

Original Research Article

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Development of Lassi Using Whey and Moringa Powder

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ABSTRACT

In current time, people of all age groups required different types of vitamin, mineral, protein etc. which are sufficient available in moringa lassi. Lassi is one of the most popular options all over the global liked by people of all age groups. It is resolve health problem and also provides enough nutrition at a low cost to a large population. The present study was conducted to know the physico-chemical and microbial attribute of moringa lassi prepared by blending with dahi, whey and moringa powder. It was prepared from standardization milk. Moringa powder was added different level (0.5%), (1%), and (1.5%) of milk and whey syrup. Addition of whey at three different concentration (19%, 29% and 39%), pectin (0.1%) and vanilla improved quality and acceptability of the product of moringa lassi. Various analysis parameters were analyzed by two way ANOVA to obtained optimum result prepared moringa lassi was subjected to chemical and microbial analysis to evaluate the suitability of lassi were sample carbohydrate T₃ (16.69%), protein T₃ (3.01 %), fat T₀ (2.47), ash T₃ (0.82), Total solid T₃ (23.10), Lactic acidity T₀ (0.87), pH T₀ (4.08) and Viscosity (cp) (252.12). The highest mean value of Yeast and Mould count was recorded in the Moringa lassi of T₀ (7.80×10^1) and SPC of Moringa lassi T₀ (19.00×10^7). Based on the result it was indicated that beneficial component of high protein in curd, Whey and Moringa powder made them more favorable choice for dairy technologist to develop lassi especially for healthy food.

Keywords

Curd, Sugar, Whey,
Moringa powder,
Vanilla flavor

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Introduction

Milk contains numerous nutrients and it makes a significant contribution to meeting the body's needs for calcium, magnesium, riboflavin, selenium, thiamin and pantothenic acid. Tremendous changes in life style and eating habits have resulted in multiplication of health problems such as anorexia, cancer, diabetes and various neurodegenerative

diseases. At the same time due to growing universal control over nutrition and personal health, consumers worldwide are trying to take a proactive position concerning their health. Fermentation is the ideal technology to preserve milk a highly perishable commodity without any adverse effect on nutritive value. In fact, pre-digestion of the protein, fat and carbohydrates in milk during fermentation is a factor in the higher nutritive value of

fermented dairy products as compared to the milk from which they are made. The demand for fermented milk product is increasing and it has been estimated that about 10% of total milk produced in India is used for preparation of traditional fermented milk products (Khurana and Kanawjia, 2007).

Lassi is one of the major fermented milk products which is ideal for serving with dishes and it help the body to digest the spicy food. Lassi is a digestive aid for the afternoon meal, it settles the upset stomach and it is the perfect cooling agent (Anonymous, 2006). Lassi is a traditional beverage having its origin in India and popular in South Asia in different varieties. It is a “ready-to-serve” fermented milk beverage popular in our country especially in summer season. This popular indigenous fermented milk beverage, is usually prepared by mixing dahi and water in required proportions. Along with all the essential nutrients required for growth, development and tissue differentiation, fermented milk contain growth hormones-gastrin and insulin (Arora, 2006). A mixed mesophilic cultures of *Lactococcus lactis subsp. lactis*, *Lactococcus lactis subsp. cremoris*, *Lactococcus lactis sub sp. diacetyl lactis* along with *Leuconostoc* species are grown together for production of dahi. The major function of a starter culture is the production of lactic acid at a suitable rate to ensure a consistent and successful fermentation (OMcKay *et al.*, 1990). Lassi contains appreciable amount of milk proteins and phospholipids and is an excellent beverage for quenching thirst because of its lactic acidity. Fermented special products are of interest in the development of new products for the several reasons. Due to the expanding market of dairy companies, there has been a merging of dairy product and fruit beverage markets, with the introduction of hybrid dairy products, such as Juice ceuticals, offering health, flavour and convenience (Khurana and

Kanawjia, 2007). Fruit lassi has very low shelf life and hence there is a need to develop process technology for ready to reconstitute shelf stable convenient fruit lassi powders with good retention of antioxidants and vitamins. Although some reports are available on spray dried lassi powders and convective air dried dahi and mango soy fortified yoghurt powder (Kumar and Mishra, 2004; Shiby and Mishra, 2008). The developed a lassi-type cultured beverage from cheese whey (Kumar *et al.*, 1987). Lassi using buttermilk and soyabean was made (Deka *et al.*, 1984).

