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Evaluation of Physico-Chemical properties of lemongrass flavoured milk

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Abstract

Milk is considered as complete food for human because it provides high quality proteins, lactose, flavour enriching fat, calcium and other minerals. Flavoured milk is one of the special milks prepared which contains all the constituents of milk like proteins, carbohydrates and minerals. In the present investigation lemongrass extract obtained from lemongrass leaves has been incorporated to prepare flavoured milk. The lemongrass extract was prepared using fresh and clean lemongrass leaves and added in fresh cow milk in different concentrations [T₁- 2% (98:2), T₂- 4% (96:4), T₃- 6% (94:6), T₄- 8% (92:8) and T₅-10% (90:10) (v/v)] to prepare lemongrass flavoured milk. In all treatments sugar was added @ 8% (w/v). After mixing the flavoured milk was analysed for different chemical attributes viz., total solids, fat, protein, ash, titratable acidity and pH. The total solids, protein, fat and pH was maximum in T₁ (19.11%, 3.31%, 3.42% and 6.46 respectively) and found decreasing with increasing concentration of lemongrass extract. While, ash content and titratable acidity had shown an increasing trend (highest in T₅; 0.84% and 0.208%, respectively) with increasing level of lemongrass extract. Considering the medicinal and flavouring properties of lemongrass, this experiment was conducted to increase the consumption of flavoured milk and improve human health.

Keywords: Physico-Chemical, flavoured milk, proteins, lactose

Introduction

Milk is considered to be divine, holy and a symbol of purity, that is why word ambrosia is synonymous with good quality dairy products. In ancient times, a country was said to be prosperous based on its cattle population and milk production. "Land of milk and honey" was always symbol of richness and prosperity, so that availability of milk and milk products in a house was an indicator of its flourishing prosperity. Utilization of milk and milk products in human diet is common from the beginning of the human civilization. This is because of the fact that milk and milk products which originate from animals are in position to supply the nutrients in balanced proportion to them. The digestibility coefficient of milk nutrients is also very high and hence they are considered indispensable in balancing the dairy food. Hence, supply of milk in one form or the other is must throughout the year. However, the milk is a perishable commodity and therefore, is required to be converted into the products having long shelf life.

Milk is regarded as rich source of nutrients as it contains high quality proteins, lactose, flavour enriching fat. The perfect composition of milk not only recommends itself for growing children but also suited to satisfy energy needs of adult. In flavoured milks, sugar, flavouring agents, colouring matters are added. Milk also provides protection against ill health and promotes good health. Milk based beverages are functional, in that they provide all essential and non-essential amino acids but, are less acidic than fruit juices (Dalim *et al.*, 2012)^[3].

In order to increase milk consumption and encourage young generation to drink milk, it has been common practice to impart flavour to the milk and then market it. This practice has given beneficial results in increasing the market value. The consumption of flavoured milk is constantly increasing. Many of the people do not like the normal taste of milk but easily accept when it is blended with some good flavours. Nowadays new trend in beverage consumption is, increase in per capita carbonated soft drink consumption and a decrease in fluid milk consumption (French *et al.*, 2003; Nielson and Popkin, 2005)^[6, 15]. Mixed fruit juice and milk beverages are considered among the most functional and nutritional foods (Pszczola, 2005)^[16].

Thus, the beverage industry should incorporate new ingredients in milk beverages which will improve their nutritional quality and organoleptic characteristics. Flavoured milks are milks to which some flavours have been added. Flavoured milk is one of the special milks prepared which contains all the constituents of milk like proteins, carbohydrates and minerals. Besides, sugar, flavouring agents, colouring matter are also present in this beverage. Flavoured milk provides energy, water to digest food, regulates body temperature and prevents dehydration. From economic point of view flavoured milks are important because it makes milk more palatable to those who don't relish it as such.

