International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2021; 9(2): 535-539

Received: 01-12-2020
Accepted: 10-02-2021

VC Kedaree
Department of Animal Biotechnology, College of Agricultural Biotechnology, Loni, Tal. Rahata, Ahmednagar Maharashtra, India

SD Nalkar
Department of Animal Biotechnology, College of Agricultural Biotechnology, Loni, Tal. Rahata, Ahmednagar Maharashtra, India

AR Gambhire
Department of Animal Biotechnology, College of Agricultural Biotechnology, Loni, Tal. Rahata, Ahmednagar Maharashtra, India

Corresponding Author:
VC Kedaree
Department of Animal Biotechnology, College of Agricultural Biotechnology, Loni, Tal. Rahata, Ahmednagar Maharashtra, India

Preparation of buffalo milk Lassi incorporated with apple powder

VC Kedaree, SD Nalkar and AR Gambhire

DOI: https://doi.org/10.22271/chemi.2021.v9.i2h.11875

Abstract
The present study entitled "preparation of lassi incorporated with apple powder" was carried out using different levels of apple powder with a view to optimize the process for its manufacture and to study its chemical, sensory and microbiological qualities. Initially the preliminary trials were conducted by blending of different levels of apple powder at 2, 4, 6 and 8% in the lassi with 15% sugar to finalize the experimental treatments. Experimental apple lassi samples were analyzed for sensory, chemical and microbiological qualities. It was observed that apple lassi samples under different treatments showed significant differences for total solid, fat, protein, ash, acidity and moisture content. Total solids, Fat, Protein, Ash, Acidity and Moisture contents differed significantly among the different types of lassi with apple flavour. Significant difference was observed within the smell and taste score and the body and texture score of different types of lassi. In case of sensory evaluation, colour and appearance and overall acceptability found to be significant over the other treatments. The microbial results indicate the SPC count was within the acceptable limit. The yeast and mould count was found to be marginal whereas coliform count was not detected up to 15 days storage period. So, it was suggested that apple lassi could be prepare successfully by adding different proportion of apple powder. It was suggested to incorporate apple powder @ 4% which showed better overall acceptability and result among the all treatments. The production cost of most acceptable quality apple powder lassi (T2) was 157.68 Rs/lit.

Keywords: Lassi, apple powder, body and texture, colour and appearance, sensory and microbial evaluation

Introduction
Lassi one of the fermented milk products is ideal for serving with hot dishes as it helps the body to digest the spicy food. Lassi is digestive aid for the afternoon meal: it settles the stomach and it is the perfect cooling agent. Along with all essential nutrients required for growth. Development and tissue differentiation, fermented milk content growth hormones-gastrin and insulin. In India, a great variation is reported in technology of lassi preparation as well as basic ingredients used. Presently the kind of lassi available in different market of India are plain lassi, Bhang lassi, Amritsar lassi, Soy lassi, Vanilla lassi, Saffron lassi, Makhaniya lassi, and lassi prepared using powder or juice or fruit like mango lassi, mango-pineapple lassi, mango-strawberry lassi, banana lassi, apple lassi and pineapple lassi etc.
Lassi is a popular product close to sweet stirred yoghurt has been used as a refreshing beverage from time immemorial in India. Especially in western, northern and central region.
Lassi has the same health benefits as yogurt or curd in that it pacifies all three doshas, reduces acidity in the stomach, colonizes the gut with healthy bacteria, improves immunity, helps digestion and serves to keep the internal organs cool during hot summers. Lassi is full of calcium, protein, carbohydrates, Vitamin A, B and riboflavin. For those with lactose intolerance, lassi is perfect since lactose converted to galactose and glucose by bacterial action.
Apple fruits are a good source of fiber and vitamin C. They also contain polyphenols. Apple fruits may aid weight loss in several ways which are linked to lower blood pressure and stroke risk. Apple fruits promote heart health in several ways. They are high in soluble fiber, lower cholesterol. Apple fruit is a fruit with many associated health benefits, lower risk of type 2 diabetes, lower risk of cancer and death from cancer, protect against asthma, promote bone health and, weight loss.
Apple fruit is rich in vitamins B_1, B_2, B_6, C and A. It contains dietary fiber, energy, potassium, phosphorous, magnesium, Sodium, Iron, Zinc and copper.

