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Effect of *pudina* extract on physico chemical properties of *Lassi* with optimized the level of *pudina* leaves

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Abstract
Lassi was prepared by using of buffalo milk and equal quantity of water with optimized the level of *pudina* extract. The investigation was undertaken to explore the possibilities of utilizing *pudina* extract in *lassi* manufacture to improve the health benefits of product. The product obtained was subjected for chemical analysis. On an average, the *pudina* extract used in *Lassi* for the treatment T_1, T_2, T_3 and T_4 contained moisture was found to be 88.45, 88.68, 88.75 and 88.84 per cent, fat 2.60, 2.53, 2.43 and 2.40 per cent, protein 2.22, 2.24, 2.27 and 2.30 per cent, ash 0.45, 0.45, 0.46 and 0.47 per cent, total solids 16.09, 18.19, 19.75 and 21.78 per cent and sugar 5.28, 5.18, 5.16 and 5.16 per cent, respectively. The observation in respect of titratable acidity was found to be 0.78, 0.76, 0.73 and 0.71 per cent and pH was found to be 4.19, 4.24, 4.25 and 4.27 per cent respectively.

Keywords: *Pudina* extract, *Pudina*, Buffalo milk, *Lassi*.

Introduction
Lassi is a popular indigenous fermented milk beverage, which is usually prepared by mixing *dahi* and water in equal proportions. It is served on very large scale in cold drink shops, bars and restaurants during summer in almost every state in India (Campbell Platt, 1994). Fermented milk product have played important role in the human consumption as refreshing beverages and nutritious food in many parts of the world since earliest ages. Fermented foods and beverages possess various nutritional and therapeutic properties. Lactic acid bacteria (LAB) play a major role in determining the positive health effects of fermented milks and related products. Lactic acid bacteria improve the digestibility of milk components, synthesize vitamins and produce beneficial metabolites like antibiotics, anti-carcinogenic compounds etc. during fermentation. By considering the nutritional significance and economical importance of *lassi*, it becomes essential to find out and check physic chemical properties of *Lassi*. Keeping these points in view, it was proposed to carry out research work on evaluation of the physico-chemical properties of *Lassi* with optimized *pudina* level. The health benefits of fermented milks include prevention of gastrointestinal infections, reduction of serum cholesterol levels and ant mutagenic activity.

The fermented products are recommended for consumption by lactose intolerant individuals and patients suffering from atherosclerosis. There are several varieties of fermented milk prepared according to local traditional practices and known under various names such as acidophilus milk, bulgarian milk, cultured milk, *dahi*, *leben*, *kefir*, *kumis*, *taete*, *lassi*, *yoghurt*, etc. (Laxminarayan and Shankar, 1980). Many eminent workers studied on Ayurvedic system of medicine 2nd century B. C. referred to the value of curd in promoting the appetite in increasing vitality and in curing of dyspepsia, diarrhea, dysentery, intermittent fever and other diseases. It has been evidently proved that fermented milk has unique importance in the diet of human being. Thus these fermented milk products have been known for "Cure all" and "Life extending" properties (Gandhi and Nambudripad, 1977).

The use of herbs in combination with different food has become regular practice to conserve the functional as well as nutritional attributes from herb. Many food items in the market available by different company are popular due to their acceptability and functionality viz. *Herbal beverages*, *Arjuna ghee*, *yoghurt.* (Afaneh, 2013). Menthol (*Mentha arvensis*) belongs to the family *Libeaceae* is a common edible and aromatic perennial herb which is cultivated throughout the India. Common name is *pudina*. The physical-chemical properties of menthol are melting point 43 ^{0}C (106-109^{0}F), freezing point is 27-28 ^{0}C, boiling point is 212 ^{0}C (414^{0}F). Molecular formula $C_{10}H_{20}O$ and molecular weight is 156.27 g/mol. The aromatic leaves widely used for flavoring foods and beverages. It is an erect aromatic herb that grows up to 60 cm height with suckers. The stem is cylindrical and the leaves are simple and opposing type. It is used as a contraceptive, carminative, antiseptic ulcer agent and has been

given to treat indigestion, skin diseases, cough and colds in folk medicine. In beverages *pudina* is used as a cooling and flavoring agent. (Yadav *et al*. 2010).

