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Evaluation of physico-chemical properties of Lassi prepared with optimized level of Tulsi or Basil (*Ocimum sanctum* L.)

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Abstract
Lassi was prepared by using of cow milk and equal quantity of water with optimized the level of *Basil* leaf extract and the sensory evaluation of *lassi* taken by the panel of judges. The investigation was undertaken to explore the possibilities of utilizing *basil* leaf extract in *lassi* manufacture to improve the health benefits of product. The product obtained was subjected for chemical analysis. On an average, the *Basil* leaf extract used in *Lassi* for the treatment T_1, T_2, T_3 and T_4 contained moisture was found to be 81.09, 82.62, 83.12 and 84.67 per cent, fat 3.17, 2.92, 2.76 and 2.54 per cent, protein 2.81, 2.72, 2.65 and 2.58 per cent, ash 0.63, 0.64, 0.65 and 0.66 per cent, total solids 18.91, 17.39, 16.88 and 15.35 per cent and sugar 12.31, 11.11, 10.82 and 9.57 per cent, respectively. The observation in respect of titratable acidity was found to be 0.80, 0.86, 0.90 and 0.93 per cent and pH was found to be 4.36, 4.04, 3.95 and 3.92 per cent respectively.

Keywords: Basil leaves, cow milk, Lassi

Introduction

Fermentation is a metabolic process that transforms sugar to acids, gases, or alcohol, extending the shelf life of the product while also improving the taste and digestibility. *Lassi* is a popular indigenous fermented milk beverage, which is usually prepared by mixing *dahi* and water in equal proportions. *Lassi* played important role in the human consumption as refreshing beverages and nutritious food in many parts of the world since earliest ages. The fermented products are recommended for consumption by lactose intolerant individuals and patients suffering from atherosclerosis (Laxminarayan and Shankar, 1980) [11]. *Lassi* is one of the thirst-quenching beverages made from fermented milk products. 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. Thus these fermented milk products have been known for "Cure all" and "Life extending" properties (Gandhi and Nambudripad, 1977) [6].

Tulsi or basil (*Ocimum sanctum* L.) has been utilized in *Ayurveda*, a Hindu form of medicine, for thousands of years for its various medicinal effects. *Tulsi* or basil is an adaptogen, which means it helps you adapt to stress by harmonizing numerous processes in our body. It is regarded as a kind of "elixir of life" in *Ayurveda*, with a powerful aroma and astringent taste, and is thought to prolong lifespan. *Tulsi* or basil is pungent and bitter in taste, pungent in the post digestive effect and has hot potency. It alleviates *kapha* and *vata doshas*, but slightly aggravates the pitta *dosha*. It possesses light and dry attributes. *Tulsi* or basil is a stimulant, aromatic herb and effectively reduces the fever; also contain antioxidants like beta-carotene that help in preventing cell damage. Its leaves are helpful in sharpening memory and in curing fever and common cold. They also act as an anti-stress agent and also help in purifying blood. This, in turn, helps in reducing the risk of heart attacks and also lowers the cholesterol level. The leaves of the basil are also effective in reducing mouth ulcer and other infections of the mouth. In Hindi and Gujarati, tulsi is known as 'Tulsi', in Sanskrit language it is known as 'Tulasi' and in Marathi, it is called as 'Tulas' while in English, tulsi is known as 'Holy basil' or 'Sacred basil'. (Krishna *et al*., 2014) [9]

Tulsi or basil (*Ocimum sanctum* L.) family-Lamiaceae, is a fragrant plant that has long been used to treat headaches, coughing, diarrhoea, constipation, warts, worms, and kidney issues. It has a long history as a culinary herb, with its leaves lending a distinct flavour to a wide range of recipes. It also contains insecticidal, nematicidal, fungistatic, and antibacterial biologically

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active components, as well as aroma compounds and essential oils. Extracts of the *tulsi* or basil are widely used to treat a variety of ailments, including the common cold, inflammation, malaria, heart disease, headaches, stomach problems, kidney stones, cardiac problems, and more. Tulsi, an Indian basil, is also useful for air cleaning. The *tulsi* plant is an excellent repellant for flies, mosquitoes and other insects. Also, extremely useful in the fight against malaria. (David J., 2015) [3]

The level of *basil* leaf extract was optimized on the sensory basis the score obtained was subjected for sensory analysis and organoleptic evaluation by the panel of judges. Mixed the culture of lactic acid bacteria @ 2 per cent was used to prepare *lassi* from cow milk containing 4.0 per cent fat. A 5 per cent *Basil* leaf extract level gave desirable result. Addition of *basil* leaf into *lassi* had a significant effect on acidity production. It was also observed that the overall acceptability sensory scores for treatment T_1, T_2, T_3 and T_4 were 8.10, 8.19, 7.61 and 7.20, respectively.

