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Studies of colour measurement of herbal cow Ghee

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Abstract
Ghee is used as media for absorption of fat-soluble vitamins in the food. Flaxseed has been considered as a functional food, so it is associated with health effects. In the present study the herbal ghee was prepared from cow ghee by using flaxseed oil at three different levels *viz*. 5% percent, 10 percent, and 15 percent and brahmi leaves at four different levels *viz*. 5 percent, 10 percent, 15 percent, and 20 percent of the content. This prepared ghee was compared with control (T_0) i.e. without addition of flaxseed oil and brahmi leaves. From the result of present investigation, the most acceptable quality of cow ghee was prepared by using 10 percent flaxseed oil and 15 percent brahmi leaves. It revealed that the highest value for Colour (L) Test was recorded 71.24 in control sample T_0 and treatments T_1, T_2, T_5, T_3, T_4, T_6, T_7, T_9, T_8, T_{10}, T_{11} and T_{12} has the value of 70.47, 68.24, 67.37, 67.17, 66.85, 66.12, 65.63, 60.95, 60.54, 59.28, 58.24 and 56.38 respectively. The highest value for Colour (a*) Test was recorded 56.24 in control sample T_0 and treatments T_4, T_1, T_3, T_2, T_6, T_5, T_7, T_8, T_{11}, T_{12}, T_{10} and T_9 has the value of 54.92, 54.67, 54.30, 54.10, 51.56, 51.42, 51.34, 51.12, 49.92, 49.54, 49.44 and 49.33 respectively. The highest value for Colour (b*) Test was recorded 59.65 in sample T_0 and treatments T_1, T_2, T_3, T_4, T_7, T_6, T_8, T_5, T_{10}, T_9, T_{11} and T_{12} has the mean value of 54.53, 54.46, 54.40, 54.11, 45.22, 45.20, 45.17, 45.15, 37.66, 37.65, 37.59 and 37.52 respectively.

Keywords: Ghee, flaxseed oil, brahmi leaves, colour image, herbal ghee, cow ghee

Introduction
Ghee is a traditional dairy product. It is used since Vedic times as the medicinal purpose. Ghee is used as media for absorption of fat-soluble vitamins A, D, E and K in the food. It is also considered as a carrier media in certain medicines and it support the transport of active principles across the cell membrane, which is permeable to lipid molecules where the transport of 'medhya' medicines is possible if the drug is used in lipid media (Prasanna, 2007) [10]. According to Ayurveda, ghee is known as a Madhur-Rasa. Ghee can be used since the birth in all over India, ghee is also used with honey mixture to the new born babies (Pandya, 1996) [8]. Chemically, ghee contains very high milk fat 99.5%. Ghee contains lesser amount of moisture. Ghee has a complex lipid of triglycerides, phospholipids, free fatty acids (FFA), sterols, fat soluble vitamins, minor amounts of charred casein, hydrocarbons, and contains traces amount of minerals. In addition, ghee contains free acids like formic, acetic, propionic, and lactic acid. Ghee fat breakdown products like fat hydroperoxides, free aldehydes and ketones, lactones etc., minerals were also present in ghee (Sharma, 1982) [12]. Ghee also carries the therapeutic properties of herbs to all the body's tissues. It is an excellent vehicle for transporting herbs to the deeper tissue layers of the body (Lad, 1998) [5]. The acceptable quality of herbal ghee supplementation of flaxseed oil and brahmi leaves on organoleptic properties was observed (Bharti *et al*., 2020) [2].
Flaxseed has been considered as a functional food, so it is associated with health effects. The flaxseed composition can vary with its genetics, growing environment conditions, seed processing and methods of analysis. Flaxseed contains a high quantity of dietary fiber 18%, various legumes range from 5–10%, soluble fibers contain 25% and insoluble fibers contains 75% (Morris, 2001) [6]. Flaxseed contains unsaturated fatty acid. Soluble dietary fiber of flaxseed uses many physiologic properties on the stomach and small intestine modulating postprandial glycemic responses and the insoluble fiber contains the improvement of insulin sensitivity (Papathanasopoulos *et al*., 2010) [9]. It contains some other bioactive compounds from the class of phenolic compounds such as lignans, p-coumaric acid and ferulic acid (Strandas *et al*., 2008) [13].

