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Sensory and Physico-Chemical Quality of Lassi Blended With Moringa (*Moringa Oleifera*) and Curry (*Murraya Koenigii*) Leaves Powder

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Abstract

The present investigation entitled "Process Optimization for Preparation of Lassi Blended with Moringa (*Moringa oleifera*) and Curry (*Murraya koenigii*) Leaves Powder" was undertaken during 2023-24 with a view to standardize the process for preparation of lassi with improved therapeutic value using moringa and curry leaves powder. The product obtained was subjected for sensory evaluation and chemical analysis. It was observed that, all the sensory attributes *viz*., colour and appearance, flavour, body and texture and overall acceptability of fresh *lassi* samples under different treatment combinations were significant. The colour and appearance, flavour, consistency and overall acceptability score ranged from 7.86 (T_0) 8.42 (T_3), 7.61 (T_0) to 8.25 (T_3), 7.90 (T_0) to 8.30 (T_2) and 7.79 (T_0) to 8.31 (T_3), respectively. The treatment combination T_3 (0.50% moringa, 0.50% curry leaves powder and 15% sugar) found sensorily superior over the rest of treatment combinations. The sensorily most acceptable treatment combination (T_3) has an average chemical composition of 2.79% fat, 2.97% protein, 18.87% total solids, 0.74% ash, 0.86% acidity, pH of 4.31, 3.56% reducing sugar, 11.21% non-reducing sugar, and 14.77% total sugar.

Key words : Lassi, Sensory evaluation, moringa, curry, fat, protein, total solids, acidity, pH, reducing sugar, total sugar, and ash.

Lassi, a refreshing drink derived from dahi, has been a timeless thirst quencher, offering a diverse range of quality variations. *Lassi* is characterized by its smooth, creamy texture and subtly acidic flavour profile. *Lassi*'s composition includes approximately 79% water, 3% fat, 2.8% protein, and 4.5% lactose. *Lassi* has important therapeutic properties and helps treat gastrointestinal issues. *Lassi*, often referred to as chhas or matha, is the by-product of churning curdled whole milk using rudimentary local machines in order to produce desi butter (makkhan). This drink features a rich aroma, a creamy texture, and a mildly tangy flavour. (Sharma, 2006).

Moringa is often referred to as the mother's best friend or the power house of minerals. In India, the drumstick pod is called munga, sargawa, or saragwe, and it's commonly known by the generic name moringa (Pandey, 2013). A wealth of proteins, vitamins, and minerals, such as potassium, calcium, phosphorus, iron, folic acid, and carotene, are potentially found in almost all parts of the drumstick, including the bark, fruit, leaves, flower, seed, and gum (Anjorin et al., 2010) Drumstick pods and green leaves are strong source of protein, which includes a decent quantity of sulphur-containing amino acids, and minerals like calcium and iron. They are also good suppliers of vitamins A, B, and C. (Ram, 1994).

Curry leaves are said to have a number of therapeutic benefits in Ayurvedic medicine, including anti-diabetic, antioxidant, antibacterial, anti-inflammatory, anticarcinogenic, and hepato-protective qualities. The bark is used to relieve snake bite pain and the roots are used to alleviate bodily ailments. Curry leaves are good source of calories, fibre, carbs, phosphorus, calcium, iron, magnesium, copper, and other

minerals. It also includes antioxidants, plant sterols, amino acids, glycosides, flavonoids, and several vitamins, including nicotinic acid and vitamins C, A, B, and E. (Pathak *et al.*,2022)

Materials and Methods

Moringa and Curry Leaves Powder : Moringa (*Moringa oleifera*) leaves powder and curry (*Murraya koenigii*) leaves powder were procured from the market.

Chemicals : All the chemicals used in study for the analytical purpose were of analytical reagent (AR) or guaranteed reagent (GR) grade Merk, India Ltd / Glaxo India Ltd.

Microbial Culture : The standard Dahi culture i.e., LF-40 was used in this study and was procured from National Collection of Dairy Cultures, National Dairy Research Institute, Karnal as lyophilized ampules.

