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Studies on sensory attributes of *lassi* enriched through the infusion of pear pulp

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Abstract
The study was conducted in the Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur. Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, under the title "Studies on preparation of *lassi* blended with pear (*Pyrus communis*) pulp" In the present investigation the attempt was made to study the sensory properties of *lassi* prepared by using pear pulp. The *lassi* was prepared by considering treatment combination of buffalo milk as 90% 80% 70% and 60% and 10%, 20% 30% and 40% of pear pulp in treatments T_2, T_3, T_4 and T_5 treatment T_1 taken as a control prepared from buffalo milk only. The mean values for colour and appearance were observed as 8.02, 7.87, 7.9, 8.35, and 8.15 for treatments T_1, T_2, T_3, T_4 and T_5 respectively. The mean score of flavour for *lassi* were observed as T_1 (7.97), T_2 (8.15), T_3 (8.25), T_4 (8.4) and T_5 (8.25). Average mean score for taste of *lassi* with addition of *pear* pulp were observed for treatment T_1, T_2, T_3, T_4 and T_5 were 7.75, 8.42, 8.17, 8.6 and 8.52 respectively. The mean score for body and texture for the *lassi* were observed as T_1 (8.00), T_2 (8.05), T_3 (7.87), T_4(8.4) and T_5 (8.17) and it shows declined as the levels of *pear pulp* increases. The last one that is the mean score for overall acceptability for *lassi* were 7.95, 7.87, 7.9, 8.35 and 8.2 for treatments T_1, T_2, T_3, T_4 and T_5 respectively. On the basis of result it was revealed that as the concentration of pear in *lassi* increased change in sensory properties of *lassi* was observed.

Keywords: Buffalo milk, Sensory properties, pear fruit, *Lassi*

Introduction
Milk and milk products play an important role in the human diet majorly recommended for children and elder people. It provides energy and nutrients for the nourishment of the human body. (Adiver, C. N., & Hiremath, J. P.2021) [1]. The demand for fermented milk products is increasing and it has been estimated that about 10.0 percent of total milk produced in India is used for preparation of traditional fermented milk products (Khurana and Kanawjia, 2007) [8]. *Lassi* contains appreciable amounts of milk protein, phospholipids and nutritive value of fermented milk product that are derived from the nutrients in form of various metabolites produced by lactic bacteria during fermentation. (Kumar *et al.* 2020) [9]. The product is popular not only because of its refreshing and delicious taste, but also due to its nutritive and therapeutic benefits and thirst-quenching quality (Momin, 2009).

Materials and Methods
The current study was conducted in the Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur. Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, under the title "Studies on preparation of *lassi* blended with pear pulp (*Pyrus communis*)" The following materials and procedures were utilized in this investigation.

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Fig 1: Preparation of pear fruit pulp
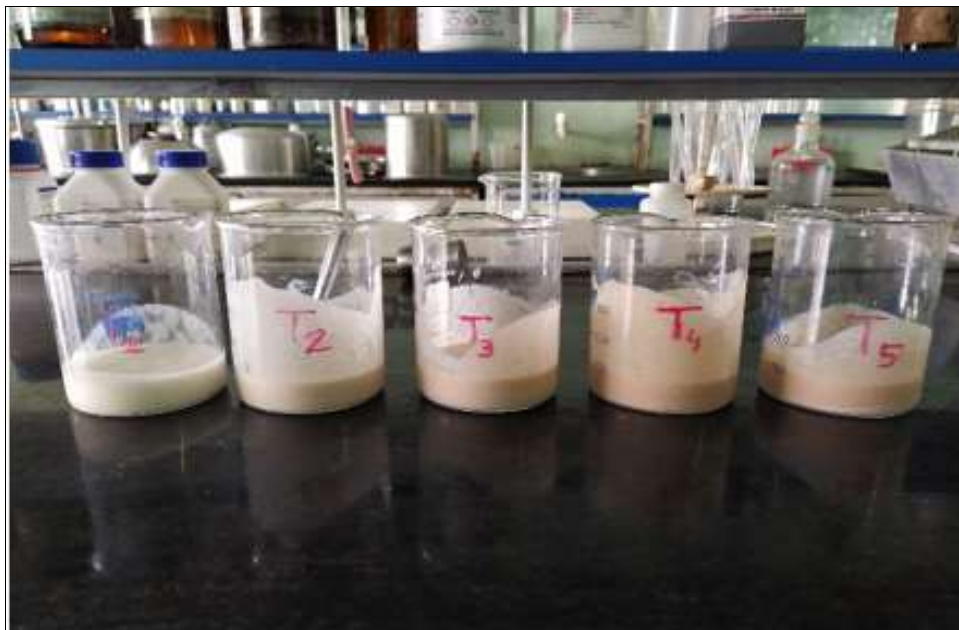
c) Samples of pear pulp blended *lassi*

