



# Studies on Physico-chemical and Sensory Aspects of Guava Lassi

Mamta P. Girguse<sup>a++\*</sup>, Bhavana R. Wankhade<sup>b</sup>,  
V.G.Atkare<sup>c</sup> and A.B. Motghare<sup>c</sup>

<sup>a</sup> Section of Animal Husbandry and Dairy Science, College of Agriculture, Nagpur (Dr. PDKV, Akola), Maharashtra, 440001, India.

<sup>b</sup> Agricultural Economics, College of Agriculture, Nagpur (Dr. PDKV, Akola), Maharashtra, 440001, India.

<sup>c</sup> College of Agriculture, Nagpur (Dr. PDKV, Akola), Maharashtra-440001, India.

## Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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## ABSTRACT

The present investigation entitled "Preparation of cow milk lassi blended with guava (*Psidium guajava*) pulp" was conducted at Section of Animal Husbandry and Dairy Science, Nagpur. An effort was made to find out the optimum level of guava pulp in the preparation of lassi, with main objectives to evaluate the product by sensory evaluation, determination of physico-chemical composition and to calculate cost of production. Some of the finding emerged from the present investigation are summarized as follows. In view of above objective present study was carried out with five treatments including control T<sub>1</sub> and lassi prepared from cow milk with different level of guava pulp i.e. 5 %, 10 %, 15 %, 20 % in treatment T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub>, respectively. From the investigation it was observed that, the mean score of flavour of lassi in treatment T<sub>4</sub> was highest

<sup>++</sup> PG Student;

\*Corresponding author: E-mail: girgusemamta@gmail.com; girgusemamta@gmail.com;

(8.50) and lowest in T<sub>5</sub> (5.50). The average score for colour and appearance of lassi was highest in T<sub>4</sub> (8.50) and lowest in T<sub>5</sub> (5.75). The average score for body and texture of lassi was highest in T<sub>4</sub> (8.50) and lowest in T<sub>5</sub> (5.25). The sensory evaluation for (overall acceptability) carried out by the judges, showed that lassi prepared by blending with 15 part of guava pulp (T<sub>4</sub>)8.50 as most acceptable treatment. This superiority was found due to addition of 15 percent of guava pulp.

**Keywords:** Lassi; guava pulp; physico-chemical properties; sensory properties; cost of production.

## 1. INTRODUCTION

Milk has a high nutritive value known as an ideal food. It supplies body building protein, bone forming minerals and health-giving vitamins and furnishes energy providing lactose and milk fat. All these properties make milk an important food for every age of human being. Bovine milk is majorly consumed among milk from other species. The bovine and caprine are the foremost source of milk, which also played a noteworthy role in the social-economic development of both developed and under-developed countries both cow and goat are comprised of an adequate number of bioactive constituents [1].

Guava (*Psidium guajava*) a native to tropical America is exceedingly well known fruit in India. And also known as *amrood* in Hindi, comes loaded with tiny hard seeds at the center. It is believed to have its genesis in Central America where it is alternatively known as "sand plum" [2,3]. Besides its unique flavour and fragrance, guava has been hailed as one of the super fruits due to the numerous health benefits it offers. It indeed is a powerhouse of nutrients. "This humble fruit is extraordinarily rich in vitamin C, lycopene and antioxidants that are beneficial for skin. Guavas are also rich in manganese which helps the body to absorb other key nutrients from the food that we eat. The potassium in guavas helps normalise blood pressure levels as well [4,5,6].

### 1.1 Objectives

The present investigation on "Preparation of cow milk lassi blended with (*Psidium guajava*) pulp"

was undertaken with following objectives, to find out the optimize level of Guava pulp in the preparation of lassi, to study the physico-chemical properties and to calculate the cost structure.