Preliminary Trails : Preliminary trials were conducted to finalize levels of moringa leaves powder and curry leaves powder in *lassi* samples. *Lassi* samples were prepared with six levels of moringa leaves powder i.e. (0.5%, 1%, 1.5%, 2%, 2.5%, 3%) and Six levels of curry leaves powder i.e. (0.5%, 1%, 1.5%, 2%, 2.5%, 3%) along with two levels of Sugar i.e. (15% and 17%). From the results of sensory evaluation of preliminary trials 1% moringa leaves powder and 1% curry leaves powder with 15 per cent sugar were selected for conducting experimental trials.

Treatment Combinations are T_0 - Dahi + 15% sugar, T_1 - Dahi + 100% Moringa leaves powder + 15% sugar, T_2 - Dahi + 75% Moringa leaves powder + 25% Curry leaves powder + 15% sugar, T_3 - Dahi + 50% Moringa leaves powder + 50% Curry leaves powder + 15% sugar, T_4 - Dahi + 25% Moringa leaves powder + 75% Curry leaves powder + 15% sugar and T_5 - Dahi + 100% Curry leaves powder + 15% sugar.

Procedure of Moringa and curry leaves powder lassi

Lassi was prepared as per the method used as per De, (2004) with some modification.

Receiving of cow milk
↓
Preheating (35-40°C)
↓
Filtration/Clarification
↓
Standardization (3.5% fat)
↓
Heating (63°C for 30 min)
↓
Cooling at 36°C
↓
Inoculation by 2% (LF-40) starter culture
④
Incubation (36°C /14-16 hrs)
↓
Dahi
↓
Breaking firm Dahi by agitation
④
Addition of 10% of water.
↓
Addition of sugar.
↓
Addition of Moringa and Curry leaves powder (as per treatment)
↓
Mixing (Agitation)
↓
Churning and formation of lassi.
↓
Packaging
↓
Storage (4-6°C)

Sensory Evaluation : *Lassi* samples were subjected to the sensory evaluation. The samples of *lassi* were provided to the panel of five semi trained judges for sensory evaluation. The scoring was recorded by using 9 point Hedonic Scale (Appendix-I) as per IS:6273 (Part-II) 1971.

Physical property analysis

Fat: As per the method described in IS: 1244, Part I, 1977. Protein: As per the procedure described in IS: 1479 (part-II) (1961). Lactose: As per Lane and Eynon method given in IS: 1479, Part II (1961).Total solids: As per the method given in IS: 1479 Part-II (1961).Titratable acidity (% LA) as per the method given in IS: 1479, Part –I (1960). pH: As per the method given in IS: 1479, Part –II (1961).Total soluble solids: The total soluble solids was determined with the help of Erma hand refractometer (Range 0-320 Brix) pH: pH of the *lassi* was measured by Elico digital pH meter. Reducing sugar and total sugar: Reducing sugar and total sugar was determined by the method of Lane and Eynon (1923), as adopted by Ranganna (1986).

Statistical Analysis : The data generated during the course of this investigation was tabulated and analyzed using Completely Randomized Design (CRD) for pre-experimental trials and to compare control with other treatments. However, effect of moringa and curry leaves powder and sugar levels and their interaction effect was analyzed by Factorial Completely Randomized Design (FCRD) with three replications (Snedecor and Corchan, 1994).

Result and Discussion

Sensory Quality of Lassi Samples : Table 1 show that the mean score of overall acceptability of moringa and curry leaves powder *lassi* for the treatments T_0, T_1, T_2, T_3, T_4 and T_5 were 7.79, 7.98, 8.24, 8.31, 8.11 and 7.96, respectively. The highest overall acceptability score was observed in treatment T3 (8.31). The results are in accordance with Mistry *et al*. (2017) who reported that as the level of moringa leaves powder in *lassi* increased, the overall acceptability of the *lassi* increases up to certain limits and Pagthinathan *et al*. (2020) noted that the highest scores for odour, taste, and overall acceptability were found in paneer containing 0.6% curry leaves extract after storage.

