



Plant Archives

Journal home page: www.plantarchives.org

DOI Url: <https://doi.org/10.51470/PLANTARCHIVES.2021.v21.no1.216>

DEVELOPMENT AND SENSORY EVALUATION OF FUNCTIONAL PROBIOTIC YOGURT FORTIFICATION WITH PAPAYA PULP

Madhu^{1*} and Singh Neetu¹

¹Department of HDFs, School for Home Science, Babashaheb Bhimrao Ambedkar (A central) University, Lucknow-226025, U.P., India

*Email: madhu.bbaulucknow2019@gmail.com

(Date of Receiving-10-11-2020; Date of Acceptance-31-03-2021)

ABSTRACT

Probiotic yogurt is defined as a live microbial food ingredient that confers a health benefit on the consumer. Probiotic yogurt fortification with papaya pulps, increase the metabolic activities and absorption process of gut flora in intestine, and enhance the sensory properties. Functional foods to promote gut health because gut is a target for the development of functional foods, because it acts as an interface between the diet and all other body functions. One of the most promising areas for the development of functional food components lies in the use of probiotics and prebiotics to modify the composition and the metabolic activity of the gut micro flora. Objectives: overall main target of the research work was to developed functional probiotic yogurt, and fortified with Papaya pulps which is a prebiotic and also a vitamin 'C' rich fruits and their sensory evaluations for consumer acceptability. Methodology: live probiotic bacteria powder are used as culture for making probiotic yogurt and 2. Extracted papaya pulps from papaya fruits and then Probiotic yogurt fortified with papaya pulp in 5 different ratios- 0%, 10%, 20%, 30% and 40% finally developed functional probiotic yogurt fortification with guava pulps. 9 point hedonic rating scale are used for sensory evaluations. Result: there was no significant difference in results fortified with different ratios of papaya pulps but showed little better ratios of 30% and 40% papaya pulps as comparisons to 10% and 20% ratios of papaya pulps. Conclusion: optimization of the desirable properties of the 30 and 40 would increase utilization and acceptance of functional probiotic yogurt fortification with papaya pulps.

Keywords: Functional foods, Probiotics & Prebiotics, Papaya pulps, sensory evaluations.

INTRODUCTION

Pro means 'for' and bio means 'life' Probiotics is living microorganism or microscopic bacteria that are created by fermenting certain foods. There are many good bacteria in our body that are beneficial; these are mentioned as probiotics. "Probiotics can help enhance digestion and regulate the function of digestive tract when consumed regularly. Probiotic bacterial cultures are added to exploit, it makes it ferment and this fermentation gives the milk a creamy texture that we all know as yogurt. The most source of these good bacteria is yogurt, which usually contains these microorganism along with other nutrient. Yogurt is a creamy, fermented dairy product. Probiotic yogurt is any yogurt that contains live, active bacterial cultures. Most natural or regular yogurt is probiotic. A normal serving of yogurt contains billions of bacteria, which many of us believe to be beneficial to the body. Research has shown that the bacteria in yogurt can affect an individual's gastrointestinal system which naturally contains trillions of bacteria itself but just how beneficial probiotic yogurt is to a person's health wasn't clear as of 2012. When yogurt is formed, bacterial cultures are added to exploit, and therefore the sugar within the milk transforms into carboxylic acid. The carboxylic acid then reacts with the protein within the milk to offer the yogurt its thick, creamy texture. Lactic acid is also what makes yogurt taste tart or tangy (Sfakianakis, *et al.*)

Micronutrient and macronutrient malnutrition, hidden hunger, is a serious health risk come due to globally estimated due to deficiency of under nutrition to cause the deaths of between 3 and 5 million people per year. (FAO) Food fortification or enrichment is that the process of adding micronutrients (essential trace elements and vitamins) to food. As defined by the planet Health Organization (WHO) and therefore the Food and Agricultural Organization of the United Nations (FAO), fortification refers to "the practice of deliberately increasing the content of an essential micronutrient, i.e. vitamins and minerals (including trace elements) during a food, so on improve the nutritional quality of the food supply and to supply a public health benefit with minimal risk to health", whereas enrichment is defined as "synonymous with fortification and refers to the addition of micronutrients to a food which are lost during processing" (Slavin *JL, et al.*)