India being a tropical country, the fluid milk has a limited keeping quality. Therefore, various milk products having longer shelf life are developed from time to time. Considerable amount of surplus milk is presently diverted to flavoured milk production in advanced dairy countries for economic reason and also to meet the palate requirements of those who do not like taste of market milk. Recently, herbal products either in the form of cosmetics or food has become more popular in the world market. Epidemiological data as well as in-vitro studies strongly suggest that food containing phyto-chemical with anti-oxidation potential has strong protective effect against major disease risks including cancer and cardiovascular disease (Kaur and Kapoor, 2002) [11].

Lemon grass (*Cymbopogon citratus* L.), also known as *Gavaticaha* in marathi language and is used as an addition to tea and in preparations such as *kadha* which is traditional herbal soup used against cough, colds, etc. It has medicinal properties and is used extensively in Ayurvedic medicine. It is supposed to help with relieving cough and normal congestion. It is also rich in β -ionone which act as raw material for synthetic vitamin A and α -ionone which is main flavouring substance. The main chemical component found in lemon grass is citral, an aromatic compound, also known as lemonal. It is an antimicrobial and therefore effective in destroying or inhibiting microorganisms. Citral also contains antifungal properties. It also has a positive effect on the body's ability to use Vitamin A. Lemon grass has rubefacient properties, meaning that it may be able to improve blood circulation.

Hence, considering the medicinal properties and pleasant flavour of lemon grass and beneficial properties of milk, we have prepared the lemongrass flavored milk using lemongrass extract in different concentrations.

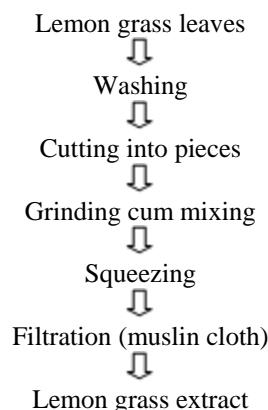
Material and methods

The present investigation was carried out at Department of Animal Husbandry and Dairy science, Dr. P.D.K.V. Akola, Maharashtra, during 2015-16. The investigation is carried out using five treatments and four replications with Randomized Block Design. As treatments, five different concentrations [T₁- 2% (98:2), T₂- 4% (96:4), T₃- 6% (94:6), T₄- 8% (92:8) and T₅-10% (90:10) (v/v)] of lemon grass extract were added to the milk and further investigation was carried out. In all treatments sugar was added @ 8% (w/v). The experimental procedures adopted during the present investigation are as mentioned below.

Collection of milk: The fresh, clean cow milk was obtained from Dairy Unit, Department of Animal Husbandry and Dairy Science. Obtained milk was filtered through the muslin cloth to avoid dirt and extraneous matter. Before the addition of lemon grass extract cow milk was analyzed for total solids, fat, protein, ash, titratable acidity and pH.

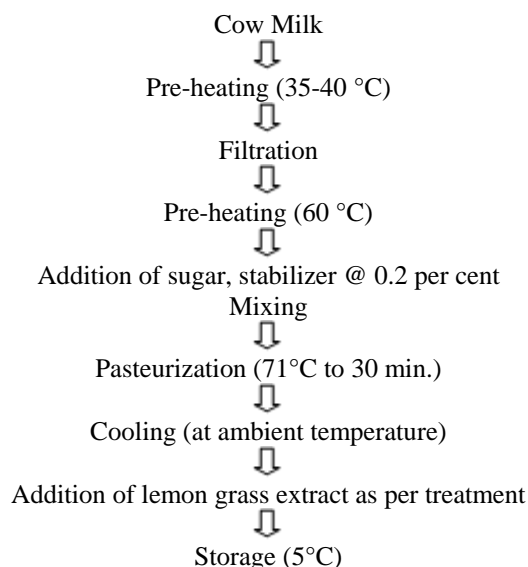
Preparation of lemon grass extract: The lemon grass extract was prepared according to the flow diagram illustrated below;

Flow Diagram-1



Preparation of Lemon grass flavoured milk: The flavoured milk was prepared as per procedure given by De (2001) [4] with slight modification.