Flaxseed also contains bioactive peptides, such as cyclolinopeptide A. It has a strong immune suppressive and antimalarial activities. Flaxseed preventing the human malarial parasite, plasmodium falciparum in culture (Bell *et al*., 2000) [1].

In the Indian Ayurveda medicine, herbal plants have been used as a brain and nerve tonics. Brahmi is used as herbs. *Bacopa monniera* (BM) is the other name of brahmi. It is one of the most popular herbs in India. Brahmi is known as a memory booster herb. The various plant has been used in the Ayurveda, a holistic system of medicinal plants originating from India, so it has been considered as under the 'Medhya rasayana', its used as a medicinal plant refreshing intellect and memory power (Deepak *et al*., 2003) [3]. Brahmi plays a protective role of bacoside A against the chronic cigarette smoking tempted oxidative damage in rat brain. The daily doses of Brahmi herbs that are generally recommended in traditional practice have been reported that to be 5 to10 g of non-standardized powder, 8 to16 mL of infusion, and 30 mL daily of syrup of brahmi.

Materials of Methods

The Experimental work was carried out in the research laboratories of Warner College of Dairy Technology, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.).

Procurement of Materials

The materials and methods to be adopted during this investigation are given below:

1. Cow and Buffalo milk was collected from local farms of Prayagraj.
2. Ghee was prepared from cream obtained from cow and buffalo milk in Food and Science Technology laboratory, WCDT, SHUATS, Prayagraj.
3. Flaxseed oil was procured from Kamani Oil Industries Pvt. Ltd., Khopoli, Maharashtra, India.
4. Brahmi was procured from Patanjali Pvt. Ltd., Haridwar, India

Determination of Colour

The colour image analysis technique can be used for measuring and analysing the colour of food surfaces (Yam *et al*., 2004) [15]. The colour of the ghee was estimated by image analysis technique. The ghee samples was transferred to a glass container of 1 mm thickness, circular in shape, having height and diameter of (3 and 2) cm respectively, such that no void (space) left. The ghee samples were scanned at 300 dpi resolution by using a flatbed scanner (model no. HP Scanjet 3970, Mumbai, India) which was connected to a Desktop. The colour image was scanned and then it was processed by using Adobe Photoshop Software to determine the average value of colour parameter such as. 'L*', 'a' and 'b'. The colour values were further put in given below equations to observe the CIE colour parameters like., 'L*', 'a*' and 'b*' values (Kumari *et al*., 2015) [4]. The various equations required for the calculation of CIE parameters are mentioned below.

$$L^* \text{ value} = \frac{L}{255} \times 100$$

$$a^* \text{ value} = \frac{240 \times a}{255} - 120$$

$$b^* \text{ value} = \frac{240 \times b}{255} - 120$$

Statistical Analysis

The data obtained during the experimental work was analysed for Analysis of Variance (ANOVA) and Critical Difference (C.D.) using MS Excel software.

Results and Discussion

The colour measurement of cow ghee by using Adobe Photoshop Software to determine the average value of colour parameter in the terms of Colour L* (Brightness index), Colour a* (Redness index) and Colour b* (Yellowness index).

Effect on Colour (L) Test of Cow ghee samples

In the present investigation, flaxseed oil was added at three different levels 5%, 10% and 15% and brahmi leaves were added at four different levels 5%, 10%, 15% and 20% in cow ghee samples. The highest value for Colour (L) Test was recorded 71.24 in control sample T_0 and treatments T_1, T_2, T_5, T_3, T_4, T_6, T_7, T_9, T_8, T_{10}, T_{11} and T_{12} has the value of 70.47, 68.24, 67.37, 67.17, 66.85, 66.12, 65.63, 60.95, 60.54, 59.28, 58.24 and 56.38 respectively. Rajni Kant (2005) [11] observed that the value of Colour (L) for the herbal ghee was found to the ranged from 4.22 to 6.84. It has been observed that when cow ghee samples were incorporated with 5% Brahmi leaves and the level of flaxseed oil increased from 5% to 15%, then the Colour (L) Test was found to decrease significantly (p<0.05) from 70.47 to 60.95. When cow ghee samples were incorporated with 10% Brahmi leaves and the level of flaxseed oil increased from 5% to 15%, then the Colour (L) Test was found to decrease significantly (p<0.05) from 68.24 to 59.28. When cow ghee samples were incorporated with 15% Brahmi leaves and the level of flaxseed oil increased from 5% to 15%, then the Colour (L) Test was found to decrease significantly (p<0.05) from 67.17 to 58.24. When cow ghee samples were incorporated with 20% Brahmi leaves and the level of flaxseed oil increased from 5% to 15%, then the Colour (L) Test was found to decrease significantly (p<0.05) from 66.85 to 56.38. When the brahmi leaves were constant, there was no significant difference (p>0.05) among Colour (L) Test of treatments suggesting that Brahmi leaves do not exert any significant influence on Colour (L) Test of ghee samples.