Whey is major by-product of dairy industry, during manufacture of products like paneer, channa, cheese, chakka, casein etc. In the manufacturing of these products, about 10- 20 per cent portion of milk is recovered as the desired end product and remaining 80-90 per cent liquid portion is the whey. The development of whey based beverages using paneer whey, cheese whey and various fruit juices (mango, pineapple, lemon and banana) at levels ranging from 73 to 87 percent and 5 to 20 percent respectively (Singh *et al.*, 1994).The technology for the manufacture of guava-whey beverage was standardized (Singh *et al.*, 1999). Studies reveals that whey contains 45-50% of total milk solids, 70% of milk sugars, 20% of milk proteins, 70-90% of milk minerals and almost all water soluble vitamins present in milk. By realizing the functional properties of whey, many industries targets upon utilizing whey as the functional food ingredient. Direct utilization of whey in the form of beverage is one of the most attractive avenues for utilizing whey for human consumption (Goyal and Gandhi, 2009). The growing obesity epidemic is a worldwide concern. Obesity contributes to health issues that result from carrying increased fat mass such as sleep apnea, osteoarthritis and joint and skin abnormalities and health issues that result from the metabolic effect of fat cells such as type 2 diabetes, insulin resistance,

metabolic syndrome, hypertension, nonalcoholic fatty liver disease, heart disease, gallbladder disease and cancer (Park *et al.*, 2005).

'*Moringa oleifera*' is commonly known as Drumstick tree and it is a part of the family called Moringaceae. The use of *Moringa oleifera* parts including roots, leaves, flowers, green pods, seeds, stems and petioles, have various medicinal, nutrient, bioactive, antioxidant, and antimicrobial properties (Gopalakrishnan *et al.*, 2016). Moringa has various nutritional properties, the leaves are loaded with medicinal benefits as they possess flavonol and phenolic acid which have the ability to inhibit prostate cancer and breast cancer. Root, bark, flower and leaf are used for treatment of infectious diseases along with cardiovascular and gastrointestinal disorders. The leaves also perform various pharmacological activities in our system, such as analgesic, antihypertensive, antitumor activity, and anti-inflammatory effects. The calorie content in *M. oleifera* leaves is also less, making it suitable for obese patients. It has been found that the leaves contain natural antioxidants such as vitamin C, tocopherols, flavonoids and other phenolic compounds (Charoensin, 2014). Medical advantages of medicinal herbs have attracted food researchers to use it in designing novel functional dairy products and evaluate their impact on product quality and consumer acceptability (Yeyinka and Oyeyinka, 2016; Al-Turki *et al.*, 2008). The minerals contents in *M. oleifera* and their bioavailability have been a subject of tremendous studies. There are however limited reports on the influence of variation in geographical locations or agro-ecology of *M. oleifera* on the mineral composition in various organs of the plant in Nigeria. Moringa is rich in nutrition owing to the presence of a variety of essential phytochemicals present in its leaves, pods and seeds. In fact, Moringa is said to provide 7

times more vitamin C than oranges, 10 times more vitamin A than carrots, 17 times more calcium than milk, 9 times more protein than yoghurt, 15 times more potassium than bananas and 25 times more iron than spinach (Rockwood *et al.*, 2013). The fact that moringa is easily cultivable makes it a sustainable remedy for malnutrition.

Materials and Methods

The experiment "Development of Lassi using by Whey and Moringa Powder" was carried out in the research lab of "CytoGene Research & Development" B – Block Chauraha, Indra Nagar, Lucknow, India – 226016.

Procurement and collection of ingredients

Milk, moringa leaf powder, sugar and sugar were collected from the local market of Lucknow. Pectin, Citric acid was collected from the CytoGene Research and development, Lucknow.

Treatment combination (Ratio)

T₀ - Control prepared from Dahi (100:00:00).

T₁- Experimental sample prepared from Dahi, Whey and Moringa powder (80:19.5:0.5).

T₂ - Experimental sample prepared from Dahi, Whey and Moringa powder (70:29:1).

T₃- Experimental sample prepared from Dahi, Whey and Moringa powder (60:39.5:1.5).