## 2. MATERIALS AND METHODS

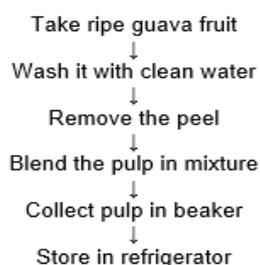
Fresh, clean, whole cow milk was used for lassi preparation. Cow milk was procured for every trial from Livestock Instructional Farm of Section of Animal Husbandry and Dairy Science, College of Agriculture, Nagpur. Guava fruit, dahi culture was procured from local market. Cow milk was standardized at 4 per cent fat and then it was heated to 72°C for 15 sec. After heating it was cooled to 32°C and inoculated with 1 per cent starter culture. Then it was allowed for incubation for 22-25 hours at room temperature. After which it was followed by break down the coagulum. After addition of chilled water and sugar @10 per cent as per treatments. Start blending lassi was stored and filled in container storage (7±°c).

### 1. Sugar

Good quality cane sugar was obtained from local market and used @ 10 in each treatment.

### 2. Procurement of starter culture

The starter culture obtained from local market in Nagpur city was used to prepared curd from fresh standardized milk. Inoculation was done by using 1 per cent starter culture for fermentation process.



**Chart 1. Flow chart of preparation of guava pulp**

## Treatment Details

| Treatments     | Lassi (in part) | Guava pulp (in part) |
|----------------|-----------------|----------------------|
| T <sub>1</sub> | 100             | 0                    |
| T <sub>2</sub> | 95              | 5                    |
| T <sub>3</sub> | 90              | 10                   |
| T <sub>4</sub> | 85              | 15                   |
| T <sub>5</sub> | 80              | 20                   |

In all treatment water and sugar was added @ 10 per cent respectively in curd.

Design of experiment: Completely Randomized Design (CRD)

Number of treatments: 5

Number of replications: 4

### 3. Starter culture used for fermentation

The starter culture were used for fermentation of milk at the rate of 1 per cent of milk

protein content was lowest T<sub>5</sub> (3.71) in 20 per cent guava pulp. It is observed from the present study that as increase in guava pulp there was decrease in protein content.

## 3. RESULTS AND DISCUSSION

The present study and investigation entitled as "preparation of cow milk lassi blended with guava (*Psidium guajava*) pulp", was carried out in the following order. The present study shifts in consumption pattern of the Indian consumers from milk to innovative milk products brings a large scope for dairy processing in the country. It is a great challenge to innovate methodologies and technologies at the same time encouraging the value addition as well as the by-product utilization of these commodities.

Similar results were reported by Kedaree et al. [8] observed that the protein percentage of the kiwi pulp lassi in different proportion of 100:00(T<sub>0</sub>), 97.5:2.5 (T<sub>1</sub>), 95:5:5 (T<sub>2</sub>) and 92.5:7.5 (T<sub>3</sub>) lassi to kiwi pulp. Fat content were recorded as 3.68, 3.59, 3.56 and 3.47, respectively. The level of protein per cent was decreased as per increase in level of kiwi pulp in lassi. The highest protein content in T<sub>1</sub> (3.68) and lowest protein content in lassi is T<sub>4</sub> (3.47).

### 3.1 Fat

The fat content of lassi in treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub> are 4.55, 4.43, 4.32, 4.23 and 4.12 per cent respectively. The average fat per cent was significantly highest (4.55) in treatment T<sub>1</sub>. While fat percentage was lowest (4.12) in treatment T<sub>5</sub> prepared with 20 per cent level of guava pulp. It was determine that increase in the level of guava pulp decrease in the fat content of lassi.

### 3.3 Ash

The ash content in lassi sample was significantly affected due to addition of guava at different levels. Ash contents in the lassi (T<sub>1</sub>), (T<sub>2</sub>), (T<sub>3</sub>), (T<sub>4</sub>), (T<sub>5</sub>) were 0.72, 0.82, 0.91, 1.14 and 1.21 per cent respectively. The ash percentage was significantly highest (1.21%) in lassi prepared with guava pulp (T<sub>5</sub>) while ash content was lowest (0.72%) in lassi prepared without addition of guava pulp (T<sub>1</sub>). It was determine that with increased in the level of guava pulp increased the ash content in lassi.