Material and Methods

Preparation of *pudina lassi*

The *pudina lassi* was prepared by using *dahi* of buffalo milk having 6 per cent fat and 9 per cent SNF and *pudina* leaves extract by method suggested by Sukumar De (2004) with minor modification in respect to quantity of *pudina* extract and sugar.

1. Preparation of *pudina* leaves extract:

The *pudina* extract (*Mentha arvensis*) was prepared as shown in the following flow chart as per procedure fallowed by Satpute (2015) by using the fresh *Pudina* leaves.

Collection of fresh *Mentha arvensis* leaves
↓
Sorting (not injured)
↓
Washing
↓
Grind in mixer (Add water 1:0.5)
↓
Filtration through muslin cloth
↓
Collection in glass
↓
Cold storage (5 ^{0}C)

Fig 1: Flow chart for preparation of *pudina* leaves extract

2. Preparation of *pudina lassi*

Pudina lassi was prepared as per the method used as per De. (2004) with some modification.

Receiving of milk (6 per cent fat and 9 per cent SNF)
↓
Filtration
↓
Pasteurization (63 ^{0}C for 30 min)
↓
Cooling (37 ^{0}C)
↓
Addition of standard *dahi* culture (NCDC-167) @ 2 per cent
↓
Incubation (37 ^{0}C/10 hrs)
↓
Dahi
↓
Addition of *Pudina* (menthol) extract (as per treatments)
↓
Mix with equal quantity of potable water and churning
↓
Lassi
↓
Addition of sugar (@ 15% on weight basis)
↓
Packaging
↓
Cooling & Storage (5 ^{0}C)

Fig 2: Flow chart for preparation of *pudina lassi* (De, 2004)

Optimization to the level of *pudina* extract

Two liter buffalo milk was taken for each treatment and filtered through double layer muslin cloth and pasteurized on 63 ^{0}C for 30 min. Then milk was cooled at 37 ^{0}C and subsequently 2 per cent standard *dahi* culture was added in it and kept for fermentation for 10 hrs. Then *pudina* extract was added as per treatments combination mentioned in section 3.2.1.1 after that equal quantity of potable water was added and churned it by using churner. Then 15 per cent sugar was mixed in it. The prepared *lassi* was packed in pastic bottles and stored at 5 ^{0}C until further study.

Treatment details: The *pudina* leaves extract was optimized for the preparation of *lassi* by taking its proportion 2.5, 5.0 and 7.5 per cent as per following treatments combinations.

T_1 - 100 Parts of *curd*
T_2 - 97.5 Parts of *curd* + 2.5 Parts of *Mentha arvensis* extract
T_3 - 95.0 Parts of *curd* + 5.0 Parts of *Mentha arvensis* extract
T_4 - 92.5 Parts of *curd* + 7.5 Parts of *Mentha arvensis* extract

Sensory evaluation

Various treatment combinations of the finished product were subjected to sensory evaluation by panel of judges using 9-point Hedonic scale (Gupta, 1976).

Statistical method

The data obtained in the present investigation was tabulated. The data were analyzed statistically by using Completely Randomized Design (CRD) as per Panse and Sukhatme (1985). The significance of the result was evaluated on the basis of critical difference.

Result and Discussion

Optimized the level of *Pudina* extract

The finished product form all the treatment combinations were served to the panel of judges. The scores given for various parameters for the sensory evaluation were compiled analyzed and results are presented in Table 1.