Plan of Work

One litre of milk was standardized to 4.5% fat and 8.5 % solid not fat and was converted to lassi as follows. The standardized milk was heated to 90°C for 15 minute, it was then cooled to 40°C. This milk then inoculated by lactic starter culture @ of 1% and then milk is

incubated, at 40°C until a firm coagulum (Dahi) was formed. The Dahi, so formed was broken and transfer 'to melt' Sugar @ 16%, Moringa leaf powder was mix melt, to obtain the final product lassi (Fig. 1 and 2).

Physico-chemical analysis of preparation of moringa lassi

Determination of Titratable acidity- Samples (expressed as lactic acid) was determined as described in IS: 1479, Part I (1960). Determination of pH by digital pH meter as per AOAC (2005). Total solids- Total solids gravimetric method as described in IS: SP: 18, Part XI (1981). Fat - The fat percent was determined by Gerber method as described in IS: SP: 18, Part XI (1981). Viscosity - The viscosity of lassi samples was determined by using Brook field viscometer (J.C. (1866). Protein- The protein was determined by Kjhdal method as per AOAC (1995). Determination of Carbohydrate- Carbohydrate was estimated by Lane-Eynon's method described in IS: 1479, Part II (1961). Ash- Ash was estimated by muffle furnace as described in Ranganna (1986).

Microbial analysis

Yeast and mould count, coliform count and total count (was determined as per manual of Dairy Bacteriology ICAR 1972)

Statistical analysis

Data was analysed using Analysis of Variance (ANOVA) and Critical difference (C.D) in WASP software and excel software.

Results and Discussion

Data collected on the different aspects were tabulated and analyzed statistically using the method of analysis of variance and critical difference technique. The significant and non-

significant differences observed have been analyzed critically within and between the treatment combinations. The present study was undertaken for development of Lassi using by Whey and Moringa Powder. The results obtained from the analyzed data are presented under physico-chemical parameters, microbiological characteristics and Statistical analysis.

Physico-chemical characteristics

Carbohydrate content

The mean value for carbohydrate percentage in control and experimental moringa lassi of different treatments are presented in table 1. It was statistically analyzed that mean value for carbohydrate of moringa lassi of T₀, T₁, T₂, and T₃ was found to be 16.21, 16.48, 16.69 and 16.84 respectively. The moringa lassi prepared by blending with dahi, whey and moringa powder, carbohydrate percentage in samples of different treatments and control, the highest mean carbohydrate percentage was recorded in the sample of T₃ (16.84) followed by T₂ (16.69), T₁ (16.48) and T₀ (16.21). Kumar *et al.*, (1987) observed slightly higher carbohydrates prepared a lassi type cultured beverage from a mixture of cheese whey and skim milk (95:5) by inoculating LF 40 culture. This indicates that, increased in proportion of whey and moringa powder in the blend increased the carbohydrates percentage of moringa lassi with significant differences (P < 0.05).

Protein content

That mean value for protein of moringa lassi of T₀, T₁, T₂, and T₃ was found to 2.70, 2.76, 2.89 and 3.01 respectively. The moringa lassi prepared by blending with dahi, whey and moringa powder, protein percentage in samples of different treatments and control, the highest mean protein percentage was

recorded in the sample of T₃(3.01) followed by T₂(2.89), T₁(2.76) and T₀(2.70). These results agree with the report of Kumar *et al.*, (1987). Manish (2010) observed that 3.80 % of protein prepared by preparation and quality evolution of Mango Lassi. Moringa lassi indicates that increased in proportion of whey and moringa powder in the blend increased the protein percentage of moringa lassi with significant differences ($P < 0.05$). The result of ANOVA reveals that the F (Cal) value (89.66) was greater than the table value of F Tab (3.49) at 5% level of significance. Therefore; the difference was significant, indicating significant effect of treatments on protein percent of moringa lassi.

Fat content

The mean value for fat percentage of moringa lassi of T₀, T₁, T₂, and T₃ was found to 2.47, 2.42, 2.39 and 2.43 respectively. Fat percentage in samples of different treatments and control, the highest mean fat percentage of moringa lassi was recorded in the sample of T₀ (2.47) followed by T₃ (2.43), T₁ (2.42) and T₂ (2.39). These results agreed with the report of Pardhi *et al.*, (2014) for studies on finger millet lassi. Moringa lassi indicates that increased in proportion of whey and moringa powder in the blend decreased the protein percentage of moringa lassi with significant differences ($P < 0.05$). The significant difference was further analyzed statistically to find out the C.D. between and within the different treatment combinations. The difference between the mean values of T₀-T₁ (0.04), T₀-T₂ (0.08) and T₂-T₃ (0.44) was equal than the C.D. value, 0.04. Therefore, the difference was significant.