The similar result were reported by Nichal et al. [7] observed that the fat percentage of the aloe vera juice lassi in different proportion of 100:00(T<sub>1</sub>), 69:4 (T<sub>2</sub>), 92:8 (T<sub>3</sub>), 88:12 (T<sub>4</sub>) and 84:16(T<sub>5</sub>) lassi to aloe vera juice. Fat content were recorded as 3.80, 3.65, 3.50, 3.35 and 3.20, respectively.

### 3.2 Protein

The protein content of lassi blended with guava pulp in T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub> treatments were 4.49, 4.29, 4.14, 3.94 and 3.71 per cent respectively. The protein percentage is significantly highest in T<sub>1</sub>(4.49) plain lassi while

Similar results were reported by Kogde [9] studies on preparation of burfi by the utilization of guava (*Psidium guajava*) pulp reported that the ash content was significantly varies due to addition of guava pulp. The average value of ash content in burfi blended with guava pulp under the treatment (T<sub>1</sub>), (T<sub>2</sub>), (T<sub>3</sub>), (T<sub>4</sub>) and (T<sub>5</sub>) were 2.45, 2.48, 2.64, 2.69 and 2.75 per cent, respectively. Significantly highest ash content was noticed in T<sub>5</sub> (2.75%) and lowest fat content shown in T<sub>1</sub> (2.45). It is shown that with increased in the level of guava pulp increased the ash content in lassi.

### 3.4 Acidity

The titratable acidity of lassi sample was affected due to the addition of guava at different levels. Titratable acidity contents in the lassi T1, T2, T3, T4 and T5 is 0.80, 0.78, 0.76, 0.75 and 0.73 per cent, respectively. It was observed that addition of different level of guava pulp had decreases on acidity of lassi. The acidity percentage was highest (0.80%) in lassi prepared without addition of guava pulp (T1) while acidity content was lowest (0.73 %) in lassi prepared with addition of 20 per cent guava pulp (T5).

The similar result were reported that Kedaree et al. [8] observed that the titratable acidity percentage of the kiwi pulp lassi in different proportion of 100:00(T0), 97.5:2.5 (T1), 95:5:5 (T2) and 92.5:7.5 (T3) lassi to kiwi pulp. Titratable acidity content were recorded as 0.86, 0.66, 0.61 and 0.54, respectively. The level of titratable acidity per cent was decreased as per increase in level of kiwi pulp in lassi. The highest titratable acidity content in T1 (0.86) and lowest titratable acidity content in lassi is T3 (0.54).

### 3.5 P<sup>H</sup>

The pH content of lassi prepared by using different levels of guava pulp was ranged from 4.32 to 4.53. The mean pH of lassi for treatments T1, T2, T3, T4 and T5 were 4.32, 4.39, 4.42, 4.46 and 4.53, respectively. The maximum pH was observed with the treatment T5 (4.53) in lassi and minimum pH was observed with the treatment T1 (4.32). It was determined that increased in the level of guava pulp increase the pH content in lassi.

Similarly, Dhumal et al. [10] studied the effect of pudina extract on physico- chemical properties of lassi with optimized the level of pudina leaves. The pH score of pudina extract lassi with addition of different level of pudina leaves extract at 100:0 (T1) controlled, 97.5:2.5 (T2), 95:5:5(T3) and 92.5:7.5 (T4) were recorded as 4.19, 4.24, 4.25 and 4.27, respectively. The maximum pH was observed with the treatment T4 (4.27) in lassi and minimum pH was observed with the treatment T1 (4.19). It was determined that increased in the level of pudina extract increase the pH content in lassi.

### 3.6 Moisture

The moisture content for control (T1) and lassi blended with guava fruit pulp (5, 10, 15, 20 per

cent) T2, T3, T4 and T5 is presented in Table 1. It was highest in T5 (90.78) and lowest in T1 (86.35). The average moisture content of finished product i.e. guava fruit pulp lassi for treatment T1, T2, T3, T4 and T5 were 86.35, 87.47, 88.58, 89.67 and 90.78 per cent, respectively.

