



FINGER MILLET (*ELEUSINE CORACANA*)

ENRICHED PROBIOTIC LASSI WITH STRAWBERRY & MANGO FLAVOUR

Anil Sabavath*¹, Sahil Multani², Akshada Warale³ Dr.Nitin ubale¹,
MSc Student, Head of department,

Parul University, Parul institute of Applied Science, Department of Food Technology, P.O. Limda, Ta. Waghodia-391760. Dist. Vadodara (Gujarat), India. Email: Anilnyk333@gmail.com

ABSTRACT

In the current study, malted finger millet flour were used to prepare finger millet enriched probiotic lassi. Fingermillet enriched probiotic lassi was prepared. off Mango and strawberry flavors were used for preparing probiotic lassi. Probiotic lassi prepared with 4% concentrations Physiochemical analysis of probiotic lassi was performed. Lactobacillus acidophilus culture was used for fermentation of probiotic lassi. phytochemical analysis of different flavor probiotic lassi was done. Malted finger millet were incorporated in heated tone milk and then add @ 2% of probiotic culture of lactobacillus acidophilus. Fermented acidophilous product without finger millet served as standard lassi. Products were analysed for titratable acidity, sensory and microbiological parameters. The study results revealed that use of malted finger millet had a significant ($p < 0.05$) effect on the probiotic and streptococcal counts and lactic bacilli counts were found to be higher in products made using malted flour. the overall acceptability score of products containing malted flour was found to be higher Compared to standard, finger millet incorporated products showed higher titratable acidity note. Acidity as well as counts increased with increased rate of finger millet incorporation. and PH decreases Even the sensory of standard was found similar to finger millet enriched products were acceptable.

Keywords: Finger millet (Eleusine coracana) Malting, Fermented milk, probiotic, Lactobacillus acidophilus

1. INTRODUCTION

Lassi is a famous dairy product to the purchasers because of its regular flavour, feature semi-stable consistency, nutritive and healing cost. Different types of lassi to be had in special markets of India are simple lassi, salted lassi, Bhang lassi, Amritsari lassi, Soya lassi, Vanilla lassi, Saffron lassi, Makhaniya lassi and lassi organized the usage of pulp or juice of end result like Mango lassi, Mango – ardour fruit lassi, Mango – pineapple lassi, Mango – strawberry lassi, Banana lassi and Pineapple lassi, etc. ‘Lassi’ refers to desi buttermilk, that is the byproduct acquired even as churning curdled complete milk with crude indigenous gadgets for the manufacturing of desi butter. In India, a high-quality version is said in generation of lassi instruction in addition to the primary components used. The look for meals which can offer balanced nutrients in addition to positive fitness advantages is presently one of the main developments withinside the meals and fitness care enterprise worldwide. Nutrient deficiencies which includes iron deficiency anaemia, folate, zinc, protein deficiency and calcium depletion had been determined to be important dietary issues adversely affecting human fitness no matter age/sex/physiological corporations

Very few studies reviews are to be had associated with combining the dietary factors of milk, finger millet and fermentation. Finger millet (Eleusine Coracana) enriched fermented milk product organized the usage of indigenous probiotic micro organism might be a unique idea of a purposeful meals. Being a wealthy supply of calcium and iron, and the reality that the bioavailability may be advanced through easy processing which includes germination and fermentation, finger millet is taken into consideration as an excellent complement for enhancing bone fitness and haemoglobin. Hence, supplementing milk with finger millet and fermentation, fortification of the identical the usage of lactic acid micro organism traces can result in a excessive nutrients meals product with fitness benefitting consequences. Therefore, the existing examine changed into deliberate to execute the subsequent targets with an goal to Preparation of Fingermillet (Eleusine Coracana) enriched Probiotic Lassi with special flavours.