Ash content

The mean value for ash percentage of moringa lassi of T₀, T₁, T₂, and T₃ was found to 0.70, 0.73, 0.76 and 0.82 respectively. The moringa

lassi prepared by blending with dahi, whey and moringa powder, ash percentage in samples of different treatments and control, the highest mean ash percentage was recorded in the sample of T₃ (0.82) followed by T₂ (0.76), T₁ (0.73) and T₀ (0.70). Moringa lassi indicates that increased in proportion of whey and moringa powder in the blend increased the ash percentage of moringa lassi. The result of ANOVA given, the F (Cal) value (13.20) was greater than the table value of F Tab. (3.49) at 5% level of significance. Therefore; the difference was significant, indicating significant effect of treatments on ash percent.

Total solid content

The mean value for total solid percentage in control and experimental moringa lassi of different treatments are presented in table 1. It was statistically analyzed that mean value for total solid of moringa lassi of T₀, T₁, T₂, and T₃ was found to 22.09, 22.40, 22.74 and 23.10 respectively. The moringa lassi prepared by blending with dahi, whey and moringa powder, Total solid percentage in samples of different treatments and control, the highest mean percentage was recorded in the sample of T₃ (23.1) followed by T₂ (22.74), T₁ (22.39) and T₀ (22.08). Kumar *et al.*, (1987) observed slightly lower TS prepared a lassi type cultured beverage from a mixture of cheese whey and skim milk (95:5) by inoculating LF 40 culture. Moringa lassi indicates that increased in proportion of whey and moringa powder in the blend increased the total solid percentage of moringa lassi with significant differences ($P < 0.05$).The significant difference was further analyzed statistically to find out the C.D between and within the different treatment combinations. The difference between the mean values of T₀-T₁ (0.31), T₀-T₂ (0.65), T₀-T₃ (1.01), T₁-T₂ (0.34), T₁-T₃ (0.70) and T₂-T₃ (0.36) was greater than the C.D. value, 0.06 Therefore, the difference was significant.

Table.1 Average data for different parameters of control and experiments of Development of Lassi using by Whey and Moringa Powder

Parameters	Treatment			
	T ₀	T ₁	T ₂	T ₃
1. Physico-chemical analysis				
Carbohydrate%	16.21±0.03	16.48±0.05	16.69±0.03	16.84±0.05
Protein%	2.70±0.02	2.76±0.04	2.89±0.10	3.01±0.04
Fat%	2.47±0.03	2.42±0.02	2.39±0.02	2.43±0.03
Ash%	0.70±0.02	0.73±0.02	0.77±0.02	0.82±0.05
Total Solids%	22.08±0.04	22.39±0.08	22.74±0.03	23.10±0.03
Acidity%(lactic acid)	0.87±0.01	0.84±0.02	0.82±0.02	0.80±0.04
pH	4.08±0.02	4.05±0.04	4.07±0.04	4.03±0.04
Viscosity (cp)	243.23±0.02	247.00±0.56	252.12±0.04	258.18±0.03
2.Microbial analysis				
Yeast & mold(×10 ¹ cfu/ml)	7.8±1.30	5.8±0.83	5.4±1.14	6.6±1.51
SPC(×10 ⁷ cfu/ml)	19±2.12	16.6±2.07	15.8±2.16	17.6±1.67
Coliform count	NIL	NIL	NIL	NIL