Chemical Quality of Fresh *Lassi* Samples

Fat : The Table 2 indicates that the average fat content in moringa and curry leaves powder *lassi* was 2.80, 2.79, 2.79, 2.79, 2.80 and 2.80 per cent for treatment T_0, T_1, T_2, T_3, T_4 and T_5, respectively. The effect of treatment combination was non-significant. This was due to lower per cent of fat in moringa leaves powder and curry leaves powder. The result are comparable with the finding of Dixit *et al*. (2018) reported that Highest fat percentage observed in T_0 (2.47) the resultant fat percentage decrease as quantity of moringa leaves powder increase in *lassi* and Kahandal et al. (2020) found that fat percentage were decreased as the strawberry pulp levels increased.

Protein : The average protein content of the finished product was found to be 2.78, 3.05, 3.01, 2.97, 2.93 and 2.90 per cent for treatment T_0, T_1, T_2, T_3, T_4 and T_5, respectively. The highest protein content was recorded for treatment T_1 i.e. 3.05 per cent and the lowest protein content was recorded for treatment T_0 i.e. 2.78 per cent. The protein

Table 1. Sensory Quality of *Lassi* Samples

Treatments	Flavour	Colour and appearance	Consistency	Overall acceptability
T_0	7.61^{d}	7.86^{c}	7.90^{d}	7.79^{d}
T_1	7.93^{bc}	7.95^{c}	8.08^{bc}	7.98^{c}
T_2	8.18^{a}	8.26^{b}	8.30^{a}	8.24^{ab}
T_3	8.25^{a}	8.42^{a}	8.26^{ab}	8.31^{a}
T_4	8.07^{ab}	8.17^{b}	8.10^{bc}	8.11^{bc}
T_5	7.83^{c}	8.11^{b}	7.95^{cd}	7.96^{cd}
S.E.(m)±	0.07	0.05	0.06	0.06
CD @ (5%)	0.21	0.15	0.18	0.18

content was increased due to the amount of protein content in moringa leaves powder (27.10%) and curry leaves powder (12.70%). The result of Protein content in the present investigation was comparable with the finding of Dubey *et al.* (2018) they noted that as the amount of moringa leaf powder increased, the protein content in the shrikhand also rose proportionately.

Total solids : It is clearly indicated from Table 2 that the average total solids content of the finished product were found to be 18.12, 18.88, 18.87, 18.87, 18.88, and 18.89 per cent for the treatments T_0, T_1, T_2, T_3, T_4 and T_5 respectively. The highest total solids content was recorded for treatment T_5 i.e. 18.89. The lowest total solids contents was recorded for treatment T_0 i.e. 18.12. The result showed that the total solids content in *lassi* increased due to addition of moringa leaves powder and curry leaves powder. The result are comparable with the finding of Tambe (2017) who observed a significant enhancement in *lassi*'s total solids content attributed to the incremental addition of papaya pulp and Dixit *et al.* (2018) they observed that as the amount of moringa leaves powder increased, the total solids content in *lassi* also increased.

Ash : From the Table 2 it is clear that the average ash per cent in *lassi* were 0.65, 0.72, 0.73, 0.74, 0.75, 0.76 per cent T_0, T_1, T_2, T_3, T_4 and T_5 respectively. The values recorded were found to be increasing order from treatment T0 toT5. This might be due to excess amount of mineral content in moringa and curry leaves powder. The result of Ash content in the present investigation was comparable with the finding of Dixit *et al.* (2018) who noted that an increase in the amount of moringa leaf powder in *lassi* resulted in a higher ash content, with the highest level of 0.82% observed in sample T_3, which contained 1.5% moringa powder.