Finger millet or Ragi (Eleusine Coracana) is one of the not unusualplace millets in numerous areas of India. It is used as a staple high meals in India (Devi et al., 2014). The nutritive cost of finger millet is higher than different cereals (Manay and Shadaksharaswamy, 2001). This millet is highly wealthy in calcium (344 mg/100g) as compared to all different cereals and millet and incorporates 283 mg % phosphorus, 3.9 mg % iron (Gopalan et al., 2009), and plenty of different hint factors and nutrients. Potassium content material of finger millet is likewise excessive (408 mg %) as compared to different cereals and millet. Finger millet incorporates vital amino acids viz., isoleucine (4.4 g), leucine (9.5 g), methionine (3.1 g) and phenyl alanine (5.2 g) which can be poor in different starchy meals. Millets additionally incorporates B nutrients, specifically niacin, B6 and folic acid, calcium, iron, potassium, magnesium and zinc. The overall nutritional fibre (22%) of finger millet grains have been said rather better than that of many different cereal grains

1.1 Nutritional Value

Proximate chemical composition of unmalted and malted ragi flour

Parameter	Unmalted	Malted
Moisture (g/100g)	12.67	12.67
Protein (g/100g)	7.52	7.60
Fat(g/100g)	1.08	1.14
Total carbohydrate(g/100g)	76.51	76.18
Crude fibre(g/100g)	3.62	3.80
Ash(g/100g)	1.76	1.93
Calcium(mg/100g)	359.4	429.8
Iron(mg/100g)	13.7	12.4
Phosphorus(mg/100g)	284.3	305.5
Vitamin C (mg/100g)	2.12	5.89

Table No.1. Proximate chemical composition of unmalted and malted ragi flour

1.2 LEGAL STANDARDS FOR RAGI

“Agmark” grade designations quality of ragi

Grade designation	I	II	III	IV
Foreign matter (% by wt)	1.5	2.5	3.5	4.0
Other food grains other than wheat (% by wt)	2.0	3.0	4.0	6.0
Nonfood grains	0.5	1.0	1.5	2.0
Damaged grain	1.0	3.0	3.0	5.0
Slightly damaged grain	3.0	6.0	6.0	>10.0
Weevil led grains	2.0	6.0	6.0	6.0
Immature and shrivelled grains (% by wt)	0.5	2.0	4.0	10.0

Table No.2. Legal Standards for ragi

2. MATERIALS AND METHODS

The materials and methods used in this study of finger millet enriched probiotic lassi with strawberry and mango lassi are collected together by various sources materials used are mentioned below

Instruments	Glass wares	Chemicals	Other requirements
1. Incubator 2. Autoclave 3. Weighing balance 4. pH meter 5. Colony counter 6. Refractometer 7. Refridgerator 8. Vaccum tray dryer	1. HDPE bottles 2. Measuring cylinder 3. Conical flasks 4. Beakers 5. Glass bottles 6. Test tube 7. Cutter 8. Peeler 9. Pipette 10. Petri plates 11. Micro pipettes 12. Tetra pack 13. Spreader 14. Muslin cloth 15. Aluminium foil	1. MRS Agar 2. Phenolphthalein indicator 3. Sodium Hydroxide 4. Sodium chloride	1. Distilled water 2. Lactobacillus Acidophillus culture 3. Toned milk 4. Sugar 5. Muslin cloth 6. Finger millet flour 7. Glass Containers 8. Mango fruit 9. Strawberry fruit 10. utensils

Table No.3. Requirements

2.1 PROBIOTICS

The term 'probiotic' is derived from two Greek words 'pro and bios' means "for life" and has had several meanings over the years. Lilly and Stillwell (1965) introduced the term 'probiotic' for the first time to describe the growth promoting factors produced by the microorganisms. Over the years, probiotic term has been linked to several definitions. As per FAO/WHO guidelines, probiotics are defined as "Live microorganisms which when administered in adequate amounts confer a health benefit on the host" (FAO/WHO, 2002).

Some important health benefits due to ingestion of probiotic bacteria include improved digestion of lactose and reduced intestinal bloating, flatulence and discomfort; prevention of traveller's diarrhea; the associated toxin production and a possible cause of sudden infant death syndrome (SID); enhancing the immune system, improving resistance to infection and improving well-being, protection against certain types of cancer; reducing allergic inflammation, etc (Wang et al., 2013).