Fig.1 Flow Diagram for preparation of Whey

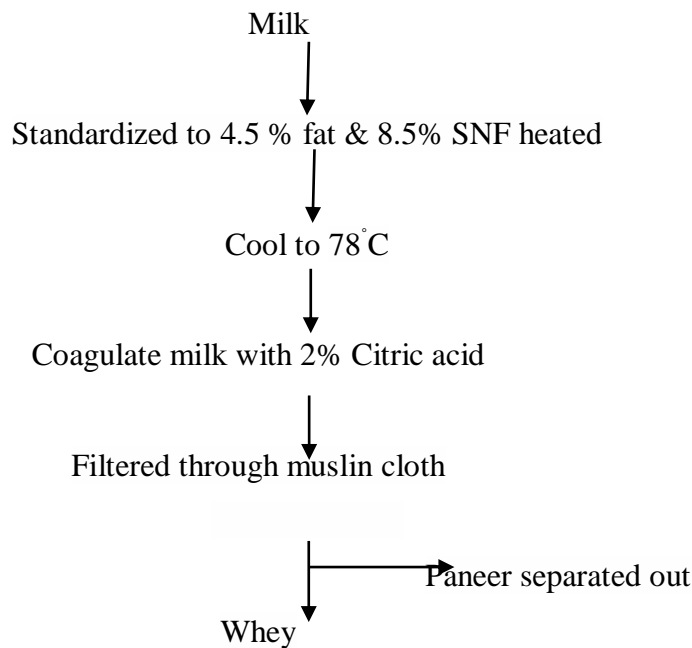


Fig.2 Flow Diagram for Preparation of Moringa Lassi

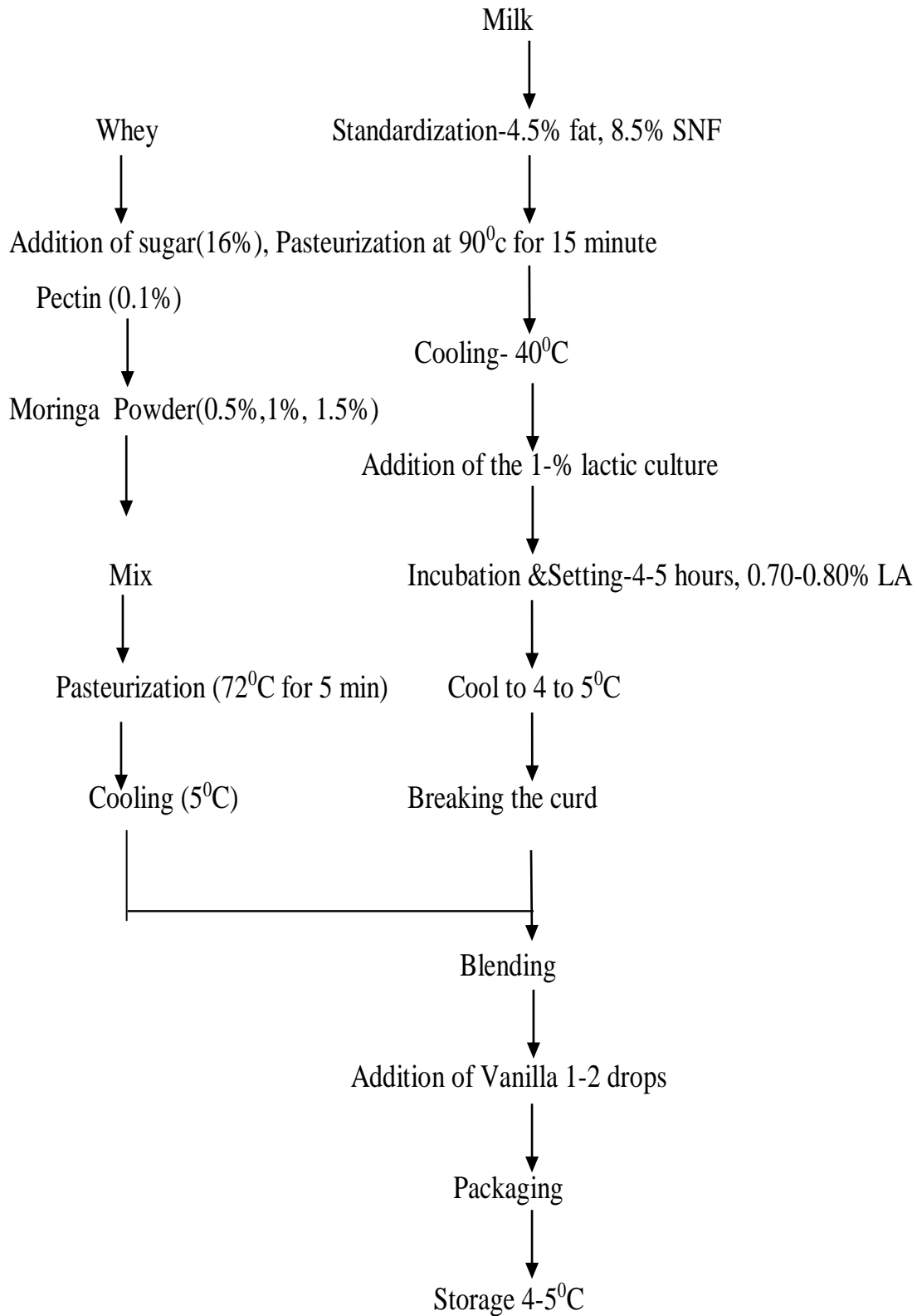