d) Preparing samples for sensory trial

e) Sensory evaluation of sample by semi trained panel

Fig 2: Preparation of *lassi* blended with pear fruit pulp

Collection of Buffalo Milk
The full fresh and clean standardized fresh buffalo milk was obtained from the local market of Latur city, from Natural Milk Pvt. Ltd., Latur. and contained 6.0 per cent fat and 9.0 per cent SNF.

Microbial culture
The normal *dahi* culture was employed at 2 per cent in the *lassi* preparation. The standard *dahi* culture i.e. Standard *dahi* contained *Streptococcus thermophilus* and *Lactococcus lactis* (NCDC-167) in this study was procured from National Dairy Research Institute (NDRI), Karnal.

Propagation and maintenance of lactobacillus cultures
The NCDC-167 (BD4) culture was propagated in 10 ml sterile de Man-Rogosa-Sharpe (MRS) broth and maintained in litmus milk in refrigerator until use. These were periodically sub-cultured in the same medium once in a week. The culture was activated by sub-culturing before use and purity was always ascertained by Gram's staining. One set of cultures was stored at -80 °C in MRS broth containing 20% glycerol as a stock.

Equipments and accessories
For preparation, stainless steel jars of sufficient capacity, muslin fabric, standard weight balance, thermometer, gas *Shegdi*, electrical churner, mixture (HERO Mixture, 550 WATTS), and glass rod were employed. This material was thoroughly cleaned and rinsed with a detergent solution before use. To avoid contamination, all cautious steps were performed during the experiments.

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

Packaging material
The prepared Pear *Lassi* was packed in sterilized plastic bottles for further study.

Collection of pear pulp
The pear pulp was acquired in the Latur city market. In the laboratory, pear pulp was created.

Treatment combinations
Lassi prepared with pear (*Pyrus communis*) pulp was finalized on a weight basis by adding sugar 15 per cent by weight of *lassi* and pear pulp as per the treatment combinations as follows:

T_1 - 100 Parts of curd
T_2 - 90 Parts of curd + 10 Parts of pear pulp
T_3 - 80 Parts of curd + 20 Parts of pear pulp
T_4 - 70 Parts of curd + 30 Parts of pear pulp
T_5 - 60 Parts of curd + 40 Parts of pear pulp

Result and Discussion
Sensory evaluation of *lassi* with addition of *pear pulp*
Sensory evaluation is defined as scientific method of used to analyse and interpret those responses to products as perceived through the senses of sight, smell, touch, taste, and hearing. *Lassi* made from buffalo milk with addition of *pear pulp* with different concentrations were took for sensory attributes such as colour and appearance, flavour, body and texture, taste and overall acceptability by semi-trained panel of judges by using a 9-point hedonic scale and the data so obtained, where analysed by using completely randomized design (CRD). The data were analyzed statistically by using Completely Randomized Design (CRD) as per Panse and Sukhatme (1985) [16]. The score given by judges for different parameters were recorded and further discussed into the following Tables and graphs.

Colour and appearance score for pear pulp blended *lassi*
The most important attribute of any products sensory is colour and its appearance. Colour and appearance is one of the most important sensory property of any product. The average score for colour and appearance with respect to different concentrations of *pear pulp* is shown in Table 1.