The observations for the Colour (L) Test of the cow ghee samples are presented graphically in fig. No. 1.

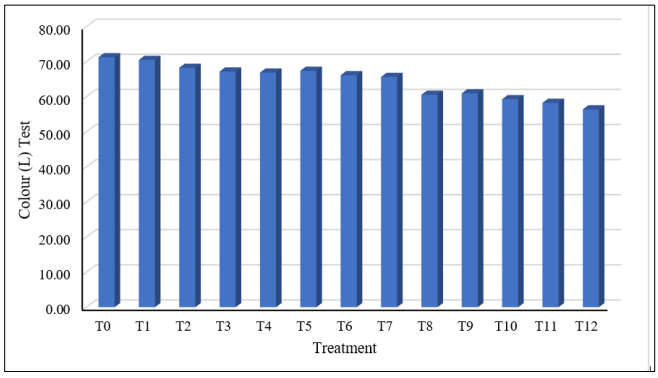

Fig 1: Graph showing Colour (L) test of control and herbal Cow Ghee samples

Effect on Colour (a*) Test of herbal cow ghee samples

In the present investigation, flaxseed oil was added at different levels and brahmi leaves were also added in cow ghee samples. The highest value for Colour (a*) Test was recorded 56.24 in control sample T_0 and treatments T_4, T_1, T_3, T_2, T_6, T_5, T_7, T_8, T_{11}, T_{12}, T_{10} and T_9 has the value of 54.92, 54.67, 54.30, 54.10, 51.56, 51.42, 51.34, 51.12, 49.92, 49.54, 49.44 and 49.33 respectively. The value of colour (a*) for the herbal ghee ranged from 1.66 to 3.89 (Rajni Kant, 2005) [11]. It has been observed that when cow ghee samples were incorporated with 5% Brahmi leaves and the level of flaxseed oil increased from 5% to 15%, then the Colour (a*) Test was found to decrease significantly (p<0.05) from 54.67 to 49.33. When cow ghee samples were incorporated with 10% Brahmi leaves and the level of flaxseed oil increased from 5% to 15%, then the Colour (a*) Test was found to decrease significantly (p<0.05) from 54.10 to 49.44. When cow ghee samples were incorporated with 15% Brahmi leaves and the level of flaxseed oil increased from 5% to 15%, then the Colour (a*) Test was found to decrease significantly (p<0.05) from 54.30 to 49.92. When cow ghee samples were incorporated with 20% Brahmi leaves and the level of flaxseed oil increased from 5% to 15%, then the Colour (a*) Test was found to decrease significantly (p<0.05) from 54.92 to 49.54. When the brahmi leaves were constant, there was no significant difference (p>0.05) among Colour (a*) Test of treatments suggesting that Brahmi leaves do not exert any significant influence on Colour (a*) Test of ghee samples.

The observations for the Colour (a*) Test of the cow ghee samples are presented graphically in fig. No. 2.