Material and Methods
The following materials were used for the present investigation.

Collection of Cow Milk
Fresh clean, composite sample of crossbreed cow milk were obtained from Research Cum Development Project on Cattle, Department of Animal Husbandry and Dairy Science, MPKV, Rahuri.

Collection of Basil Leaves
Fresh basil (*Ocimum sanctum* L.) leaves were obtained from Dhanvantary Udyan, Medicinal & Aromatic Plant Research Project, MPKV, Rahuri.

Microbial Cultures
The standard *dahi* culture i.e., LA 40 containing *Lactobacillus spp. and Lactococcus lactis* were used in this study and was procured from NDRI, Karnal.

Chemicals
Analytical (AR) or guaranteed grade (GR) reagents were used in the chemical analysis.

Packaging material
Plastic glasses were used for serving the developed *lassi* for sensory study and packaging was done in plastic bottles.

Methods
Phase –I
Preliminary Trails
Preliminary trails were conducted to decide the levels of sugar and basil leaf extract in *lassi*. First, level of sugar is fixed by taking trials with 12%, 14%, 16% and 18% sugar. After sensory evaluation 16% sugar was fixed. *Lassi* was prepared by addition of 2.5, 5, 7.5, 10, 12.5, 15 and 17.5 per cent levels of basil leaf extract on part basis of curd and constant 16 per cent sugar level. The control sample was also prepared without addition of basil leaf extract. The *lassi* prepared were subjected to sensory evaluation by five semi trained panel of judges.
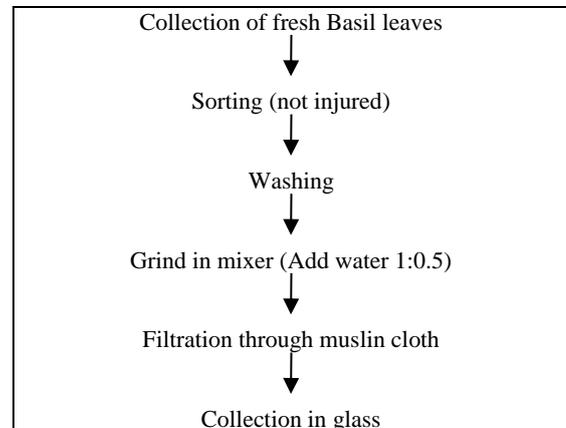
Phase –II
Experimental Trails
On the basis of results of sensory evaluation 5%, 7.5%, 10%

basil leaf extract levels and 16% sugar levels were selected for experimental trails. The *lassi* prepared were subjected to sensory evaluation by five semi trained panel of judges.
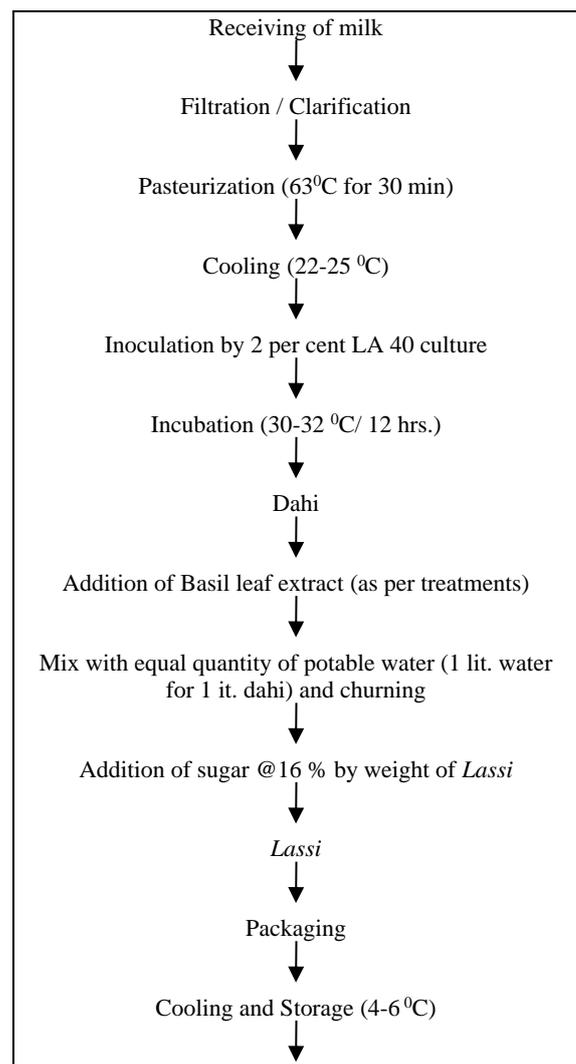
Preparation of *Basil Leaf* Extract
The Basil (*Ocimum sanctum* L.) leaf extract was prepared as shown in the following flow chart as per Satpute (2016) [14].


```
Collection of fresh Basil leaves
              ↓
     Sorting (not injured)
              ↓
           Washing
              ↓
  Grind in mixer (Add water 1:0.5)
              ↓
  Filtration through muslin cloth
              ↓
      Collection in glass
```