Table 1: Mean colour and appearance score for pear pulp blended *lassi*

Replication Treatment	R_1	R_2	R_3	R_4	Mean
T_1	8.3	8.1	7.9	7.8	8.02[b]
T_2	8.1	7.9	7.8	7.7	7.87[b]
T_3	8.2	7.7	7.9	7.8	7.9[b]
T_4	8.5	8.3	8.4	8.2	8.35[a]
T_5	8.1	8.4	8	8.1	8.15[ab]
S.E.±0.0926, C.D. at 5 % 0.2792					

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

The mean score for colour and appearance for *lassi* made with addition of *pear pulp* of treatments T_1, T_2, T_3, T_4 and T_5 shown in the Table 1. The average score for colour and appearance are ranges from 8.02 to 8.15 score of *lassi* is majorly affected due to addition of different level of *pear pulp*. The mean of all

treatments was acceptable and secured score for the point of like very much but T_4 have much like on "9 point hedonic" scale for colour and appearance. The average scores for colour and appearance of *pear lassi* were 8.02, 7.87, 7.9 ,8.35 and 8.15 for treatments of T_1, T_2, T_3, T_4 and T_5 respectively. The highest score for colour and appearance was found with treatment T_5 (8.15) and lowest for T_1 (8.02), It indicates positive impact of using *pear* for making *lassi*. The treatments T_1 and T_2 were at par with each other and were not significantly differed from each other. The treatments T_3, T_4 and T_5 had shown significant difference from treatments T_1 and T_2.

The results for developed *lassi* were comparable with some other research works as similar results were observed in following discussed research works.

Shaikh *et al*. (2016) [14] indicated that the *lassi* blended with sapota pulp with treatment T_4 had obtained highest score and significant superior due to its flavour, body and texture, colour and appearance. On the basis of overall results, it was concluded that a good quality *lassi* could be prepared by blending with 15 per cent sapota pulp.

Maji *et al*. (2018) [10] concluded on quality of honey *lassi* fortified with turmeric extract. Average score for colour and appearance of *lassi* shows decline by addition of turmeric extract. Mean values for treatment T_0, T_1, T_2, T_3 and T_4 were 7.66, 7.50, 7.45, 7.33 and 6.66, respectively.

Flavour score for pear pulp blended *lassi*
The flavour is very important among the other properties because of its feeling and quality indication of food. Flavour plays vital role in determining the acceptability of foods. It includes smell and taste of the products. The data related to sensory score for flavour with respect to different levels of *pear pulp* added in *lassi* is formulated in Table 2.

Table 2: Mean flavour score for pear pulp blended *lassi*

Replication Treatments	R_1	R_2	R_3	R_4	Mean
T_1	8.10	8.00	7.90	7.90	7.97[c]
T_2	8.20	8.10	8.30	8.00	8.15[bc]
T_3	8.30	8.40	8.10	8.10	8.25[ab]
T_4	8.50	8.60	8.40	8.10	8.4[a]
T_5	8.40	8.20	8.40	8.00	8.25[ab]
S.E.±0.0811, C.D. at 5 % 0.2445					

The values with different small letters superscripts row wise differ significant at 5 percent level of significance.

From the Table 2. it was determined that the average score of flavour for treatments T_1, T_2, T_3 T_4 and T_5 were 7.97, 8.15, 8.25, 8.4 and 8.25 respectively. The highest score for flavour was recorded for the treatment T_4 (8.4) thereafter it was decreases from T_1, T_2, T_3 and the lowest for treatment T_1 (7.97). The highest flavour score i.e, 8.4 was obtained for treatment T_4 in 30 per cent *pear pulp* was added in *lassi* and lowest score is observed in T_1 in which no *pear pulp* was in *lassi*. The treatment T_4 was significantly ($p<0.05$) differed from other three treatments. The treatment T_1 with T_2 were also significantly ($p<0.05$) differed from each other and T_3, T_4 with T_2 and T_1 were non-significantly differed from each other.

Kedaree *et al*. (2021) [7] conducted research on *lassi* blended with kiwi pulp. He observed that *Lassi* prepared from T_1 level recorded highest score for flavour (8.38) followed by T_0 (7.50). The sensory score increased at T_1 i.e. 2.5 per cent level kiwi pulp. Treatment T_1 found significantly different than the

other treatments T_1, T_2 and T_3 whereas treatment T_2 and T_3 found at par with treatment T_0.

Bagal *et al*. (2016) [2] created *lassi* by using papaya pulp. It could be seen that *lassi* blended with 8 per cent papaya pulp recorded the highest score (37.38 out of 45) in respect of flavour for the treatment T_3, lowest score 34.95 for the treatment T_4 whereas, score obtained by plain *lassi* was 35.87 for the treatment T_1. The *lassi* blended with 8.0 per cent papaya pulp scored highest points as compared to 4 and 12 per cent levels of papaya pulp. Results indicate that the *lassi* prepared with 8 per cent level of papaya pulp was superior to 4 and 12 per cent levels. It showed that increase in level of fruit pulp increases flavour of *lassi* up to certain limit and thereafter it decreases proportionately.