Apples contain a variety of photochemical, including quercetin, catechin, phloridzin and chlorogenic acid, all of which are strong antioxidants. As per the saying, "an apple a day, keeps the doctor away," apple helps to improve digestion, prevents stomach disorders, gallstones, constipation and liver disorders. Furthermore, apple helps to treat rheumatism, dysentery, eye disorders, a variety of cancer and gout.The study aims at developing simple technology for better utilization of apple powder in the preparation of lassi.

Materials and Methods

The research was conducted in department of Animal Biotechnology, College of Agricultural Biotechnology, Loni. Curd was prepared by using the procedure prescribed by De (2008) [3] with slight modifications. Commercial grade clean, white crystalline cane-sugar and apple powder were procured from local market of Loni, Tal. Rahata, Dist- Ahmednagar.

In this trial, for the preparation of apple lassi following different levels of apple in lassi were studied.

T_0 - Control (Lassi without addition of apple powder)
T_1 - Lassi + 2% apple powder
T_2 -Lassi + 4% apple powder
T_3 -Lassi + 6% apple powder
T_4- Lassi + 8% apple powder

Physico-chemical analysis

The total solid content of milk, curd and apple powder were determined by gravimetric method as per IS: 1479 (part II), 1961 [8]. The fat content was determined by using standard Gerber method as described in IS: 1224 (part II), 1977 [6]. The protein content was determined by estimating the per cent nitrogen by Micro-kjeldhal method as recommended in IS: 1479 (part II), 1961 [8]. The per cent nitrogen was multiplied by 6.38 to find out protein percentage in lassi. Per cent ash content was determined by the method described in A.O.A.C., 1975. Per cent moisture content was determined by gravimetric method as per IS: 1479 (part II) 1961 [8]. The acidity of lassi expressed as per cent lactic acid was determined by the method described in IS: 1479 (part I), 1960.

Sensory evaluation

The fresh sample of lassi were evaluated organoleptically by nine point hedonic scale for various quality attributes such as general appearance, body, texture and flavour by panel of 8-10 judges. The experimental samples were served to the judges at 7°C. The panelists were instructed to rate each sample on 9 point hedonic scale.They were provided hedonic scale score cards for evaluating the quality of product as described in IS: 6273 (part-II) 1971.

Microbiological analysis

All the treatment samples of apple lassi along with control sample were stored at 4^0C and analysed for different microbial parameters such as standard plate count, coli form count, yeast and mould count by adopting standard procedure as given by (Dubey and Maheshwari, 2004) throughout the storage period.

Statistical analysis

For present investigation RBD i.e. Randomised Block Design was employed using three replications. The data were tabulated and analysed according to Snedecor and Cochran (1994) [15].

Flow chart for preparation of apple lassi

Collection of milk
↓
Pasteurization at 85°C for 10 minutes
↓
Cooled at room temperature
↓
Inoculation of Starter culture at rate of 2%
↓
Incubation at room temperature for 8 hrs for setting of dahi
↓
Dahi
↓
Breaking of coagulum
↓
Addition of water, sugar and apple powder
↓
Blending
↓
Filling in containers
↓
Storage (7±2 °C)

Results and Discussion

Table 1: Chemical analysis of buffalo milk, curd and apple powder

Sr. No.	Constituents	Buffalo milk (%)	Curd	Apple powder
1	Total Solid	16.40	30.32	96.32
2	Fat	6.02	7.49	1.62
3	Protein	4.53	4.36	4.46
4	Ash	0.82	1.00	3.26
5	Acidity	0.15	0.71	0.41

These observations indicate that the buffalo milk used in the present investigation was of good quality. Curd used for lassi preparation had on an average fat content 7.49 per cent, acidity 0.71 per cent, protein 4.36 per cent and total solids 30.32 per cent.