Flow chart for preparation of basil leaf extract

Preparation of Basil *Lassi*
Basil (*Ocimum sanctum* L.) *lassi* was prepared as per the method used as per De. (2004) [4] with some modification.


```
            Receiving of milk
                   ↓
        Filtration / Clarification
                   ↓
   Pasteurization (63⁰C for 30 min)
                   ↓
          Cooling (22-25 ⁰C)
                   ↓
  Inoculation by 2 per cent LA 40 culture
                   ↓
    Incubation (30-32 ⁰C/ 12 hrs.)
                   ↓
                 Dahi
                   ↓
 Addition of Basil leaf extract (as per treatments)
                   ↓
 Mix with equal quantity of potable water (1 lit. water
         for 1 it. dahi) and churning
                   ↓
  Addition of sugar @16 % by weight of Lassi
                   ↓
                 Lassi
                   ↓
               Packaging
                   ↓
    Cooling and Storage (4-6 ⁰C)
```

Flow chart for preparation of basil *lassi*

Procedure

Basil or *Tulsi* leaves extract was prepared from the fresh leaves cultivated in laboratory as shown in flow chart. *Basil* leaves extract was prepared by extracting the harvested grass in mixture (HERO Mixture, 550 WATTS) by using 0.5 per cent water for easy and complete extraction of solid grass through following the steps sorting *Basil* leaves, washing, grinding and filtration.

Treatment combinations

For preparation of herbal *lassi* by using *Ocimum sanctum* extract, the treatment combinations were finalized in preliminary trials on weight basis as per follows:

T_1 - 100 Parts of curd
T_2 - 95 Parts of curd + 5 Parts of Basil leaf extract.
T_3 - 90 Parts of curd + 7.5 Parts of Basil leaf extract.

T_4 - 85 Parts of curd + 10 Parts of Basil leaf 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) [8].

Statistical method

The data obtained in the present investigation was tabulated. The data were analyzed statistically by using (CRD) as per Panse and Sukhatme (1985) [12]. The significance of the result was evaluated on the basis of critical difference.

Result and Discussion
Optimized the level of *Basil* leaves extract

Table 1: Overall acceptability score of *herbal* lassi

Parameter	Overall acceptability Sensory score (out of 9.0)			
Treatment	Colour and appearance	Flavour	Consistency	Mean
T_1	8.03	8.05	8.22	8.10[a]
T_2	8.35	8.28	7.95	8.19[a]
T_3	7.81	7.40	7.62	7.61[a]
T_4	7.17	6.98	7.47	7.20[a]
S.E. $\pm$ 0.12			C.D. at 5% 0.37	

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

The finished product form all the treatment combinations were served to the panel of judges. Table 1 show that the mean overall score of acceptability of *Basil lassi* for the treatments T_1, T_2, T_3 and T_4 were 8.10, 8.19, 7.61 and 7.20, respectively. The highest overall acceptability score was observed in treatment T_2 means 5 percent of extract i.e. (8.19). The lowest overall acceptability score was found in treatment T_4 means 10 percent of extract i.e. (7.20) in *Basil*

lassi. It was observed that all treatments were at par with each other. The different scientists studied on sensory attributes of *lassi* and give their parallel remarks to our findings especially by Bagel *et al.* (2007) [2], Patidar and Prajapati (2010) [13] in their respective work on different aspect.