Foods supported fruits and vegetables, like its juices and pulp represent a replacement potential carrier and source of probiotic microorganism. Yogurt, the simplest carrier of probiotics, traditionally is manufactured streptococcus thermophiles and lactobacillus deldrueckii ssp. Bulgaricus (*L. bulgaricus*) as starter cultures. raw and fermented fruits represent an excellent vehicle for probiotics due to Majority 70% of people in India do not consume enough micronutrients such as vitamins and minerals

in day to day life. Most yogurt is combined with one or more flavors, typically fruit flavors. Various toppings and other foods, like berries or granola, are often added to or mixed into yogurt also. Probiotic organisms, or probiotics, live microorganisms that are believed to profit the health of a number organism when administered in adequate numbers. Dietary supplements that contain probiotic organisms also are called probiotics. According to Hippocrates, “Let your food be your medicine” and foods is also as a medicine because that is cure disease but medicinal product is not foods. Now health foods is define which is a healthy diet consisting of foods with functional properties also because that is help to promote wellbeing and reduce the some disease. Guava is a Functional fruits which is major role play in metabolic activities an also effective for human intestinal health (Frazier,W.C. and D.C. Westhhoff).

MATERIALS AND METHODS

To developed functional probiotic yoghurt fortification with papaya pulp, first developed probiotic yoghurt than fortified with papaya pulp at different ratio (0, 10, 20, 30, 40) added with probiotic yoghurt.

Developed Probiotic Yogurt

Milk containing fat 6.0%, SNF 9.0%, in 100 g, energy, Kcal 86.4g, saturated fat 3.9g, carbohydrates 5.0g, protein 3.1g, calcium 108mg. was obtain from (Amul Gold, pasteurized full cream milk) local market sharda Nagar Rae Bareli road, Lucknow, Uttar Pradesh, India. And live & Active freeze-dried Starter probiotic powder culture (contains Casei, Bifidus & Acidophilus, etc) was purchasing from online Ammazone.

Flow chart of probiotic yogurt preparation and fortification of yogurt

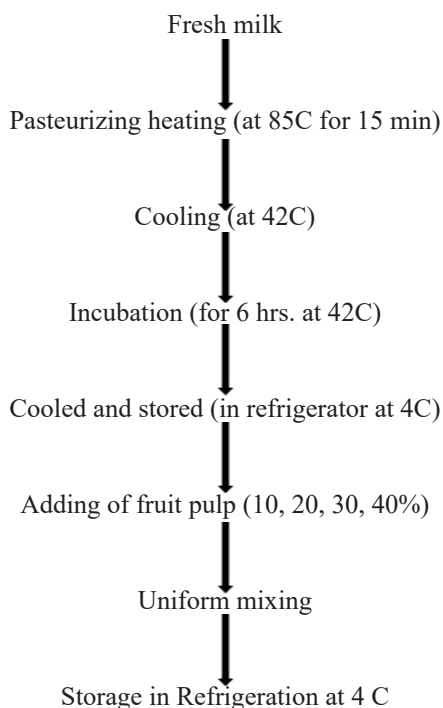


Table: 1 formulation of fortified probiotic yogurt with papaya pulp

Sample	Ingredients	
	Probiotic yoghurt (%)	Papaya pulp (%)
A	100	0
B	90	10
C	80	20
D	70	30
E	60	40

Microbial analysis

For this test, MacConkey Agar media for coliform test and Sabouraud Dextrose Agar media was prepared, and autoclaved at 121°C, 15psi for 15minutes.The sterile media was poured separately into sterile petri plates under Laminar air flow and allowed to solidify properly. The sample were serially diluted in 1% sterile peptone water up to 10⁷ dilutions and from this 10⁻² dilution was used for yeast and mold count while 10⁻⁶ was used for the coliform count. From the diluted sample, 0.1ml of aliquot was added drop wise on the plate and uniformly spread with the glass rod till it gets completely absorbed. The plates were sealed and incubated at 37°C for the coliform and 27°C for the yeast and mold count. The CFU/ml was calculated using the formula:

$$cfu = \frac{\text{No. of colonies}}{\text{dilution factor} \times \text{volume of sample plated}}$$

*10⁻² dilution was plated for yeast and mold count while 10⁻⁶ dilution was used for coliform count. The volume of sample used for plating was 0.1ml.