The overall score of acceptability of *pudina lassi* for the treatments T_1, T_2, T_3 and T_4 were 7.80, 8.00, 7.36 and 7.17, respectively. The highest overall acceptability score was observed in treatment T_2 i. e. (8.00). The lowest overall acceptability score was found in treatment T_4 (7.17) in *Pudina lassi*. It was observed that treatments T_1 and T_2 and treatments T_3 and T_4 at par with each other. The different scientist studied on sensory attributes of *lassi* and give their parallel remarks to our findings specially by Kadam *et al.* (2005), Kadam *et al.* (2006), Bagal *et al*. (2007), Nair *et al.* (2010), Patidar and Prajapati (2010), Bhutkar (2011), Marafon *et al.* (2011) and Shuwu *et al.* (2011) in their respective work on different aspect.

Table 1: Overall acceptability score of *pudina lassi*

Parameter	Sensory score (out of 9.0)				
Treatment	Colour and appearance	Flavour	Body and Texture	Mouth feel	Overall acceptability
T_1	7.50	7.68	7.88	8.13	7.80[a]
T_2	7.63	7.88	8.25	8.25	8.00[a]
T_3	7.19	7.38	7.25	7.63	7.36[b]
T_4	6.88	7.06	7.25	7.50	7.17[b]
S. E. ± 0.13			C. D. at 5% 0.40		

The values with different small letters superscripts row wise differ significantly at 5 per cent level of significance.

Physico chemical analysis of *pudina* extract *lassi*:

The Buffalo milk *lassi* prepared by using of *pudina* extract study was subjected for physic chemical quality viz., acidity, pH, Moisture etc.

Table 2: Chemical composition of *Pudina* extract *Lassi*

Treatments	Acidity	pH	Moisture	Fat	Protein	TS	Ash	Sugar	Viscosity
T_1	0.78	4.19	88.45	2.60	2.22	11.55	0.45	5.28	27.84
T_2	0.76	4.24	88.68	2.53	2.24	11.33	0.45	5.18	26.51
T_3	0.73	4.25	88.75	2.43	2.27	11.25	0.46	5.16	25.66
T_4	0.71	4.27	88.84	2.40	2.30	11.16	0.47	5.16	24.36

Acidity

The average acidity was 0.78, 0.76, 0.73 and 0.71 per cent for treatment T_1, T_2, T_3 and T_4, respectively (Table 2). All the treatments were significantly different from each other. It was further observed that the highest acidity was observed in treatment T_1 (0.78) followed by the treatment T_2, T_3 and T_4 this might be due to contribution of *pudina* extract in it which was supported by Kumar *et al*. (2013).

pH

From the table 2 it is clear that average pH was 4.19, 4.24, 4.25 and 4.27 per cent for treatment T_1, T_2, T_3 and T_4, respectively. The treatment T_2 and T_3 were non-significant different from each other. It was further observed that the highest pH was observed in treatment T_4 (4.27) followed by the treatment T_3, T_2 and T_1. The effect of *pudina* extract on pH of *lassi* was found similar by Kumar *et al.* (2013) and Satpute (2016) in their studies for mint flavoured yoghurt spread and herbal whey based beverage by using menthol.

Fat

The table 4 indicates that the average fat content in *pudina* extract *lassi* was found to be 2.60, 2.53, 2.43 and 2.40 per cent for treatment T_1, T_2, T_3 and T_4, respectively. The highest fat content was recorded for treatment T_1 i.e. 2.60 and the lowest fat content was recorded for treatment T_4 i.e. 2.40 per cent. Above observations clearly indicate that, as the adding of *pudina* extract in to the buffalo milk was increased, the fat content in the finished product was decreased due to the 10 times less fat content in *pudina* (0.6) as compared to buffalo milk (6.0)**.**

Protein

The average protein content of the finished product was found to be 2.22, 2.24, 2.27 and 2.30 per cent for treatment T_1, T_2, T_3 and T_4, respectively. The highest protein content was recorded for treatment T_4 i.e. 2.30 per cent and the lowest protein content was recorded for treatment T_1 i. e. 2.22 per cent. This might be due to adding of *pudina* extract in increasing level, which has more protein 4.80 per cent as compared to buffalo milk (3.5 per cent).

Ash

From the table 4 it is clear that the average ash per cent in *pudina lassi* were 0.45, 0.45, 0.46 and 0.47 per cent for treatment T_1, T_2, T_3 and T_4, respectively. The values recorded were found to be increasing order from treatment T_1 to T_4. This might be due to excess amount of mineral than buffalo milk.