Flow Diagram- 2



Physico-chemical Analysis of flavoured milk

1. Total solids: The total solid content in milk (raw and flavoured) was determined by gravimetric method as per IS:1479 (part II), 1961 [8].

$$\text{Total solids (\%)} = \frac{\text{Wt. of residue obtained after drying (g)}}{\text{Wt. of flavoured milk sample taken for test (g)}} \times 100$$

2. Determination of fat: Fat content of milk (raw and flavoured) was estimated by Gerber's method as per described in IS: 1224 (part I), 1977 [7].

3. Determination of protein: Protein was determined by estimating the per cent nitrogen by Micro-Kjeldahl (1883) [13] method. The per cent nitrogen was then multiplied by 6.38 to find out the protein percentage in milk.

$$\text{Nitrogen (\%)} = \frac{(A-B) \times 0.0014}{W} \times 100$$

Where,

A = Volume in ml N/10 NaOH in blank determination

B = Volume in ml of N/10 NaOH in the rest

W = Weight in mg of sample taken

The protein per cent was calculated by multiplying nitrogen percentage with factor 6.38.

Protein (%) = Per cent total nitrogen x 6.38

4. Determination of Ash: Ash was determined as per the method described in A.O.A.C.1995^[1].

$$\text{Ash (\%)} = \frac{\text{Weight of ash}}{\text{Weight of sample}} \times 100$$

5. Determination of Titratable Acidity: The acidity of milk expressed as per cent lactic acid was determined according to IS:1479 (part I), 1960^[9].

$$\text{Acidity (\%)} = \frac{\text{No. of ml 0.1 N NaOH required} \times 0.009}{\text{Weight of sample}} \times 100$$

6. pH: pH of milk was determined according to procedure laid down in BIS:1479 (Part II), 1961^[2]. The pH of the sample was measured using digital pH meter.

Results and discussion

Chemical composition of cow milk: The chemical composition of fresh cow milk was determined and the mean values are presented in Table 1.

Table 1: Chemical composition of fresh cow milk

S. No	Constituents	Mean Value (%)
	Total solids	12.82
	Fat	3.5
	Protein	3.41
	Ash	0.69
	Acidity	0.13
	pH	6.46

Proximate composition of lemongrass leaves and lemongrass extract: The proximate composition of lemongrass and lemongrass extract is presented in Table 2 and 3, respectively. The data for proximate composition of lemongrass and lemongrass extract have been acquired from Thorat *et al.* (2017)^[20].

Table 2: Proximate composition of lemongrass leaves

S. No.	Parameters	Value (%)
1.	Moisture	71.03
2.	Protein	3.83
3.	Carbohydrates	20.73
4.	Fat	4.76
5.	Fibre	9.30
6.	Ash	2.94

Table 3: Proximate composition of lemon grass extract (%)

S. No	Parameters	Value (%)
1	Moisture	11.15
2	Protein	0.30
3	Lipid	1.05
4	Crude fibre	81.11
5	Ash	6.20

Chemical composition of lemongrass flavoured milk: Both the ingredients are of different origin and contain different levels of chemical attributes. On the mixing of milk and lemongrass extract the overall composition changes and new levels of attributes are generated which again differs with different concentrations of lemongrass extract. The overall average physico-chemical attributes of lemongrass flavoured milk as affected by different levels (%) of lemongrass extract is illustrated in Table 4.

Table 4: Overall average of physico-chemical attributes of flavoured milk as affected by addition of different levels of lemon grass extract

Treatments	Total solids	Fat	Protein	Ash	Titratable acidity	pH
T ₁	19.11	3.42	3.31	0.71	0.135	6.46
T ₂	18.86	3.35	3.27	0.76	0.148	6.45
T ₃	18.78	3.17	3.26	0.81	0.150	6.41
T ₄	18.72	3.17	3.23	0.82	0.173	6.38
T ₅	18.35	3.05	3.20	0.84	0.208	6.33
CD.	0.258	0.152	0.040	0.031	0.018	0.010
SE(±m)	0.083	0.049	0.013	0.010	0.005	0.003
F test	Sig	Sig	Sig	Sig	Sig	Sig

*Values with different superscripts differ significantly ($P < 0.05$)