Fig.3 average physico-chemical analysis of control and experimental samples of *Moringa lassi*

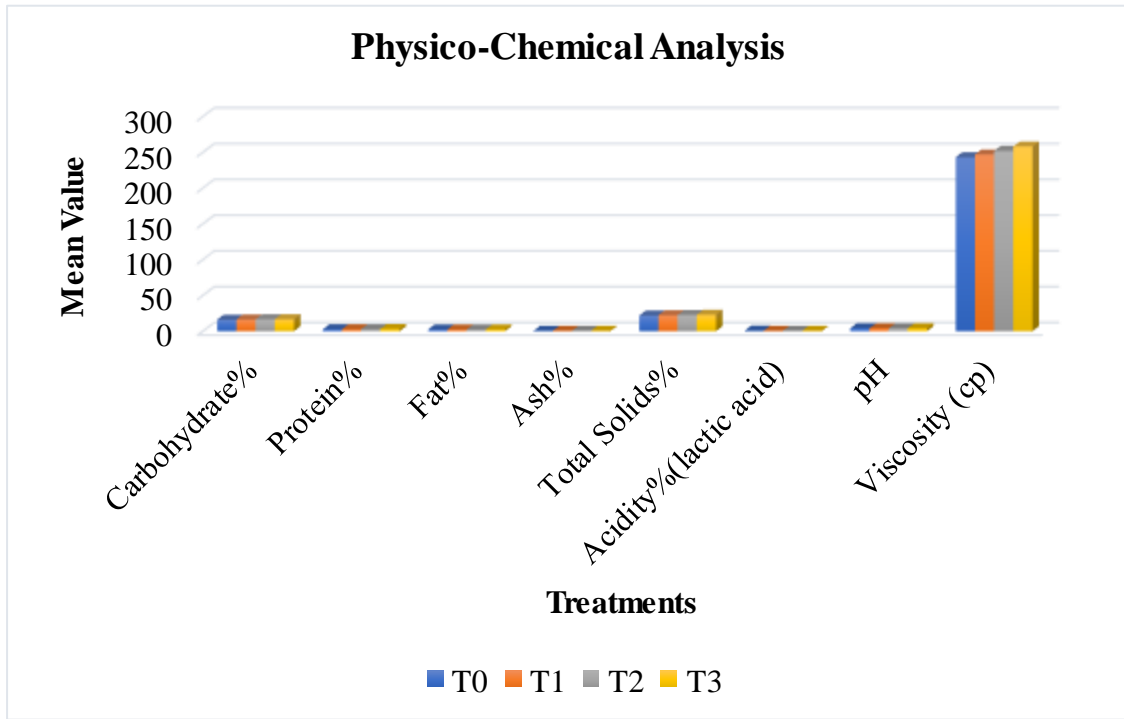
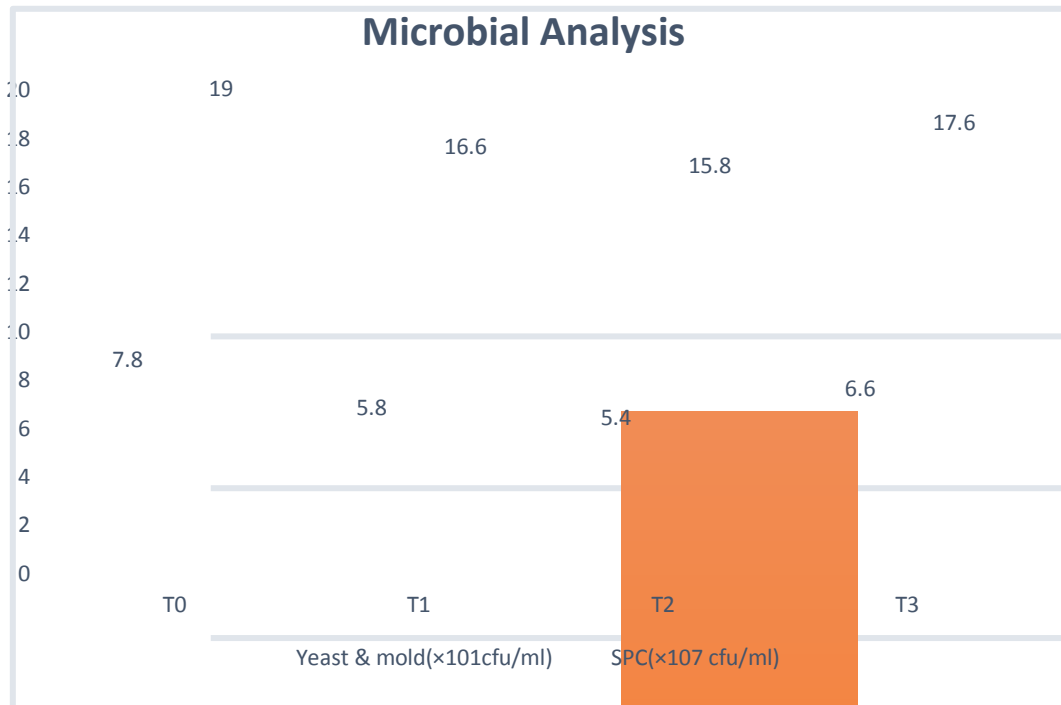