2.2 LACTOBACILLUS ACIDOPHILLUS CULTURE

Lactobacillus acidophilus is a species of gram positive bacteria. Lactobacillus acidophilus are bacteria has Phylum Firmicutes, Class Bacilli, Order Lactobacillales, Family Lactobacillaceae, Genus Lactobacillus and Species L.acidophilus is a homofermentative, microaerophilic species, chemical process sugars into carboxylic acid, and grows without delay at rather low pH values (below pH five) And has an optimum growth temperature of around 37°C (99 °F). L. acidophilus happens naturally within the human and animal digestive tube and mouth. Some strains of L. acidophilus is also thought-about to own probiotic characteristics Trillions of bacterium and different microorganisms sleep in each person's gut. analysis indicates that overwhelming probiotics will facilitate improve the balance between the helpful and harmful bacterium that sleep in the gut.

2.3 FERMENTED DAIRY PRODUCT LASSI

Lassi is associate ancient refreshing drink for extinguishing thirst. Lassi is an indigenous milk product obtain by lactic fermentation of milk to base product “Dahi” followed by its breaking, mixing and/ or addition of water, sugar, flavouring and colouring agents to make homogenous liquid mass. In rural india lassi is also additionally called as butter milk.

Lassi is creamy viscous fluid with wealthy aroma and gently acidic in style h rich aroma and mildly acidic in taste. On an average Lassi contains 79 per cent water, 3 per cent fat, 2.8 per cent protein, 4.5 per cent lactose and 12 per cent sugar (Sharma, 2006)

Vacuum Tray Drying

Malted finger millet grains should be dried under mild conditions to reduce moisture content considerably below 12%. The finger millet grains were loaded on the trays forming one single layer and dried at $40\pm 5^{\circ}\text{C}$ and 740 to 760 mm Hg vacuum in vacuum tray dryer. The total time taken for drying to a moisture content of $\sim 12\%$ was 4.5 h. The dehydrated grains were removed from the dryer, cooled and stored in an air tight plastic jar

Milling and Sieving

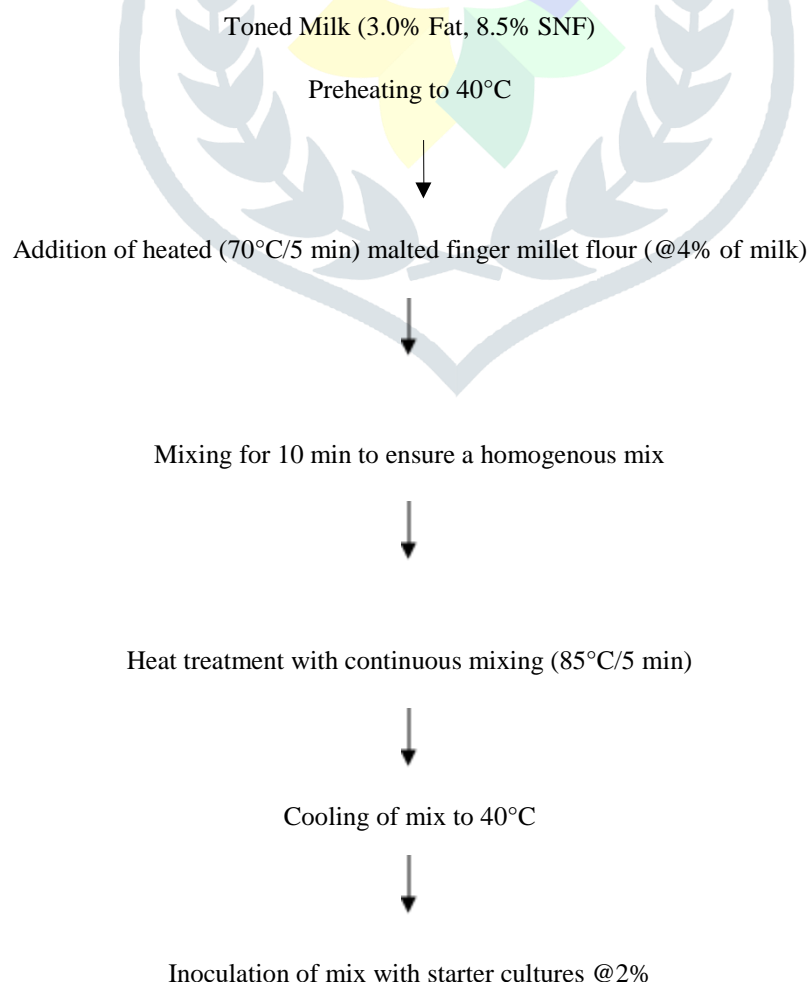
The finger millet grains were ground into a very fine powder in a commercial flour mill adjusted to a fine setting. The flour was sieved using a U.S. Standard 20 Mesh sieve.