Total solids content: The total solid content of lemongrass flavoured milk was found elevated as compared to the fresh cow milk. The elevation in total solids might be due to the addition of lemongrass extract and sugar added. However, the value decreased with increasing concentration of the extract added. Significantly highest total solids content was noticed in T₁ (19.11%) prepared with 2 parts of lemon grass extract and lowest total solids content was noticed in T₅ (18.35 %) prepared with 10 parts of lemon grass extract. Similarly, the increase in total solid content was reported with increased fat level by Khandawe (2003)^[12] in chocolate flavoured milk, Kubde (2004)^[14] in cardamom flavoured milk and Deore (2013)^[5] in pineapple flavoured milk. Shelke (2008)^[18] reported that total solids content in seven types of flavoured milk were increased as compared to original milk, this was due to addition of sugar and not due to the flavour. Repate *et al.* (2010)^[17] also noticed decrease in the total solids content with increasing safflower concentrate in safflower flavoured milk.

Fat content: The total fat content of the flavoured milk was decreased as compared to the fresh cow milk. The fat content had shown a continuous decreasing pattern with increasing concentration of the lemongrass extract. The highest fat content was noticed in T₁ (3.42 %) and lowest content was in T₅ (3.05 %). The decrease in the fat content might be due to the low fat content of lemongrass extract. Similarly, Kubde (2004)^[14] reported that fat content of cardamom flavoured milk was proportionately decreased as compared to original milk and suggested that, it was due to increase in volume of final flavoured milk. Shelke (2008)^[18] reported that fat content of rose, vanilla, cardamom, strawberry, kesar, pineapple and mango flavoured milks slightly decreased as compared with original milk. This was due to increase in volume of final flavoured milk because of addition of sugar and not due to addition of flavour. Deore (2013)^[5] reported that there was slightly decrease in fat content (1.5, 2.5 and 3.5 per cent) of pineapple flavoured milk.

Protein content: The protein content also showed a decreasing trend with increasing concentration of lemongrass extract. Significantly the highest total protein content was

noticed in T₁ (3.31 %) and the lowest was in T₅ (3.20%). Dalim *et al.* (2012) ^[3] which showed that average protein content of chickoo flavoured milk was 3.56 per cent. Likewise, Repate *et al.* (2010) ^[17] also noticed that with increase in concentration of flavouring agent, protein content of flavoured milk beverage was gradually decreased.

Ash content: Significantly highest ash content was noticed in T₅ (0.84 %) prepared with 10 parts of lemon grass extract and lowest ash content was noticed T₁ (0.71 %) prepared with 2 parts of lemon grass extract. It indicated that ash content in flavoured milk increased with the increased lemon grass extract level. This increase in ash content was due to the higher ash content of lemongrass extract added in milk. Jothylingam and Pugazhenth (2013) ^[10] reported that ash content of dietetic herbal flavoured milk was ranging from 0.75 to 0.78 per cent.

Titrateable acidity: The titrateable acidity had shown an increasing trend with increasing level of lemongrass extract. The highest titrateable acidity content was reported in T₅ (0.208 %) and the lowest was in T₁ (0.135 %). The lemongrass extract is an acidic additive which on addition to milk, had increased the acidity of flavoured milk. Singh *et al.* (2005) ^[19] reported that increase in the level of carrot juice there was proportionately increase in the acidity content of flavoured milk.

pH: The pH of lemongrass flavoured milk was decreased with increasing level of lemongrass extract. The highest pH content was noticed in T₁ (6.46) and the lowest was in T₅ (6.33). The decrease in pH with increasing level of lemongrass extract might be due the lower pH level of lemongrass extract as compared to the fresh milk. Singh (2005) ^[19] studied the effect of incorporation of carrot juice in the preparation of flavoured milk. The pH of flavoured milk beverage at 10 per cent level of juice was found to be maximum for buffalo (6.65) and cow milk (6.51) and was lowest at 30 per cent of carrot juice for both buffalo (6.59) and cow milk (6.46). The lower pH at the higher level of incorporation of carrot juice may be due to the low pH of carrot juice.

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