Moisture

It is observed from table 4 that the average moisture content of the product i.e. *pudina lassi* was found to be 88.45, 88.68, 88.75 and 88.84 per cent for treatments T_1, T_2, T_3 and T_4, respectively. It was also observed that the moisture content was in increasing order from treatment T_1 to T_4. This might be due to the increase in the proportion of *pudina* extract has more moisture content as compare to buffalo milk.

Total Sugar

Table 4 represent the average total sugar content of *pudina lassi* were 5.28, 5.18, 5.16 and 5.16 per cent for treatment T_1, T_2, T_3 and T_4, respectively. The total sugar content were found to be highest in treatment T_1 followed by T_2, T_3, and T_4, respectively.

Total solids

It is clearly indicated from table 4.15 that the average total solids content of the finished product were found to be 11.55, 11.33, 11.25 and 11.16 per cent for treatment T_1, T_2, T_3 and T_4, respectively. The highest total solids content was recorded for treatment T_1 i.e. 11.55. The lowest total solids contents was recorded for treatment T_4 i.e. 11.16. It was observed from above findings that as the adding of *pudina* extract was increased, the total solids content of the finished product was decreased from treatment T_1 to T_4.

Viscosity

From the table 4 it is clear that the average viscosity of *lassi* were found 27.84, 26.51, 25.66 and 24.36 cps, respectively. The viscosity was highest in control treatments i. e. T_1 (27.84 cps) in control *lassi* as compared to mixed samples i. e. T_2 (26.51 cps) T_3 (25.66 cps) and T_4 (24.36 cps), respectively.

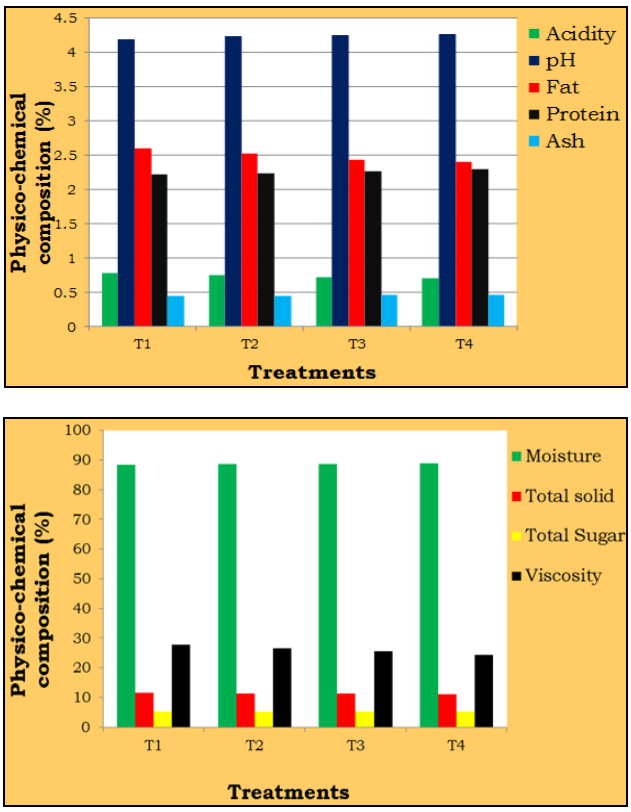

Fig 1: Graphical presentation for physico-chemical properties of *pudina lassi*

Conclusion

As regard to physico-chemical properties, the highest acidity was found in treatment T_1 (0.78%). It was observed that as the extract of *pudina* increased, there was increased in pH, protein, moisture, and ash content and decreased in acidity, fat, total sugar, total solids and viscosity content of *pudina lassi*. From the result of the present study, it may be concluded that the *pudina* extract @ 2.5 per cent with 15 per cent sugar level could be used to improve sensory quality and physic chemical properties of *lassi* adaptable as far as processing technology is concerned and also provide a novelty product.

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