Table 2: Effect of different levels of apple on total solids of lassi

Treat	R_1	R_2	R_3	R_4	Average	S.D.
T_0	34.54	37.48	37.72	37.66	36.85^e	1.3366
T_1	38.86	38.78	39.06	38.98	38.92^d	0.107703
T_2	40.20	40.11	40.37	40.28	40.24^c	0.096177
T_3	41.51	41.42	41.70	41.61	41.56^b	0.105119
T_4	42.80	42.72	43.04	42.96	42.88^a	0.126491

It was observed that the total solid content showed gradual increase with the increase in level of apple powder. This simultaneous increase from T_0 to T_4 may be due to high amount of total solid content of apple powder (96.32) than buffalo milk (16.40) and curd (30.32). The lowest total solid content was noticed at T_0 (36.85) i.e. lassi without apple powder, while the highest total solid content was observed at T_4 (42.88) i.e. lassi blended with 8% apple powder. Treatment T_4 was found to be significantly superior over the treatments T_3, T_2, T_1 and T_0, respectively.

Table 3: Effect of different levels of apple powder on fat content of apple lassi (Per cent)

Treat	R_1	R_2	R_3	R_4	Average	S.D.
T_0	7.45	7.38	7.60	7.53	7.49^a	0.082765
T_1	7.43	7.24	7.50	7.42	7.3975^b	0.096014
T_2	7.17	7.09	7.41	7.33	7.25^c	0.126491
T_3	7.10	6.99	7.29	7.18	7.14^d	0.109772
T_4	6.97	6.88	7.16	7.07	7.02^e	0.105119

It was observed that blending of apple powder decrease the fat content of lassi. The average fat content of apple lassi was 7.25 per cent. The highest fat content in lassi (7.49) was observed in (T_0) i.e. lassi without apple powder and the lowest (7.02 per cent) with 8% apple powder (T_4). Treatment T_0 found significantly superior over the combination of treatments T_1, T_2, T_3 and T_4.

Table 4: Effect of different levels of apple powder on protein content of apple lassi (per cent)

Treat	R_1	R_2	R_3	R_4	Average	S.D.
T_0	4.39	4.33	4.37	4.39	4.370^b	0.024495
T_1	4.39	4.37	4.37	4.37	4.375^{ab}	0.00866
T_2	4.39	4.38	4.37	4.38	4.380^{ab}	0.007071
T_3	4.39	4.39	4.38	4.38	4.385^{ab}	0.005
T_4	4.40	4.39	4.40	4.40	4.3975^a	0.00433

The highest level of protein content was noticed at treatment T_4 i.e. (4.3975) with 8% apple powder whereas, lowest (4.37 per cent) at T_0without apple powder. It was observed that the protein content showed gradual increase in lassi with the increase in level of apple powder. The simultaneous increase from T_0 to T_4 may be due to high amount of protein content of apple powder (4.3975per cent). Non-significant differences were observed in between the treatments T_4, T_3, T_2, T_1 and T_0. Whereas treatment T_4 found superior over the treatment T_0.

Table 5: Effect of different levels of apple powder on ash content of apple lassi (per cent)

Treat	R_1	R_2	R_3	R_4	Average	S.D.
T_0	1.10	1.00	1.28	1.18	1.14^e	0.102956
T_1	1.12	1.08	1.30	1.26	1.19^d	0.092195
T_2	1.19	1.13	1.33	1.27	1.23^c	0.076158
T_3	1.25	1.16	1.4	1.31	1.28^b	0.087464
T_4	1.29	1.18	1.48	1.37	1.33^a	0.109772

It was observed that the ash content showed gradual increase with increase in level of apple powder. The simultaneous increase from T_0 to T_4 may be due to total amount of ash content of apple powder (3.26). The lowest ash content was observed at T_0 i.e. lassi without apple powder (1.14), while the highest ash content was observed at T_4 i.e. lassi with 8% apple powder (1.33). Treatment T_4 was found to be significantly superior over the treatments T_3, T_2, T_1 and T_0, respectively.

