specific gravity        | G       | 0.9100  | 0.9100   | 0.9100   | 0.9100   | 0.9100    |
|                        | MG      | 0.9112  | 0.9112   | 0.9112   | 0.9112   | 0.9112    |
| Refractive index        | G       | 1.4590  | 1.4590   | 1.4590   | 1.4590   | 1.4590    |
|                        | MG      | 1.4650  | 1.4650   | 1.4650   | 1.4650   | 1.4650    |
| Loss on drying          | G       | 0.4450  | 0.3449   | 0.4831   | 0.4727   | 2.0146    |
|                        | MG      | 0.3903  | 0.3898   | 0.4567   | 0.4973   | 0.5451    |
| Acid value              | G       | 1.6221  | 2.0073   | 2.3339   | 2.5810   | 2.9500    |
|                        | MG      | 1.5787  | 1.7790   | 1.9362   | 1.9884   | 2.1862    |
| Iodine value            | G       | 30.6750 | 33.6000  | 33.8000  | 33.9000  | 40.5000   |
|                        | MG      | 30.9200 | 33.2012  | 33.8701  | 34.2600  | 40.8454   |
| Saponification value    | G       | 203.45  | 203.62   | 204.27   | 204.82   | 227.21    |
|                        | MG      | 192.88  | 200.45   | 203.15   | 204.25   | 212.76    |
| Peroxide value          | G       | 0.0000  | 1.9900   | 6.8100   | 10.3900  | 10.5700   |
|                        | MG      | 1.9900  | 9.1000   | 9.1700   | 9.1600   | 9.3649    |
| Unsaponifiable value    | G       | 0.8840  | 0.8830   | 0.8948   | 0.8930   | 1.3936    |
|                        | MG      | 1.5086  | 1.5092   | 1.5120   | 1.5112   | 1.7866    |
| Rancidity test*         | G       | -ve     | -ve      | -ve      | -ve      | -ve       |
|                        | MG      | -ve     | -ve      | -ve      | -ve      | -ve       |

*At 20th month, Go Ghṛta showed –ve rancidity test, while MG showed positive rancidity test. G: Go Ghṛta; MG: Mūrcchita Ghṛta; –ve: No rancidity found
Table 7: Physicochemical parameters of *Kesarayukta* (with *Kesara*) *Kuṅkumādi Ghṛta* and *Nāgakesara yukta* (with *Nāgakesara*) *Kuṅkumādi Ghṛta*

| Tests                        | Samples | 0 month | 3 months | 6 months | 9 months | 16 months |
|------------------------------|---------|---------|----------|----------|----------|-----------|
| Specific gravity             | KKG     | 0.9120  | 0.9120   | 0.9122   | 0.9122   | 0.9122   |
|                             | NKG     | 0.9110  | 0.9122   | 0.9122   | 0.9122   | 0.9122   |
| Refractive index             | KKG     | 1.4640  | 1.4650   | 1.4650   | 1.4650   | 1.4650   |
|                             | NKG     | 1.4650  | 1.4650   | 1.4650   | 1.4650   | 1.4650   |
| Loss on drying               | KKG     | 0.5647  | 0.5661   | 0.6469   | 1.2667   | 2.0038   |
|                             | NKG     | 0.2046  | 0.2040   | 0.2055   | 1.2010   | 2.0300   |
| Acid value                   | KKG     | 0.6678  | 1.6751   | 1.7838   | 1.7862   | 1.7900   |
|                             | NKG     | 1.8099  | 2.2391   | 2.4265   | 2.5246   | 2.8344   |
| Iodine value                 | KKG     | 21.5700 | 28.5900  | 32.3500  | 32.1600  | 42.0800  |
|                             | NKG     | 30.6000 | 31.1000  | 33.9500  | 34.1100  | 45.5700  |
| Saponification value         | KKG     | 201.78  | 200.24   | 201.22   | 203.19   | 242.35   |
|                             | NKG     | 204.51  | 206.83   | 206.32   | 207.73   | 250.21   |
| Peroxide value               | KKG     | 1.0000  | 4.2000   | 7.2000   | 9.1100   | 12.3450  |
|                             | NKG     | 1.9900  | 3.1800   | 6.8300   | 8.0000   | 11.9140  |
| Unsaponifiable value         | KKG     | 1.0921  | 1.0920   | 1.0934   | 1.0962   | 1.1170   |
|                             | NKG     | 1.1281  | 1.1276   | 1.1280   | 1.1298   | 1.1552   |
| Rancidity test*              | KKG     | <ve     | <ve      | <ve      | <ve      | <ve      |
|                             | NKG     | <ve     | <ve      | <ve      | <ve      | <ve      |