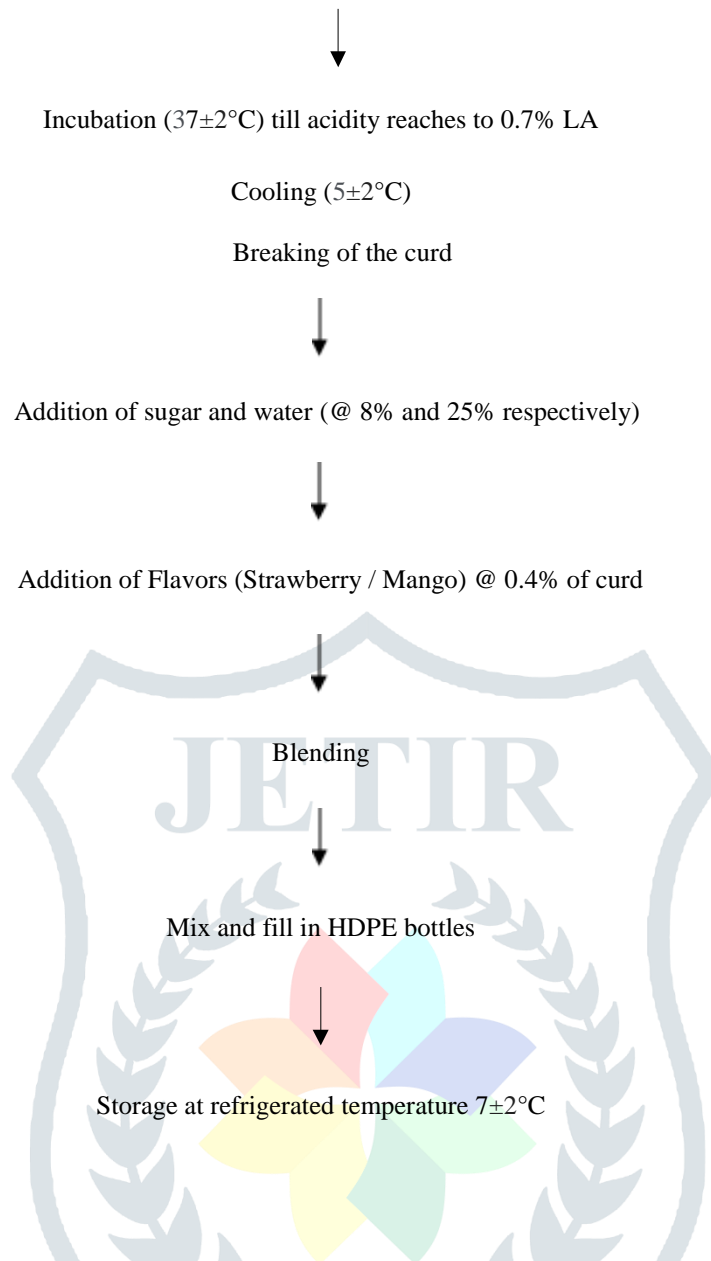
Packaging

After sieving, the powder was left to cool at room temperature for 2 h and packed into clean, polythene bag and heat-sealed. This was done to maintain freshness and dryness prior to further use. The bags were stored in a cool, dry place

Here after malting the flour is packed in HDPE Bottle and used it in while the lassi is going to prepare.