Table 6: Effect of different levels of apple powder on acidity of apple lassi (per cent)

Treat	R_1	R_2	R_3	R_4	Average	S.D.
T_0	0.68	0.70	0.74	0.76	0.72^a	0.031623
T_1	0.64	0.59	0.85	0.80	0.72^a	0.107935
T_2	0.65	0.56	0.86	0.77	0.71^a	0.114237
T_3	0.69	0.64	0.74	0.71	0.695^a	0.036401
T_4	0.66	0.60	0.70	0.72	0.67^a	0.045826

It would be seen from the data that the variation in acidity of apple lassi was found to be non-significant. The average per cent acidity of apple lassi were 0.72 (T_0), 0.72 (T_1), 0.71 (T_2), 0.695 (T_3) and 0.67 (T_4). It was observed that the acidity showed gradual decrease with the increase in level of apple powder. Treatment T_0 was found to be superior over the treatments T_1, T_2, T_3 and T_4, respectively.

Table 7: Effect of different levels of apple powder on moisture content of apple lassi (per cent)

Treat	R_1	R_2	R_3	R_4	Average	S.D.
T_0	62.46	62.52	62.28	62.34	62.40^a	0.094868
T_1	61.14	61.22	60.94	61.02	61.08^b	0.107703
T_2	59.80	59.89	59.63	59.72	59.76^c	0.096177
T_3	58.49	58.58	58.3	58.39	58.44^d	0.105119
T_4	57.20	57.28	56.96	57.04	57.12^e	0.126491

It would be seen from the data that the variation in moisture content was significant. The highest level of moisture content was noticed at treatment T_0 i.e. (62.40) without apple powder, lowest (57.12 per cent) at T_4 i.e. 8% apple powder. It was observed that the moisture content showed gradual decrease in lassi with the increase in level of apple powder. The simultaneous decrease from T_0 to T_4 may be due to low amount of moisture content of apple powder (3.68 per cent). Treatment T_0 was found to be significantly superior over the treatments T_1, T_2, T_3 and T_4, respectively.

Sensory evaluation of apple lassi

Table 8: Score for Colour and appearance of apple lassi (out of nine)

Treat	R_1	R_2	R_3	R_4	Average	S.D.
T_0	7.85	7.50	7.50	7.70	7.6375^c	0.147373
T_1	7.80	7.8	8.1	8.05	7.9375^b	0.138632
T_2	8.70	8.50	8.70	8.55	8.6125^a	0.089268
T_3	7.70	7.35	7.60	7.70	7.5875^c	0.143069
T_4	7.85	7.40	8.10	7.60	7.7375^{bc}	0.263095

Score for colour and appearance was increased and sometimes decreased due to addition of apple powder. The highest score (8.6125) was observed for treatment T_2 i.e. lassi blended with 4% apple powder and this highest score may be due to its peculiar slight reddish appealing colour and appearance which was liked most by the judges. Lowest score (7.5875) was observed for treatment T_3 i.e. lassi @ 6% apple powder. The lowest score may be due to its dark reddish colour which was not accepted by judges. Treatment T_2 found significantly different than the other treatments whereas treatment T_0, T_1, T_3 and T_4 found at par with each other.

Table 9: Score for consistency of apple lassi (out of nine)

Treat	R_1	R_2	R_3	R_4	Average	S.D.
T_0	7.5	7.8	7.7	7.5	7.625^b	0.129904
T_1	7.5	7.4	7.65	7.8	7.5875^b	0.151554
T_2	8.7	8.4	8.45	8.6	8.5375^a	0.119242
T_3	7.7	7.45	6.95	7.5	7.40^b	0.276134
T_4	7.45	7.6	7.35	7.3	7.425^b	0.114564

Lassi prepared from T_2 level recorded highest score for (8.54) followed by T_1 (7.63). The sensory score increased at T_2 i.e. 2 per cent level of apple powder. Treatment T_2 significantly different than the other treatments whereas the treatment T_0, T_1, T_3 and T_4 found at per with each other.