Taste score of pear pulp blended *lassi*

The taste is the prominent parameter for the consumer liking. Table 4.13 indicates the score of taste of *lassi* from *pear pulp*. The score recorded for prepared product is given in Table 3. From the Table 3. it was concluded that highest score for taste was significantly obtained by T_4 (8.52) and lowest score recorded in treatment T_1 (7.75). It can be observed that score for taste of *lassi* increased. Mean score for the treatments T_1, T_2, T_3, T_4 and T_5 were 7.75, 8.42, 8.17, 8.6 and 8.52 respectively. The highest score for taste was recorded for the treatment T_4 in which 30 per cent *pear pulp* was added in *lassi* (8.6) and lowest score for the treatment T_1 in which no *pear pulp* was mixed in *lassi* (7.75).

From the above treatments it concluded that treatment T_4 was most superior over the other treatments. Treatment T_1, T_2 T_3 and T_4 were at par with each other and the treatment T_5 was significantly ($p<0.05$) differed from all other treatments.

The results given below for taste score in above analysis where co-ordinate with below specified research works.

Dhumal *et al*. (2018) [3] evaluated that the taste scores of pudina extract *lassi* ranges from 8.13, 8.25, 7.63 and 7.50 for treatment T_1, T_2, T_3 and T_4, respectively. He showed that the increased in pudina extract level, it was significantly increased in the taste score of *lassi* from treatment T_1, T_2, T_3 and then decrease in treatment T_4.

Table 3: Mean taste score for pear pulp blended *lassi*

Replication Treatment	R_1	R_2	R_3	R_4	Mean
T_1	7.80	7.60	7.70	7.90	7.75c
T_2	8.20	8.40	8.60	8.50	8.42a
T_3	8.30	8.10	8.10	8.20	8.17b
T_4	8.4	8.6	8.7	8.7	8.6a
T_5	8.50	8.40	8.70	8.50	8.52a
S.E.± 0.06739, C.D. at 5 % 0.2031					

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

Jamdar *et al*. (2020) [5] carried work on standardization and sensory properties of skim milk *lassi* blended with sorghum extract. It was observed that taste score for sorghum extract *lassi* in treatment T_1, T_2, T_3 and T_4, were 7.55, 7.65, 8.13 and 7.10, respectively. Score for taste of the *lassi* increased up to treatment T_3 (8.13) and then it shows slowly decline in treatment T_4 (7.10).

Body and texture score of pear pulp blended *lassi*

Body and texture is one of the essential parameter of every milk product and it is one of the reason for attracting sellers towards milk products. Both body and texture are opposite of

each other for food with their acceptability. For the sensory evaluation it has huge significance. The sensory score for the body and texture with respect to the different levels of *pear lassi* is given in the Table 4.

Table 4: Mean body and texture score for pear pulp blended *lassi*.

Replication Treatment	R_1	R_2	R_3	R_4	Mean
T_1	8.2	8.1	7.9	7.8	8bc
T_2	8.3	8.2	7.8	7.9	8.05bc
T_3	8.1	7.8	7.9	7.7	7.87c
T_4	8.5	8.1	8.6	8.4	8.4a
T_5	8.4	8.2	8	8.1	8.17ab
S.E.±0.0987, C.D. at 5 % 0.2976					

The values with different small letters superscripts row wise differ significant at 5 percent level of significance.

In the Table 4 for the body and texture average score was recorded and it ranges between 8.00 to 8.17 for the *pear lassi*. The average mean score for *pear lassi* was 8.00, 8.05, 7.87, 8.4 and 8.17 for treatments T_1, T_2, T_3, T_4 and T_5 respectively. For the *pear lassi* highest mean score was recorded for treatment T_4 (8.4) and lowest one recorded for treatment T_1 (8.00). The highest score was obtained for T_4 in which 30 per cent *pear pulp* was added in *lassi* and lowest for T_1 in which 0 per cent *pear pulp* was added in *lassi*. The treatment T_4 was superior to other treatments. The treatments T_2 with T_4 was not significantly differed from each other.