Physico chemical analysis of *Basil lassi*

The Cow milk *lassi* prepared by using of *Basil* leaves study was subjected for physic chemical quality viz., acidity, pH, Moisture etc.

Table 2: Chemical composition of *Basil leaves Lassi*

Treatments	Acidity	pH	Fat	Protein	TS	Ash	Sugar	Moisture
T_1	0.80	4.36	3.17	2.81	18.91	0.63	12.31	81.09
T_2	0.86	4.04	2.92	2.72	17.39	0.64	11.11	82.62
T_3	0.90	3.95	2.76	2.65	16.88	0.65	10.82	83.12
T_4	0.93	3.92	2.54	2.58	15.35	0.66	9.57	84.67

Acidity

The average acidity was 0.80, 0.86, 0.90 and 0.93 per cent for treatment T_1, T_2, T_3 and T_4, respectively. It was further observed that the highest acidity was observed in treatment T_4 (0.93) followed by the treatment T_3, T_2 and T_1 this might be due to contribution of *Basil* leaves extracting it which was supported by: Bagal *et.al.* (2011) & Deshmukh (2014) [5] show that the acidity of *lassi* sample were 0.66, 0.70, 0.72 and 0.73 per cent.

pH

From the table 2 it is clear that average pH was 4.36, 4.04, 3.95 and 3.92 per cent for treatment T_1, T_2, T_3 and T_4, respectively. All treatments are significantly different from each other. It was further observed that the highest pH was observed in treatment T_1 (4.36) followed by the treatment T_2, T_3 and T_4. The effect of *Basil* leaves extraction on pH of *lassi* was found similar by. Bagal *et al.* (2007) [2], Agarwal and Prasad (2013) [1] and Ghule *et.al.* (2012).

Fat

The table 2 indicates that the average fat content in *Basil* leaves *extract lassi* was found to be 3.17, 2.92, 2.76 and 2.54 per cent for treatment T_1, T_2, T_3 and T_4, respectively. The highest fat content was recorded for treatment T_1 (3.17) and the lowest fat content was recorded for treatment T_4 (2.54) per cent. Above observations clearly indicate that, as the adding of *Basil* leaves extract in to the Cow milk was decreased, the fat content in the finished product, in the present investigation were comparable with the findings of Shuwu *et al.* (2011) [15], Deshmukh (2014) [5].

Protein

The average protein content of the finished product was found to be 2.81, 2.72, 2.65 and 2.58 per cent for treatment T_1, T_2, T_3 and T_4, respectively. The highest protein content was recorded for treatment T_1 i.e. 2.81 per cent and the lowest protein content was recorded for treatment T_4 i.e. 2.58 per cent. This might be due to adding of *Basil* leaves extract in increasing level, which has low protein as compared to cow

milk supported by David (2015) [3] and Kumar *et al.* (2013) [10] in *lassi*.

Ash
From the table 2 it is clear that the average ash per cent in *Basil* leaves *lassi* were 0.63, 0.64, 0.65 and 0.66 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 toT_4. This might be due to excess amount of mineral than cow milk.

Moisture
It is observed from table 2 that the average moisture content of the product i.e. *Basil* leaves *lassi* was found to be 81.09, 82.62, 83.12 and 84.67 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 *Basil* leaves extract has more moisture content as compare to cow milk.

Total Sugar
Table 2 represents the average total sugar content of *Basil* leaves *lassi* were 12.31, 11.11, 10.82 and 9.57 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 treatment T_2 T_3 and lowest in T_4, while T_1 was found significantly higher than rest of treatments. It indicates that as the *Basil* leaves extract was increased the total sugar content decreased might be due to the low non reducing sugar in *Basil* leaves.

Total solids
It is clearly indicated from table 2 that the average total solids content of the finished product were found to be 18.91, 17.39, 16.88 and 15.35 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. 18.91. The lowest total solids contents was recorded for treatment T_4 i.e. 15.35. It was observed from above findings that as the adding of *Basil* leaves extract was increased, the total solids content of the finished product was decreased from treatment T_1 to T_4.

Conclusion
The *Basil* leaves extract added *lassi* was acceptable. The extract reduced fat, protein, total solid, pH and increased in, Acidity, moisture, ash and total sugar of developed *Basil* leaves *lassi*. From the result of the present study, it may be concluded that the *Basil* leaves extract @ 5 per cent 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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