Flowchart Representing the process of preparation and packing of fingermillet enriched probiotic lassi





Flavour		7.4	7.8	8.0
Body and Texture		7.5	7.7	8.1
Colour and Appearance		7.7	7.9	8.2
Overall Acceptability		7.5	7.8	8.1

Table No.4. Results of sensory evaluation of different flavours of finger millet probiotic lassi

C1 = STANDARD LASSI

C2 = STRAWBERRY FLAVOURED LASSI

C3 = MANGO FLAVOURED LASSI

2.4 STORAGE STUDY OF FINGER MILLET ENRICHED PROBIOTIC LASSI.

The samples of probiotic lassi were stored at refrigerated temperature ($7\pm 2^{\circ}\text{C}$) to study changes occurring during storage. Observations were taken at the interval of 5 days till the end of shelf life of products. During this period samples were evaluated for sensory (i.e. flavour, body and texture, colour and appearance, and total score, chemical (i.e. acidity, pH) and microbiological (i.e. lactic count, yeast and mold count) parameters.

Lassi keeps smart just for daily or 2 at temperature. below refrigeration, the keeping quality of lassi is extended significantly. additional extension of time period is achieved by UHT process once fermentation and packaging aseptically. Wheying off could occur however it will be avoided by employing a appropriate stabilizer and correct process conditions

2.5 PROPOSED HEALTH BENEFITS OF FINGER MILLET

Finger millet is highly extremely wholesome and renders varied health edges. Proposed health benefits of finger millet are mentioned below.

Cardiovascular Diseases: Finger millets have shown to lower significantly the concentrations of serum triglycerides.

Diabetes Mellitus: Finger millet based diets have shown lower glycemc response due to high fibre content and also alpha amylase which are known to reduce starch digestibility and absorption.

Detoxification-Anti-Oxidant Properties: The inhibitor, metal chelating and reducing powers are shown by the soluble and insoluble certain synthetic resin extracts of many sorts of ragi .

Cancer: Recent research has revealed fibre as one of the best and easiest ways to prevent the onset of breast cancer in women. It can reduce chances of breast cancer by more than 50% by eating more than 30g of fibre every day.

Gastrointestinal Disorders: An immune mediated enteropathic disease called Celiac Disease. As millets are protien free, they need appreciable potential in foods and beverages and may meet the growing demand for protien free foods and can be appropriate for people .

Weight Loss: Ragi contains an amino acid called tryptophan which lowers appetite and helps in keeping weight in control.

Bone Health: Ragi is rich in calcium which helps in strengthening bones. It consumption helps in development of bones in growing young kids and in maintenance of bone health in adults.

Lowering Blood Cholesterol: Finger millet contains amino acids lecithin and methionine which help in bringing down cholesterol level by eliminating excess fat from liver.

Anaemia: Ragi is a good source of natural iron.

Relaxation: Ragi is beneficial in conditions of anxiety, depression and insomnia (sleepless nights). It is also useful for migraines.

Other Health Benefits: If consumed regularly, ragi could help in keeping malnutrition, degenerative diseases and premature aging at bay. Green ragi is recommended for conditions of blood pressure, liver disorders, asthma and heart weakness

3.CONCLUSION:

Preparation of Finger millet (*Eleusine Coracana*) enriched Probiotic Lassi with different flavours done successfully. In which optimize the 2%, 4% and 6% concentration of Finger millet (flour) enriched probiotic lassi on the sensory evaluation then it can be concluded that the 4% enriched finger millet flour has good quality along with the good taste . Hence it can be consider next analysis of different flavoured lassi like strawberry and mango with compared without flavor control lassi. The physico-chemical analysis of

different flavors lassi conclude that acidity of the product increases when pH of the product decreases, fat content decreased due to added water while manufacture of the product and ash content depend amounts of inorganic residue remaining in completely burned sample at specific high temperature. The sensory evaluation analysis of different flavours lassi with control conclude that overall acceptability, flavor score maximum Mango flavour lassi and colour and appearance, body and texture score maximum mango flavor lassi. In which way optimization of different flavoured lassi was done successfully in physico-chemical analysis and sensory evaluation, lassi is a ferment drink which is taken after meal for easy digestion it helps very much in controlling the acidity and it is rich in macronutrients like calcium zinc and many more and it cleans the intestine gut flora Overall the ragi along with fermented dahi does magic.