SDA media plates with colonies for yeast and mold count

Sensory evaluation

The color and appearance, flavor, texture, taste and overall acceptability of all yogurt samples were evaluated sensorial by a semi trained panel of 30 members using a 9

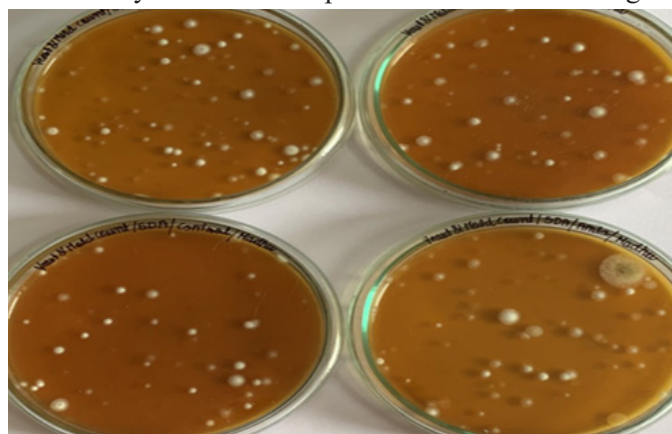


Fig: SDA media plates with colonies for yeast and mold count

- point score system with score ranging from 9 to 1 where score represented like extremely and dislike extremely respectively.

RESULT AND DISCUSSION

The freshly activated yoghurt culture was inoculated in fresh milk at the 1% and 2 % level and incubated at 42C for the preparation of yoghurt. Sensory evaluation, it was found that 2 % level of functional probiotic yoghurt inoculum used was found to be most acceptable. The acidity of plain yoghurt confirms with the FSSAI standards. The data obtained was statistically analyzed for mean \pm standard error. From the statistical analysis, it was found that overall acceptability of yoghurt prepared with

2% inoculum level was found to be highly acceptable (Table 2). From the sensory evaluation it was found that functional probiotic yoghurt fortified with papaya pulp (40%) was recorded to be highly acceptable.

Papaya is an important source of antioxidants (vitamin C, A, B, E and fibers) and calcium, magnesium and potassium. Papaya characterized by high amount of papain enzymes and fibers, which help in digestion and high amount of β carotene, anti-oxidant and minerals. Blending of papaya pulp in yoghurt would produce balanced and enjoyable food. However, guava pulp could be used in the production of fruit yogurts that would reduce the postharvest loss also.

The data obtained by statically analyzed for mean \pm

Table: 2 Mean sensory characteristic of plain yogurt

Quality parameters	Probiotic yoghurt (1%level inoculum)	Probiotic yoghurt (2%level inoculum)
Flavor	8.7 \pm 0.12	8.6 \pm 0.12
Consistency	8.5 \pm 0.16	8.2 \pm 0.24
Taste	8.6 \pm 0.20	8.3 \pm 0.20
Color and Appearance	7.8 \pm 0.19	8.0 \pm 0.18
Overall Acceptability	8.2 \pm 0.18	8.6 \pm 0.21

Table: 3 Mean sensory characteristic of probiotic yogurt

Quality parameters	Control (plain probiotic yogurt)	Probiotic yoghurt prepared using <i>L. delbrueckii</i>	Probiotic yoghurt prepared using <i>L. casei</i>	Probiotic yoghurt prepared using <i>S. thermophilus</i>
Flavor	8.5 \pm 0.16	8.7 \pm 0.13	8.3 \pm 0.15	8.7 \pm 0.32
Consistency	8.2 \pm 0.25	8.5 \pm 0.16	8.2 \pm 0.22	8.3 \pm 0.22
Taste	8.3 \pm 0.33	8.3 \pm 0.14	8.3 \pm 0.23	8.5 \pm 0.33
Color & appearance	8.1 \pm 0.22	8.1 \pm 0.16	8.6 \pm 0.18	8.5 \pm 0.17
Overall Acceptability	8.0 \pm 0.26	8.2 \pm 0.18	8.6 \pm 0.25	8.2 \pm 0.24

Table: 4 Mean sensory characteristic on quality of plain yogurt, fortified with papaya pulp at different ratio (0%, 10%, 20%, 30%, 40%)

Quality parameters	Control 0%	Probiotic yoghurt fortified with papaya pulp (10%)	Probiotic yoghurt fortified with papaya pulp (20%)	Probiotic yoghurt fortified with papaya pulp (30%)	Probiotic yoghurt fortified with papaya pulp (40%)
Flavor	8.5 \pm 0.17	8.0 \pm 0.17	8.2 \pm 0.16	8.4 \pm 0.18	8.5 \pm 0.34
Consistency	8.2 \pm 0.26	8.2 \pm 0.26	8.2 \pm 0.25	8.2 \pm 0.25	8.4 \pm 0.26
Taste	8.3 \pm 0.32	8.1 \pm 0.32	8.3 \pm 0.32	8.3 \pm 0.33	8.3 \pm 0.31
Color & appearance	8.1 \pm 0.21	8.1 \pm 0.21	8.1 \pm 0.22	8.1 \pm 0.22	8.4 \pm 0.33
Overall Acceptability	8.0 \pm 0.25	8.2 \pm 0.16	8.3 \pm 0.25	8.4 \pm 0.32	8.6 \pm 0.36