Acidity : The average acidity was 0.65, 0.72, 0.73, 0.74, 0.75, 0.76 per cent T_0, T_1, T_2, T_3, T_4 and T_5 respectively. It was further observed that the highest acidity was observed in treatment T_5 (0.76) this might be due to contribution of moringa and curry leaves powder which was supported by Dixit *et al*. (2018) examined the impact of moringa powder on the acidity of lassi and found that increasing levels of moringa resulted in higher acidity.

pH : From the Table 2 it is clear that average pH was 4.34, 4.33, 4.32, 4.31, 4.31, and 4.30 for treatment T_0, T_1, T_2, T_3, T_4 and T_5, respectively. All treatments are significantly different from each other. It was further observed that the highest pH was observed in

Table 2. Chemical composition of fresh *lassi* samples

Treatments	Fat (%)	Protein (%)	Total solids (%)	Ash (%)	Acidity (%)	pH	Reducing sugars (%)	Non reducing sugar (%)	Total sugars (%)
T_0	2.80	2.78^{f}	18.12^{c}	0.65^{d}	0.82^{d}	4.34^{a}	3.58^{a}	11.28^{a}	14.86^{a}
T_1	2.79	3.05^{a}	18.88^{ab}	0.72^{c}	0.83^{cd}	4.33^{ab}	3.57^{ab}	11.22^{b}	14.79^{b}
T_2	2.79	3.01^{b}	18.87^{b}	0.73^{bc}	0.84^{c}	4.32^{bc}	3.57^{ab}	11.21^{bc}	14.78^{c}
T_3	2.79	2.97^{c}	18.87^{b}	0.74^{ab}	0.86^{b}	4.31^{bc}	3.56^{b}	11.21^{bc}	14.77^{cd}
T_4	2.80	2.93^{d}	18.88^{ab}	0.75^{ab}	0.87^{ab}	4.31^{bc}	3.56^{b}	11.21^{bc}	14.77^{cd}
T_5	2.80	2.90^{e}	18.89^{a}	0.76^{a}	0.88^{a}	4.30^{c}	3.56^{b}	11.20^{c}	14.76^{d}
S.E.(m)±	0.003	0.007	0.004	0.006	0.005	0.006	0.004	0.004	0.004
CD @ (5%)	NS	0.021	0.012	0.018	0.015	0.018	0.012	0.012	0.012

treatment T_0 (4.34) and the lowest pH was recorded for treatment T_5 (4.30). The result are comparable with the finding of Sayyad et al. (2022) reported that the pH of *lassi* samples made with various treatment combinations ranged from 3.92 to 4.36.

Reducing sugars : The reducing sugars content in the prepared *lassi* samples was recorded as 3.58, 3.57, 3.57, 3.56, 3.56 and 3.56, for treatments T_0, T_1, T_2, T_3, T_4 and T_5 respectively. The reducing sugars content of the *lassi* decreased with the addition of moringa leaves powder and curry leaves powder due to lesser percent of reducing sugar present in moringa leaves powder and curry leaves powder. Which was supported by Rajput *et al*. (2017)

Total sugars : Table 2 represents the average total sugar content of *lassi* samples were 14.86, 14.79, 14.78, 14.77, 14.77, and 14.76 per cent for the treatment T_0, T_1, T_2, T_3, T_4 and T_5 respectively. The total sugar content were found to be highest in treatment T0 followed by treatment T_0, T_1, T_2, T_3, T_4 and lowest in T_5. It indicates that the total sugar content in product was slightly decreased due addition of moringa leaves powder and curry leaves powder. Which was supported by Dhumal (2018) reported that as the proportion of mentha leaves extract increased, the total sugars content decreased. & Sayyad et al. (2022) found that the average total sugar content of *lassi* for treatment T_1, T_2, T_3 and T_4 were 12.31, 11.11, 10.82 and 9.57, respectively.

Conclusion

The best quality *lassi* can be prepared by adding 0.50% moringa leaves powder, 0.50% curry leaves powder and 15 per cent sugar (on the weight basis of dahi) The sensorily superior fresh *lassi* sample had average chemical composition 2.79 per cent fat, 2.97 per cent protein, 18.87 per cent total solids, 0.74 per cent ash, 0.86 per cent acidity, 3.56 per cent reducing sugars, 11.21 per cent non-reducing sugar, 14.77 per cent total sugars, and 4.31 pH.

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