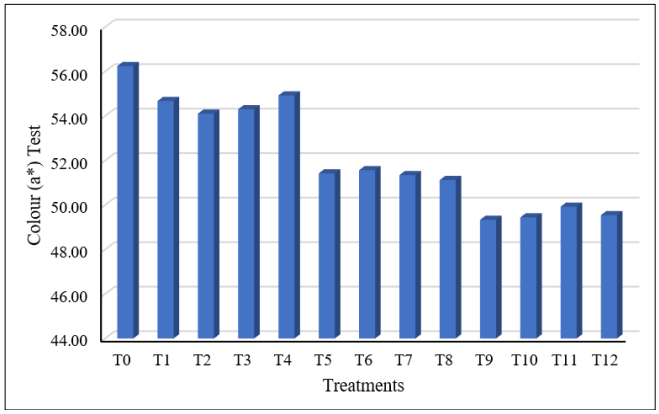

Fig 2: Graph showing Colour (a*) test of control and herbal cow ghee samples

Effect on Colour (b*) Test of herbal cow ghee samples

The highest value for Colour (b*) Test was recorded 59.65 in sample T_0 and treatments T_1, T_2, T_3, T_4, T_7, T_6, T_8, T_5, T_{10}, T_9, T_{11} and T_{12} has the mean value of 54.53, 54.46, 54.40, 54.11, 45.22, 45.20, 45.17, 45.15, 37.66, 37.65, 37.59 and 37.52 respectively. Similar results were obtained by Wasnik *et al*., (2017) [14] of Colour (b*) test of ghee adulterated with Vanaspati using image analysis. Nimbkar *et al*., (2019) [7] reported that the Colour (b*) test found to be decreased with increase in level of adulterants. It has been observed that when cow ghee samples were incorporated with 5% Brahmi leaves and the level of flaxseed oil increased from 5% to 15%, then the Colour (b*) Test was found to decrease significantly (p<0.05) from 54.53 to 37.65. When cow ghee samples were incorporated with 10% Brahmi leaves and the level of flaxseed oil increased from 5% to 15%, then the Colour (b*) Test was found to decrease significantly (p<0.05) from 54.46 to 37.66. When cow ghee samples were incorporated with 15% Brahmi leaves and the level of flaxseed oil increased from 5% to 15%, then the Colour (b*) Test was found to decrease significantly (p<0.05) from 54.40 to 37.59. When cow ghee samples were incorporated with 20% Brahmi leaves and the level of flaxseed oil increased from 5% to 15%, then the Colour (b*) Test was found to decrease significantly (p<0.05) from 54.11 to 37.52. When the brahmi leaves were constant, there was no significant difference (p>0.05) among Colour (b*) Test of treatments suggesting that Brahmi leaves do not exert any significant influence on Colour (b*) Test of ghee samples.

The observations for the Colour (b*) Test of the cow ghee samples are presented graphically in fig. No. 3.

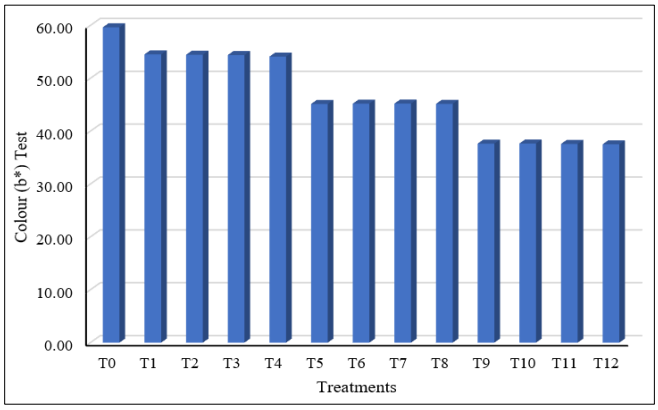

Fig 3: Graph showing Colour (b*) test of control and herbal cow ghee samples

Conclusion

From the results of the present investigation, it concluded that flaxseed oil and brahmi leaves could be successfully utilized for preparation of herbal cow ghee. Addition of brahmi leaves and flaxseed oil in herbal ghee improved the quality of cow ghee. Besides typical flavour, it also adds medicinal properties to the final product. Colour (L) Test for different samples of various treatments was found to ranges from 71.24 to 56.38. With increase in the flaxseed oil concentration the colour (L) test decreased significantly. When flaxseed oil level was constant but brahmi leaves levels was varied, no significance difference was observed among the treatments. When flaxseed oil level was varied and brahmi leaves levels was constant, there was significant different of colour (L) test among the treatments. Similarly, colour (a*) Test for different samples of various treatments was found to ranges from 56.24 to 49.54. With increase in the flaxseed oil concentration the colour (a*) test decreased significantly. When flaxseed oil level was constant but brahmi leaves levels was varied, no significance difference was observed among the treatments. When flaxseed oil level was varied and brahmi leaves levels was constant, there was significant different of colour (a*) test among the treatments. Colour (b*) Test for different samples of various treatments was found to ranges from 59.65 to 37.52. With increase in the flaxseed oil concentration the colour (b*) test decreased significantly. When flaxseed oil level was constant but brahmi leaves levels was varied, no significance difference was observed among the treatments. When flaxseed oil level was varied and brahmi leaves levels was constant, there was significant different of colour (b*) test among the treatments.

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