Table: 5 Mean sensory characteristic on quality of probiotic fruit yoghurt

Quality parameters	Control 0%	Probiotic yoghurt fortified with papaya pulp (10%)	Probiotic yoghurt fortified with papaya pulp (20%)	Probiotic yoghurt fortified with papaya pulp (30%)	Probiotic yoghurt fortified with papaya pulp (40%)
Flavor	8.3 \pm 0.70	8.0 \pm 0.17	8.2 \pm 0.16	8.4 \pm 0.17	8.5 \pm 0.69
Consistency	8.2 \pm 0.75	8.2 \pm 0.26	8.2 \pm 0.25	8.6 \pm 0.26	8.6 \pm 0.66
Taste	8.0 \pm 0.40	8.1 \pm 0.32	8.3 \pm 0.32	8.3 \pm 0.32	8.6 \pm 0.64
Color & appearance	8.1 \pm 0.55	8.1 \pm 0.21	8.1 \pm 0.49	8.5 \pm 0.55	8.4 \pm 0.73
Overall Acceptability	8.0 \pm 0.50	8.2 \pm 0.16	8.3 \pm 0.55	8.4 \pm 0.33	8.7 \pm 0.75

standard error. From the statically analyze it was found that overall acceptability of yoghurt prepared with 2% inoculum level was found to be highly acceptable (table 2)

Probiotic yoghurt fortified with papaya (40%) had secured highest score for organoleptic values than the control probiotic yoghurt. Papaya pulp fortified yoghurts were founds most preferred to panelists than control yoghurt. Higher solids and fiber content in fruit pulp may be associated with increasing viscosity and consequently improve the textural properties of fortified with papaya pulp yoghurts.

Statistical analysis

The data was collected from different parts were analyzed on the software of SPSS.20 version

CONCLUSION

Probiotic yogurt prepare by fortified with 40% papaya pulp are more acceptable by panelists, this was due to combination between papaya pulp and probiotic yoghurt of dairy products. This is successfully stored up to 14 days. It can be recommended to all age group. Probiotic lactobacilli and streptococcus thermophilus are gaining enormous attention because of their effects on health such as anti-diabetic, anti-diarrheal, anti-pathogenic, anti-cancerous etc. papaya pulp is also extremely healthy, having a high content of dietary fiber anti-oxidants and minerals and vitamins etc. and hence could prepare as a beneficial medium for cultivating production.