*At 20th month, both KKG and NKG showed positive rancidity test. KKG: *Kesarayukta* (with *Kesara*) *Kuṅkumādi Ghṛta*, NKG: *Nāgakesara yukta* (with *Nāgakesara*) *Kuṅkumādi Ghṛta.*

for rancidity, is the number of milli equivalents of active oxygen that expresses the amount of peroxide contained in 100 g of the substance. At 0 month it was 0 for *Ghṛta* and 1.99 for *Mūrcchita Ghṛta*. But for *Mūrcchita Ghṛta*, it increased more rapidly than *Ghṛta*. Un-saponifiable matter is the matter present in oil which after saponification and extraction with an organic solvent remains non volatile on drying at 80°C. The un-saponifiable matter includes hydrocarbons, higher alcohols, sterols, mineral oil etc., Most oils contain less than 2% of un-saponifiable matter. At 0 month, in both samples it was less than 2%. Oils and fat with higher degree of unsaturation pick up the oxidative rancidity earlier. Volatile products are those which are produced by complex chemical changes due to high peroxide levels and are responsible for rancid taste and odor. After 16 months and after 9 months rancidity test was negative for *Go Ghṛta* and *Mūrcchita Ghṛta* respectively.

No organoleptic changes were found in *Go Ghṛta* and *Mūrcchita Ghṛta* after 16 months. The values of parameters of both samples showed no specific difference or rapid changes towards Rancidity. The findings suggest that the Shelf life of *Go Ghṛta* and *Mūrcchita Ghṛta* is more than 16 months.

Table 7 shows that both KKG and NKG had <1% loss on drying at 110°C value (at 0 month), indicating meager moisture content in the samples. In conjunction with a suitable temperature, moisture may lead to the activation of enzymes and given suitable conditions, lead to the proliferation of living organisms. Hence, moisture contents may affect the quality and hence the shelf life of the drug. The results obtained suggest that the samples had been prepared properly till the *Siddhi Lakṣaṇas* (confirmative signs of process completion) were observed. The shelf life of the sample is enhanced if there is absence or very little moisture content in the sample. Loss on drying was found <1% up to 6 months in both samples. No significant difference was found in specific gravity and refractive index during 16 months in both samples. Changes found in loss on drying, saponification value and peroxide value were almost parallel in both samples during 16 months. Slightly higher changes were found in acid value and iodine value but they were negligible. Unsaponifiable matter of both samples was almost same at 0 month (i.e., 1.0921 for KKG and 1.1281 for NKG). No significant difference was found for any parameter between both KKG and NKG after 16 months, though organoleptic character - colour was different. Rancidity test was also found negative for both samples. The findings suggest the shelf life of both KKG and NKG to be more than 16 months. At 20th month KKG and NKG showed positive rancidity test, which indicates that their deterioration might have started after 16 months. These findings can validate the Ayurvedic principles that stipulate *Ghṛtas* to have shelf life of 16 months. It is also evident from results that comparatively lesser iodine value, acid value and saponification value was found in KKG than NKG (at 0 to 16 months), which suggest more stability of the former.

Chromatographic study showed 3 spots in *Go Ghṛta*, 4 spots in *Mūrcchita Ghṛta*, 5 spots in NKG and 9 spots in KKG [Table 8]. In *Mūrcchita Ghṛta*, 3rd spot (light purple) at 0.81 R, value was different from *Go Ghṛta*. In KKG, 2nd spot (light purple) at 0.17 R, value, 4th (light
The present study is a preliminary attempt to analyze thoroughly the Ayurvedic Principles of shelf life of medicated \textit{Ghṛta}. The present paper has developed physicochemical profile of KKG to estimate its shelf life at various time intervals. However more extensive studies are needed to evaluate the qualitative and chromatographic profile of the formulation, to ascertain the quality of both formulations KKG and NKG, and their comparative biological roles.

### Future directions

The present study is a preliminary attempt to analyze thoroughly the Ayurvedic Principles of shelf life of medicated \textit{Ghṛta}. The present paper has developed physicochemical profile of KKG to estimate its shelf life at various time intervals. However more extensive studies are needed to evaluate the qualitative and chromatographic profile of the formulation, to ascertain the quality of both formulations KKG and NKG, and their comparative biological roles.

### Conclusion

The present study establishes the physicochemical profile of KKG and concludes that the shelf life of MG, KKG and NKG to be 16 months. After 16 months, \textit{Go Ghṛta} showed negative rancidity test, while MG, KKG and NKG showed positive rancidity, indicative of onset of deterioration after 16 months. Present findings validate the Ayurvedic principles that stipulate \textit{Ghṛtas} to have shelf life of 16 months. It is also evident from obtained results (at 0 to 16 months) that KKG has comparatively lesser iodine value, acid value and saponification value than NKG, thus KKG is probably more stable than NKG. Chromatographic study showed few differences between KKG and NKG samples. Data obtained by present study may be considered as standards for future researches.

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### Conflicts of interest

There are no conflicts of interest.

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