4. BIBLIOGRAPHY

1. Aijaz Shaikh, Sreeja.V Dairy Microbiology Department, S.M.C. College of Dairy Science, Anand Agricultural University, Anand, Gujarat, India. Study to select the sugar concentration and compatible Flavour for preparation of finger millet enriched Probiotic fermented milk product
2. AACC (2000). Approved methods of the American Association of Cereal Chemist, 10th Edition. AACC, st Paul, MN USA. Method No, 1-46.
3. Agrahar-Murugkar, D., Zaidi, A., & Gupta, C. (2016). Quality evaluation of Composite flour laddoo containing sprouted and malted ingredients. *Nutrition & Food Science*.
4. Ahmed S. M., Saleh, Qing Z., Jing C. and Qun S (2013). Millet Grains: Nutritional Quality, processing and potential health benefits. *Comprehensive Reviews in Food Science and food safety*. 12, 281-295.
5. Amadou, I., Gounga, M. E., & Le, G. W. (2013). Millets: Nutritional composition, some health benefits and processing- A review. *Emirates Journal of Food and Agriculture*, 501-508.
7. Ambati, K., & Sucharitha, K. V. (2019). Millets-Review on Nutritional Profiles and Health Benefits. *Int J Recent Sci Res*, 10(7), 33943-33948.
8. Behera, M. K. (2017). Assessment of the state of millets farming in India. *Ecology and Environment Science*, 2(1), 16.
9. Behare P, Kumar H, Mandal S (2016) Yogurt: Yogurt Based Products. *Encyclopedia of Food and Health*, pp. 625-63
10. Caulibaly, A., & Chen, J. (2011). Evolution of energetic compounds, antioxidant capacity, some vitamins and minerals, phytates and amylase activity during the germination of finger millet. *American Journal of Food Technology*, 6(1), 40-51.
11. Chamoli, V., Badoni, A., Bahuguna, N., & Joshi, N. Finger millet (*Eluesine coracana*):-Nutritional status, health benefits and processing status-A review.
12. Changmei, S., & Dorothy, J. (2014). Millet-the frugal grain. *International Journal of Scientific Research and Reviews*, 3(4), 75-90.
13. Chauhan, M., Sonawane, S. K., & Arya, S. S. (2018). Nutritional and nutraceutical properties of millets: A review. *Clinical Journal of Nutrition and Dietetics*, 1(1), 1-10.

- 14 . Chilkawar, P. M., Salve, R. V., & Hashmi, S. I. (2010). Studies on standardization of malting process for finger millet (ragi). *International Journal of Processing and Post Harvest Technology*, 1(2), 81-86.
- 15 . Cheplin HA, Rettger LF (December 1920). "Studies on the Transformation of the Intestinal Flora, with Special Reference to the Implantation of Bacillus Acidophilus.
16. Dhewa, T., V. Bajpai, R. K. Saxena, et al. *International Journal of Probiotics and Prebiotics*. 2010. 5(1). 45–52.
17. Desai, A. D., Kulkarni, S. S., Sahoo, A. K., Ranveer, R. C., & Dandge, P. B. (2010). Effect of supplementation of malted ragi flour on the nutritional and sensorial quality characteristics of cake. *Advance Journal of Food Science and Technology*, 2(1), 67-71.
- 18 . ElisaDiStefano^{1,2,†}, Jessica White^{2,†}, Shannon Seney², Sharareh Hekmat³, Timmcdowell¹.
1.FoodMicrobiology,Universityofwageningen,6708pbwageningen,TheNetherlands;
2.F3-106, Lawson Health Research Institute, 268 Grosvenor Street, London, ON N6A 4V2,
Jwhit44@uwo.ca (J.W.); shannon.seney@sjhc.london.on.ca (S.S.)
1.Food and Nutritional Sciences, Brescia College, London, ON N6G 1H2, Canada; hekmat@uwo.ca
2.Agriculture and Agri-Food Canada, 1391 Sandford Street, London, ON N5V 4T3, Canada; Tim.mcdowell@AGR.GC.CA
(T.M.); mark.sumarah@agr.gc.ca (M.S.)
A Novel Millet-Based Probiotic Fermented Food for the Developing World.
19. Gull, A., Prasad, K., & Kumar, P. (2015). Physico-chemical, functional and antioxidant properties of millet flours. *Journal of Agricultural Engineering and Food Technology*, 2(1), 73-75.
20. Gitanjali B. Sathe* and S.Mandal Fermented products of India and its implication: A review
- 21 . Issoufou A., Mahamadou E. G., and Guo-wei Le (2013). Millets: Nutritional composition, some health benefits and processing – A review, *Food science and Nutrition*, 25 (7): 501-508.
22. ICAR-National Dairy Research Institute,Karnal-132 001, India. *Asian J. Dairy & Food Res*, 35 (1) 2016 : 1-9 Print ISSN:0971-4456 / Online ISSN:0976-0563. How to use freeze dried cultures (ampoules)
In-charge, National Collection of Dairy Cultures; I/C, NDRI, Karnal. Phone: +91-184-2259192/96 (O)
- 23 . JAFARALI K. MOMIN B.Tech. (Dairy Technology) Department of Dairy Microbiology, College of Dairy Science, Anand Agricultural University, Anand – 388110 Effects of medicinal herbs on lactic Acid bacteria and their use in Preparation of probiotic lassi