Table 10: Score for flavour of apple lassi (out of nine)

Treat	R_1	R_2	R_3	R_4	Average	S.D.
T_0	7.45	7.8	7.35	7.3	7.475^b	0.195256
T_1	7.8	7.9	7.75	7.35	7.70^b	0.209165
T_2	8.45	8.55	8.5	8.6	8.525^a	0.055902
T_3	7.75	7.65	7.7	7.4	7.625^b	0.134629
T_4	7.5	7.55	7.3	7.7	7.5125^b	0.143069

Lassi prepared from T_2 level recorded highest score for flavour (8.525) followed by T_1 (7.70). The sensory score increased at T_2 i.e. 4 per cent level of apple powder. Treatment T_2 found significantly different than the other treatments whereas treatments T_0, T_1, T_3 and T_4 found at par with each other.

Table 11: Score for body and texture of apple powder lassi (out of nine)

Treat	R_1	R_2	R_3	R_4	Average	S.D.
T_0	7.65	7.4	7.2	7.75	7.50^c	0.215058
T_1	7.65	7.85	7.45	7.65	7.65^{bc}	0.141421
T_2	8.6	8.8	8.55	8.7	8.6625^a	0.096014
T_3	7.6	8.05	8.05	8	7.925^b	0.188746
T_4	7.5	7.3	7.15	7.65	7.40^c	0.190394

Differences in the mean score of samples under different treatment for body and texture were significant. The maximum scores from 8.66 (T_2) and lowest score is 7.40 (T_4). The samples under treatment T_2 and T_3 scored higher than samples under T_0, T_1, and T_4. The different treatments under study could not bring about any obvious change in the body and texture of product. Treatment T_2 found significantly different than the other treatments whereas treatment T_1 found at par with treatment T_3. Similarly treatment T_0 to found at per with T_1 and T_4.

Table 12: Score for overall acceptability of apple lassi (out of nine)

Treat	R_1	R_2	R_3	R_4	Average	S.D.
T_0	7.6125	7.625	7.4375	7.5625	7.559375^{de}	0.074149
T_1	7.6875	7.7375	7.7375	7.7125	7.71875^b	0.020729
T_2	8.6125	8.5625	8.55	8.6125	8.584375^a	0.02847
T_3	7.6875	7.625	7.575	7.58	7.616875^{cd}	0.045186
T_4	7.575	7.4625	7.475	7.5625	7.51875^e	0.050389

Lassi prepared from 4 per cent apple powder scored highest point (8.58), followed by lassi prepared from 2 per cent apple powder (7.72). On the basis of results obtained we can affirmatively state that amongst different levels of apple powder T_2 (4 per cent apple powder) treatment was found more acceptable for blending. Treatment T_2 found significantly different than the other treatments whereas treatment T_0 found at par with treatment T_3 and T_4. The results of overall acceptability scores thus indicate that lassi blended with 4 per cent apple powder is superior over rest of treatments. Lowest score was noticed for lassi blended with 8 per cent apple powder.

Changes in microbial qualities of apple lassi during storage

The microbial results indicate the SPC and yeast and mould were varied among the different treatments. Overall, the lassi was acceptable upto 15th day because the count was within the acceptable limit. The *E coli* count was not detected upto 15 days. The microbial load may be due to inadequate cleaning or aseptic condition. Hence, it is recommended that the aseptic condition should be maintained during product preparation.

Production of cost

It is pointed out here that the data indicated the cost of ingredients only and other cost factors remains constant for all treatments and were not accounted for cost estimation.