REFERENCE

- Sfakianakis, Panagiotis, and Constatnina Tzia. "Conventional and innovative processing of milk for yogurt manufacture; development of texture and flavor: A review." *Foods* 3.1 (2014): 176-193.
- Sfakianakis, Panagiotis, and Constantina Tzia. "Dairy technologies in yogurt production." *Microbiology in Dairy Processing* (2018): 279.
- Farag, Mohamed A., Enas A. El Hawary, and Moamen M. Elmassry. "Rediscovering acidophilus milk, its quality characteristics, manufacturing methods, flavor chemistry and nutritional value." *Critical reviews in food science and nutrition* 60.18 (2020): 3024-3041.
- U.S. Department of Agriculture, Agricultural Research Service. FoodData Central, 2019. fdc.nal.usda.gov.
- Bhat JA, Naik MI and Tenguria RK.2013. Isolation of Lactic acid bacteria under low temperature for the preparation of yoghurt. *Int. J. Appl. Bio pharmaceutical Technol.* 4(1): 293-298.
- Dinesh Meel and Drishti Kadiyan. 2017. Development of herb supplemented fruit yoghurt. *International Journal of Advanced Scientific Research and Management*, 2(7): 94-96.
- Frazier,W.C. and D.C. Westhhoff, 1995. Food Microbiology. Mc Graw-Hill Book Company. Kalab, M; 2000, Yoghurt: Electron microscopy. Foods under the microscope scimat. Nafiseh Vahedi, Mostafa Mazaheri Tehrani and Fakhri Shahidi. 2008. Optimizing of Fruit Yoghurt Formulation and Evaluating Its Quality During Storage. *American-Eurasian J. Agric. & Environ. Sci.*, 3(6): 922-927.
- Nongonierma A., Cayot P., Springett M., Le Quere J. L., Cachon R. and Voilley A. 2007. Transfers of small analytes in a multiphasic stirred fruit yoghurt model. *Food Hydrocolloids*, 21(2), 287-296.
- Vasiljevic, T. and Jelen, P. 2002. Lactose hydrolysis in milk as affected by neutralizers used for the preparation of crude β -galactosidase extracts from *Lactobacillus bulgaricus* 11842. *Innovative Food Science and Emerging Technologies* 3: 175-184.
- Viljoen, B.C., Lourens-Hattingh, A., Ikalafenga, B. and Peter, G.2003. Temperature abuse initiating yeast growth in yoghurt. *Food Research International* 36: 193–197.
- Wang, Y. C., Yu, R. C. and Chou. C. C. 2002. Growth and survival of bifidobacteria and lactic acid bacteria during the fermentation and storage of cultured soymilk drinks. *Food Microbiology* 19: 501-508.
- Yeganehzad, S., Mazaheri-Tehrani, M. and Shahidi, F. 2007. Studying microbial, physiochemical and sensory properties of directly concentrated probiotic yoghurt. *African Journal of Agricultural Research* 2 (8): 366-369.
- Zekai Tarakci and Erdogan Kucukoner. 2003. Physical, Chemical, Microbiological and Sensory Characteristics of Some Fruit-Flavored Yoghurt. *YYÜ Vet Fak Derg* 2003, 14(2): 10-14.
10. Boeing H, Bechthold A, Bub A, Ellinger S, Haller D, Kroke A, LeschikBonnet E, Muller MJ, Oberritter H, Schulze M, *et al.*, Critical review: vegetables and fruit in the prevention of chronic diseases. *Eur J Nutr* 2012;51:637–63.
- O'Connor LM, Lentjes M, Luben R, Khaw K-T, Wareham N, Forouhi N. Dietary dairy product intake and incident type 2 diabetes: a prospective study using dietary data from a 7-day food diary. *Diabetologia* 2014;57:909–17.
- Díaz-López A, Bullo M, Martínez-González MA, Corella D, Estruch R, Fito M, Gomez-Gracia E, Fiol M, Garcia de la Corte FJ, Ros E, *et al.*, Dairy product consumption and risk of type 2 diabetes in an elderly Spanish Mediterranean population at high cardiovascular risk. *Eur J Nutr* 2016;55:349–60.
- Keast DR, Gallant KM, Albertson AM, Gugger CK, Holschuh NM. Associations between yogurt, dairy, calcium, and

- vitamin D intake and obesity among U.S. children aged 8–18 years: NHANES, 2005–2008. *Nutrients* 2015;7:1577–93.
- Cormier H, Thifault É, Garneau V, Tremblay A, Drapeau V, Pérusse L, Vohl M-C. Association between yogurt consumption, dietary patterns, and cardio-metabolic risk factors. *Eur J Nutr* 2016;55:577–87.
- Eales J, Lenoir-Wijnkoop I, King S, Wood H, Kok FJ, Shamir R, Prentice A, Edwards M, Glanville J, Atkinson RL. Is consuming yoghurt associated with weight management outcomes? Results from a systematic review. *Int J Obes (Lond)* 2016;40:731–46.
- Wang H, Livingston KA, Fox CS, Meigs JB, Jacques PF. Yogurt consumption is associated with better diet quality and metabolic profile in American men and women. *Nutr Res* 2013;33:18–26.
- Marette A, Picard-Deland E. Yogurt consumption and impact on health: focus on children and cardiometabolic risk. *Am J Clin Nutr* 2014;99:1243S–7S.
- Slavin JL, Lloyd B. Health benefits of fruits and vegetables. *Adv Nutr* 2012;3:506–16.
- Terry LA. Health-promoting properties of fruit and vegetables. 1 ed. Wallingford (United Kingdom): CABI; 2011.
- Padayachee A, Day L, Howell K, Gidley MJ. Complexity and health functionality of plant cell wall fibres from fruits and vegetables. *Crit Rev Food Sci Nutr* 2015 (Epub ahead of print; DOI: 10.1080/10408398.2013.850652).
- Slavin JL. Position of the American Dietetic Association: health implications of dietary fiber. *J Am Diet Assoc* 2008;108:1716–31.
- Southgate DA. Nature and variability of human food consumption. *Philos Trans R Soc Lond B Biol Sci* 1991;334:281–8.
- Slavin J. Fiber and prebiotics: mechanisms and health benefits. *Nutrients* 2013;5:1417–35.
- Delzenne NM. Oligosaccharides: state of the art. *Proc Nutr Soc* 2003; 62:177–82.
- World Cancer Research Fund/American Institute for Cancer Research. Food, nutrition, physical activity and the prevention of cancer: a global perspective. Washington (DC). 1997.