The moisture contents were comparable with Dhumal et al. [10] studied the moisture score of pudina extract lassi with addition of different level of pudina leaves extract at 100:0 (T1) controlled, 97.5:2.5 (T2), 95:5:5 (T3) and 92.5:7.5 (T4) were recorded as 88.45, 88.68, 88.75 and 88.84, respectively. The maximum moisture was observed with the treatment T4 (88.84) in lassi and minimum moisture was observed with the treatment T1 (88.45). It was determined that increased in the level of pudina extract increase the moisture content in lassi.

### 3.7 Total Solids

The total solids of guava pulp lassi in treatment. T1, T2, T3, T4 and T5 were 15.12, 17.25, 18.27, 19.32 and 19.55, respectively. It was seen that as the levels of guava pulp increases the total solids content also increases in lassi. The mean total solids content for control (T1) and lassi blended with guava fruit pulp (5, 10, 15 per cent) T2, T3 and T4 is presented in Table 2. It was highest in T5 (19.55%) and lowest in T1 (15.12%).

The result obtained in present study are in agreement with the results reported by Kedaree et al. [8] observed that the total solids percentage of the kiwi pulp lassi in different proportion of 100:00(T0), 97.5:2.5 (T1), 95:5:5 (T2) and 92.5:7.5 (T3) lassi to kiwi pulp. total solids content were recorded as 9.03, 9.60, 10.11 and 10.43, respectively. The level of total solids per cent was increased as per increase in level of kiwi pulp in lassi. The highest total solids content in T3 (10.43) and lowest total solids content in lassi is T0 (9.03).

### 3.8 Sensory Evaluation of Lassi

Sensory evaluation for all the parameters (flavor, body and texture, colour and appearance and overall acceptability) will be carried out by the panel of judge by using 9 point Hedonic scale as prescribed by Nelson and Trout (1964).

### 3.9 Flavour

The variation in flavour score was observed statistically significant in the different treatments. The mean score of flavour of guava lassi for treatment T1, T2, T3, T4 and T5 were 5.75, 6.50, 6.75, 8.50 and 5.50, respectively.

**Table 1. Mean values of five replication in percent**

| Treatments (% guava pulp) | Mean values of five replication in percent |         |       |              |          |         |       |
|---------------------------|--|---------|-------|--------------|----------|---------|-------|
|                           | Fat  | Protein | Ash   | Total Solids | Moisture | Acidity | pH    |
| T <sub>1</sub>            | 4.55                                       | 4.49    | 0.72  | 15.12        | 86.35    | 0.80    | 4.32  |
| T <sub>2</sub>            | 4.43                                       | 4.29    | 0.82  | 17.25        | 87.47    | 0.72    | 4.39  |
| T <sub>3</sub>            | 4.32                                       | 4.14    | 0.91  | 18.27        | 88.58    | 0.91    | 4.42  |
| T <sub>4</sub>            | 4.23                                       | 3.94    | 1.14  | 19.32        | 89.67    | 1.14    | 4.46  |
| T <sub>5</sub>            | 4.12                                       | 3.71    | 1.21  | 19.55        | 90.78    | 1.21    | 4.53  |
| 'F' test                  | Sig  | Sig     | Sig   | Sig          | Sig      | Sig     | Sig   |
| SE (m)±                   | 0.007                                      | 0.010   | 0.007 | 0.005        | 0.11     | 0.004   | 0.006 |
| CD at 5 %                 | 0.021                                      | 0.030   | 0.023 | 0.016        | 0.34     | 0.012   | 0.019 |

The result obtained in this study are agreement with the result obtained by Khupse [11] studied the utilization of honey as sweetener for the preparation of cow milk lassi. The lassi prepared with addition of sugar @15 with treatments T1 (control), T2 (10%), T3 (12%) and T4(14%) by the weight of dahi for each treatments. The lassi prepared with 14 (T4) per cent honey was score highest (7.89 out of 9) and superior in flavour over plain lassi and other treatments.