From the above discussion, it was revealed that, as the level of *pear pulp* was increases, the score for body and texture also increases up to certain limit and thereafter it decreases.

Mule *et al*. (2018) [12] reported that the mean score of body and texture of lemon grass extract added *lassi* from 7.36, 7.61, 7.66, 7.43 and 7.34 for treatments T_0 T_1, T_2, T_3 and T_4 respectively.

Jadhav (2016) [4] examined that *lassi* prepared from 10 per cent musk melon was superior in body and texture than other treatments.

Overall acceptability score for pear blended *lassi*

Overall acceptability is the average score for all the sensory attributes of the final product. Overall acceptability can be considered as complex parameter of product that finalize its acceptability to consumer. The average score for overall acceptability for *pear lassi* is given below in Table 5.

Table 5: Mean overall acceptability score for pear pulp blended *lassi*

Replication Treatment	R_1	R_2	R_3	R_4	Mean
T_1	8	8.1	7.9	7.8	7.95b
T_2	8.1	7.9	7.7	7.8	7.87b
T_3	8.2	7.8	7.9	7.7	7.9b
T_4	8.4	8.3	8.4	8.2	8.35a
T_5	8.1	8.3	8.2	8.2	8.2a
S.E.±0.07359, C.D. at 5 % 0.2218					

The values with different small letters superscripts row wise differ significant at 5 percent level of significance.

The mean score for overall acceptability for control (T_1) and other treatments T_2, T_3, T_4 and T_5 is given in above Table 5. The overall acceptability score for *pear lassi* increased as the level of *pear pulp* is increases in *lassi* then decreases. The average score for overall acceptability of *pear lassi* for treatments T_1, T_2, T_3, T_4 and T_5 were 7.95, 7.87, 7.9, 8.35 and 8.2 respectively. From the above data, we can conclude that treatment T_4 (8.35) obtained highest score and treatment T_2

(7.87) got lowest score for overall acceptability. The treatment T_4 was significantly ($p<0.05$) differed from treatment T_1, T_2, T_3 and T_4 the treatments T_1 and T_2 were also non-significantly differed from each other.

There are so many scientists who worked on the sensory attributes of *lassi*. Mean score for *lassi* obtained from their work is less or more similar with results.

Kakade *et al.* (2018) [6] demonstrated that the overall acceptability of wheat grass extract *lassi* for treatments T_1, T_2, T_3 and T_4 were 7.10, 7.41, 7.53 and 7.47 respectively. The overall acceptability scores of wheat grass extract *lassi* first increased then some decline.

Washimbe *et al.* (2020) [15] evaluated sensory analysis of low-fat muskmelon *lassi*. Most acceptable quality of low fat *lassi* can be prepared by using 5.0 parts of muskmelon pulp i.e. T_2 (8.94) which had obtained highest score for overall acceptability as compared to T_1 (8.13), T_3 (8.13), T_4 (7.25) and T (6.69).
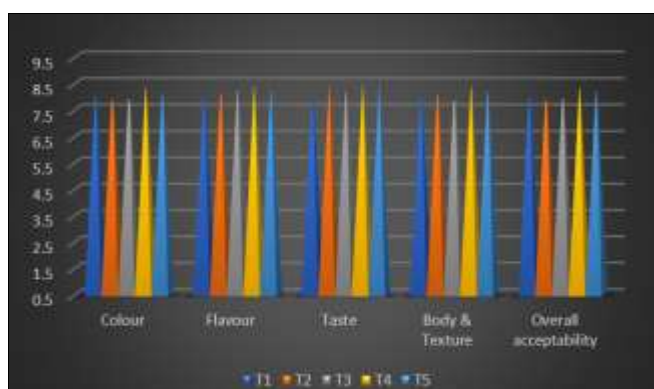
Fig 3: Graphical representation for sensory evaluation of pear pulp blended *lassi*

Conclusion
From present investigation it was observed that the Pear fruit pulp can be used for acceptable *lassi* on the reason of sensory properties of *lassi*. The nutritional and long shelf life *lassi* can be made by using *pear* pulp for completing consumer's demand. The sensory parameters related with dairy product was recorded and which scored more than 8 ranged in between like very much to like extremely on 9-point hedonic scale. In the present research, as the level of *pear* pulp in *lassi* increases change in sensory properties of *lassi* was observed.

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