24 . Karki, D. B., & Kharel, G. P. (2012). Effect of finger millet varieties on chemical Characteristics of their malts. *African Journal of Food Science*, 6(11), 308-316.

so 25 .Muhammad Shah Moazzem¹, Md Nurul Islam¹, AKM Masum^{1*}, Md Rezwanul Habib ¹.Department of Dairy Science, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh. 2.Bangladesh Livestock Research Institute Regional Station, Baghabari, Shahjadpur, Sirajganj 6770, Bangladesh Effect of different levels of sugar on qualitative characteristics of lassi prepared from ur dahi.

26 . Monika Rani¹, Dabur RS², Priyanka³ ¹.Assistant Professor, Dairy Technology, College of Dairy Science & Technology. Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, India ².Ex-Dean, College of Dairy Science & Technology. Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, India.¹.Ph.D. Scholar, Veterinary Public Health & Epidemiology, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, India. Effect of fat percentage on sensory attributes and growth characteristics of starter culture for development of whey-cereal based fermented beverage

27 .Makarova K, Slesarev A, Wolf Y, Sorokin A, Mirkin B, Koonin E, et al. (October 2021 PROBIOTICS 61 2006). "Comparativegenomicsofthelacticacidbacteria".Proceedingsof theNationalAcademyofSciencsoftheUnitedStatesofAmerica.103(42):156116:Bibcode:2006PNAS...10315611M.doi:10.1073/pnas.0607117103.PMC1622870. PMID 17030793

28 . Nout, M. J. R., & Davies, B. J. (1982). Malting characteristics of finger millet, sorghum and barley. *Journal of the Institute of Brewing*, 88(3), 157-163.

29 .Ocheme, O. B. (2007). Effect of storage of millet flour on the quality and acceptability of millet flour porridge (Enyiokwolla). *Journal of Food Technology*, 5(3), 215-219

30. Ogori, A. F., Jatua, M. K., Apeh, M. O., & Adamu, L. (2013). Chemical and functional characteristics of flours from blends of millet grain flour from distilled water soaking and malting.(*Pennisetum glaucum*). *International Journal of Food Science and Technology*, 1(1), 01-07.

31. P.S.Pardhi,R.J.Desale,P.R.Mule*B.K.Ghule,D.R.TambeandM.SGavhane Mahatma Phule Krishi Vidyapeeth, Rahuri – 413 722, India. Studies on finger millet lassi

32. Srivastava, K., & Sharma, A. K. (2012). Nutraceutical importance of finger millet (*Eleusine coracana*) for improved human health. *The European Journal of Plant Science and Biotechnology*, 6(S (2)).