Fig.4 Average yeast and mould and SPC count of control and experimental samples of *Moringa lassi*



Acidity content

The mean value for acidity of moringa lassi of T₀, T₁, T₂, and T₃ was found to 0.88, 0.84, 0.83 and 0.80 respectively. The moringa lassi prepared by blending with dahi, whey and moringa powder, Acidity percentage in samples of different treatments and control, the highest mean Acidity percentage was recorded in the sample of T₀ (0.88) followed by T₁ (0.84), T₂ (0.82) and T₃ (0.80). Pardhi *et al.*, (2014) observed slightly lower acidity prepared for finger millet lassi. Moringa lassi indicates that increased in proportion of whey and moringa powder in the blend decreased the acidity percentage of moringa lassi with significant differences ($P < 0.05$). Acidity level was slightly lower in sample T₁ to T₃ than control T₁ because of the effect of whey and moringa on lactic acid bacteria. The significant difference was further analyzed statistically to find out the C.D. between and within the different treatment combinations. The difference between the mean values of T₀-T₂ (0.05), T₀-T₃ (0.07) and T₁-T₃ (0.04) was greater than the C.D. value, 0.04 Therefore, the difference was significant. The difference between the mean values of T₀-T₁ (0.03), T₂-T₃ (0.02) and T₂-T₃ (0.02) was lower than the C.D. value, 0.04 Therefore, the difference was non-significant of moringa lassi.

pH

pH of moringa lassi was inversely proportional to the acidity levels. The mean value for pH of moringa lassi of T₀, T₁, T₂, and T₃ was found to 4.08, 4.05, 4.08 and 4.04 respectively. The moringa lassi prepared by blending with dahi, whey and moringa powder, pH in samples of different treatments and control, the highest mean pH was recorded in the sample of T₀ (4.08) followed by T₂ (4.08), T₁ (4.05) and T₃ (4.03) with significant differences ($P < 0.05$). These

results also agree with the results of Bagal *et al.*, (2007). The significant difference was obtained analyzed statistically to find out the C.D. between and within the different treatment combinations. The difference between the mean values of T₀-T₃ (0.04) was greater than the C.D. value, 0.04 Therefore, the difference was significant and the difference between the mean values of T₀-T₁ (0.03), T₀-T₂ (0.006), T₁-T₂ (0.02), T₁-T₃ (0.01) and T₂-T₃ (0.03) was lower than the C.D. value, 0.04 Therefore, the difference was non-significant of moringa lassi.