### 3.10 Colour and Appearance

The colour and appearance score of lassi was significantly affected due to addition of different level of guava pulp. The score for colour and appearance of lassi were T1 (5.75), T2 (6.75), T3 (6.50), T4 (8.50) and T5 (6.00). The highest score was observe in T4 (8.50 out of 9) and lowest score in T1 (5.75 out of 9).

The result obtained in this study are in agreement with the result obtained by Khupse et al. [11] studied the utilization of honey as sweetener for the preparation of cow milk lassi. who reported that the lassi prepared with

addition of sugar @ 15 % with treatments T1(control), T2(10%), T3(12%), T4(14%) of honey by the weight of dahi for each treatment.

### 3.11 Body and Texture

The body and texture score of lassi was significantly affected due to addition of different level of pulp. The mean score for body and texture of guava lassi for treatment T1, T2, T3, T4 and T5 were 6.00, 6.50, 6.75, 8.50 and 5.25 respectively.

The result obtained in this study are more or less in agreement with the result obtained by Shaikh et al. [12] studies on sensory properties of lassi blended with sapota pulp with treatments (T1) 5%, (T2) 10 %, (T3) 15%, (T4) 20% to prepare lassi. The body and texture attribute ranges between 30.25 to 30.20. It was observed that, the sensory quality of lassi in term of body and texture were highest in T2 (30.90) which is superior over all other treatments and were significantly affected (p<0.05) by the addition of sapota pulp.

**Table 2. Overall acceptability of guava lassi**

| Treatments     | Flavour | Body and texture | Colour and appearance | Overall acceptability |
|----------------|---------|------------------|-----------------------|-----------------------|
| T <sub>1</sub> | 5.75    | 6.00             | 5.75                  | 6.00                  |
| T <sub>2</sub> | 6.50    | 6.50             | 6.75                  | 6.25                  |
| T <sub>3</sub> | 6.75    | 6.75             | 6.50                  | 6.50                  |
| T <sub>4</sub> | 8.50    | 8.50             | 8.50                  | 8.25                  |
| T <sub>5</sub> | 5.50    | 5.25             | 6.00                  | 5.75                  |
| SE(m)±         | 0.52    | 0.30             | 0.47                  | 0.39                  |
| CD@ 5 %        | 1.58    | 1.06             | 1.42                  | 1.18                  |

Values with different superscripts differ significantly (P<0.05)

### 3.12 Overall Acceptability of Guava Lassi

The overall average score for flavour, body and texture, colour and appearance were calculated and presented in Table 2. Result indicated that the mean score for overall acceptability for T1, T2, T3, T4 and T5 treatments were 6.00, 6.25, 6.50, 8.25 and 5.75, respectively. The result obtained in this study are more or less in agreement with the result obtained by Shaikh et al. [12] studies on sensory properties of lassi blended with sapota pulp with treatments (T1) 5%, (T2)10%, (T3) 15%, (T4) 20% to prepare lassi. The overall acceptability of lassi range from 89.35 to 90.00. It was observed that, the sensory quality of lassi in term of body and texture were highest in T4 (95.80) which is superior over all other treatments and were significantly affected ( $p < 0.05$ ) by the addition of sapota pulp.

### 4. CONCLUSION

It was concluded from the present investigation that. The blending of (T4)15% guava pulp for preparation of acceptable quality lassi was found superior over the rest of treatments. In respect to physico-chemical composition of lassi i.e. fat, protein, and titratable acidity were decreased with increases in the levels of guava pulp, while moisture, total solids, ash and pH were increased with increase in the level of guava pulp in lassi preparation. The cost structure of lassi decreased with the increased in the levels of guava pulp. The cost of most acceptable treatment prepared with 15 per cent guava pulp (T4) was Rs. 57.17 per liter.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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