Cost of ingredients decreased with the increase in the level of apple powder. The yield of apple lassi shows declining trend, with the increase in the level of apple powder, which resulted in decreasing cost of production on weight basis.

The highest cost (T_4) was recorded in case of apple lassi blended with 8 per cent apple powder, while lower cost (T_0) recorded in case of without apple powder. It was observed that the cost of apple lassi was increase with the increase in the level of apple powder flavour. The production cost of most acceptable level (T_2) /was 157.68 Rs/lit.

Conclusion

From the results of the present investigation, it may be concluded that apple lassi could be successfully utilized for the studies on development of lassi. The most acceptable level of lassi can be prepared by using 4 per cent apple powder. The apple powder had a positive effect on flavor acceptability and its consumption. On the basis of microbial analysis, it may be concluded that the product is safe for drinking purpose.

References

1. AOAC. Official methods of analysis, 12th Edition, Association of Official Analytical Chemists, Washington, D.C., U.S.A 1975.
2. Dixit Neeraj Kumar, Aktar Hossain SK, Binod Kumar Bharti, Shankar Suwan Singh, Simar Mishra. Development of lassi using whey and moringa powder. Int. J Curr. Microbiol. App. Sci 2018;7(11):602-612.
3. De S. Outlines of dairy technology. 2nd ed. oxford university press, New Delhi 2008;9:385-399, 516.
4. Ghule BK, Desale RJ, Gavhane MS, Khore MC. Preparation of strawberry Lassi. Research J of Animal Husbandry and Dairy Science 2015;6(1):22-26.
5. IS: 6273 part-II. Guide for sensory evaluation of foods. Methods and evaluation cards, Indian standards Institution, Manak Bhavan, New Delhi, India 1971.
6. IS: 1224 Part-I. Determination of fat by Garber's method (Revised) Indian Standard Institution, Manak Bhavan, and New Delhi, India 1977.
7. IS: 1479 Part-I. Methods of test for dairy industry: Chemical analysis of milk. Indian Standard Institution, Manak Bhavan, New Delhi, India 1960.
8. IS: 1479 Part-II. Method of test for dairy industry: Chemical analysis of milk. Indian Standard Institution, Manak Bhavan, New Delhi, India 1961.
9. Islam MN, Hossain MS, Rashid MH, Shiddiki MSR, Khan MS, Pravin F. Preparation of Dahi from buffalo milk and blends with soy milk. Bang. J Animal science 2016;44(3):137-142.
10. Kumar Shashi, Rai DC, Himanshu Kumar Raian, Saloni. To study the microbial changes of herbal lassi (Enriched with Honey and Tulsi (*Ocimum sanctum* Linn) during storage. Int. J Cuee. Microbiol. App. Sci 2018;7(8):2750-2757.
11. Mule SM, Snehal Kadam S, Suraj Jadhav R, Vishnu Dandekar S, Sandip Ramod S. Sensory evaluation of low fat lassi prepared by incorporation of lemon grass

(*Cymbopogon citratus* L.) extract. International Journal of Chemical Studies 2018;6(1):1299-1302.
12. Nahar A, Al-Amin M, Alam SMK, Wadud A, Islam MN. A Comparative Study on the Quality of dahi (Yoghurt) Prepared from cow, Goat and Buffalo milk. International Journal of Dairy Science 2007;2(3):260-267.
13. Padghan PV, Bimlesh Mann, Rajesh Kumar, Rajan Sharma, Anil Kumar. Studies on bio-functional of traditional Lassi. Indian Journal of Traditional Knowledge 2013;1(1):124-131.
14. Pardhi PS, Desale RJ, Mule PR, Ghule BK, Tambe DR, Gavhane MS. Studies On Finger Millet Lassi, Asian J Dairy & Food Res 2014;33(4):255-258.
15. Snedecor WG, Cochran GW. Statistical methods, 8th Edn. The Iowa State University Press, Ames, Iowa 1994.