Viscosity

The mean value for viscosity (centi poise) of moringa lassi of T₀, T₁, T₂, and T₃ was found to 243.22, 247.27, 252.07 and 258.14 respectively. The moringa lassi prepared by blending with dahi, whey and moringa powder, viscosity in samples of different treatments and control, the highest mean viscosity (centi poise) was recorded in the sample of T₃ (258.14) followed by T₂ (252.07), T₁ (247.27) and T₀ (243.22). It indicates that increased in proportion of whey and moringa powder in the blend decreased the viscosity content of moringa lassi. The significant difference was analyzed statistically to find out the C.D. between and within the different treatment combinations. The difference between the mean values of T₀-T₁ (4.05), T₀-T₂ (8.85), T₀-T₃ (14.92), T₁-T₂ (4.80), T₁-T₃ (10.87) and T₂-T₃ (6.06) was greater than the C.D. value, 0.38 Therefore, the difference was significant (Fig. 3).

Yeast and mould count

The mean value for yeast and mould counts ($\times 10^1$) of moringa lassi of T₀, T₁, T₂, and T₃ was found to 7.80, 5.80, 5.40 and 6.60 respectively. The moringa lassi prepared by blending with dahi, whey and moringa powder, Yeast and count samples of different

treatments and control, the highest mean Yeast and mold count was recorded in the sample of T₀ (7.80) followed by T₃ (6.60), T₁ (5.80) and T₂ (5.40). Moringa lassi indicates that increased in proportion of whey and moringa powder in the blend decreased the yeast and mould count of moringa lassi. The significant difference was further analyzed statistically to find out the C.D. between and within the different treatment combinations. The difference between the mean values of T₀-T₁ (2.00) was greater than the C.D. value, 1.33. Therefore, the difference was significant. The difference between the mean values of T₀-T₃ (1.2), T₁-T₂ (0.4), T₁-T₃ (0.8) and T₂-T₃ (1.2) was lower than the C.D. value, 1.33. Therefore, the difference was no significant.

SPC count

The mean value for SPC ($\times 10^7$) of moringa lassi of T₀, T₁, T₂, and T₃ was found to 19.00, 16.60, 15.80 and 17.60 respectively. The moringa lassi prepared by blending with dahi, whey and moringa powder, SPC (cfu/gm) in samples of different treatments and control, the highest mean SPC (cfu/gm) was recorded in the sample of T₀ (19.00) followed by T₃ (17.6), T₁ (16.6) and T₂ (15.8) (Fig. 4).

Coliform count

The mean value for SPC of moringa lassi of T₀, T₁, T₂, and T₃ was found to be absent. From the study conducted, it can be concluded that a health beverage like Lassi can be prepared by incorporating whey and moringa powder for better functionality. The highest mean of carbohydrate percentage was recorded in the Moringa lassi sample of T₃ (16.84), followed by T₂ (16.69), T₁ (16.48) and T₀ (16.21). The highest mean of protein percentage was recorded in the Moringa lassi sample of T₃ (3.01) and lowest was T₀ (2.70). Similarly, the highest mean of fat percentage was recorded in the Moringalassi sample of T₀ (2.47) and lowest was T₂ (2.39). Similarly, the highest mean of ash percentage was recorded in the Moringalassi sample of T₃ (0.82) followed by T₂

(0.77), T₁ (0.73) and T₀ (0.70). The highest mean of total solids percentage was recorded in the Moringa lassi sample of T₃ (23.10) and lowest was T₀ (22.08). The highest mean of Lactic acid percentage was recorded in the Moringa lassi sample of T₀ (0.87) and lowest was T₃ (0.80). The highest mean of pH was recorded in the Moringa lassi sample of T₀ (4.08) and lowest was T₃ (4.03). Similarly, the highest mean of viscosity was recorded in the Moringa lassi sample of T₃ (258.18) and lowest was T₃ (243.23). The highest mean of Yeast and Mould recorded in the Moringa lassi sample of T₀ (7.80) and lowest was T₂ (5.40). The highest mean of SPC recorded in the Moringa lassi sample of T₀ (19.00) and lowest was T₂ (15.80). The coliform count in control and experimental sample were found to be absent. It may be concluded that, the Lassi of good quality and with more acceptability prepared having beneficial, value added and nutritionally enriched product. There was significant variation in respect of fat, protein, sucrose, total sugar and total solids content in all of the lassi samples examined.

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