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Incorporation of Vellore culinary banana pulp and peel fiber in curd and yoghurt to enhance its nutritional qualities

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ABSTRACT

The aim of this experiment was to isolate strains of Lactobacillus from different curd samples .A total of four samples were taken .Out of this 2 were curd and 2 were yoghurt from different brands .Different strains were isolated and a pure culture was obtained .The culture was further cultured on selective media .Then utilizing the strains on the selective media curd was made using milk .To the milk fruit pulp rich in fiber was added before adding the inoculum .Then it was kept for incubation for the formation of curd .People with lactose intolerence generally lack the enzyme lactase and hence cannot digest lactose .For them curd comes as a very whole some food and its important to enrich its nutritional properties .Thus adding fiber to it enhances its nutritional value .Also fiber is an integral requirement in our daily diet .The roughage provided by fiber helps in the bowel movement and the detoxification of the body. Without the proper roughage many complications can occur which might result in the detoriation of health due to toxic accumulation in the body.

Key words: curd, Lactobacillus, fiber, culinary ,Vellore

INTRODUCTION

Vellore is the administrative head quarters of Vellore district in Tamil Nadu .The city experiences semi-arid type of climate with high temperatures prevailing through out the year. Due to the high temperatures curd and yoghurt becomes one of the major constituents of the locals .Thus this region demands a high supply of dairy products including milk and curd and yoghurt. The major sources of milk in this region are the near by dairy that supply a major part of the milk (nearly 55%) .Rest of the milk comes from the local villages houses. The locals usually have a good intake of curd and associated products(yoghurt, buttermilk, mattha etc) to keep the body temperatures low in the scorching heat. Besides the homemade curd the factory made curd and flavored yoghurts are also in demand .These have proved to be a great alternative for those with lactose intolerance and thus is extremely essential. The presence of several strains of the bacteria Lactobacillus sp. is extremely important for the fermentation of curd **.L**actic acid bacteria is usually a non spore forming bacteria usually rod shaped (coccus) and gram positive .These are GRAS (generally recognized as safe) bacteria that helps in curd formation .These bacteria take up the lactose from milk and break it down into simpler molecules easy to digest in the curd .Now a days probiotic bacteria are being introduce to the curd and other food products. ”Pro-biotic” actually means “for life ” thus the probiotic bacteria reaching the stomach and intestine of the consumer confer health benefits to them .Since time immemorial milk has proved to be an wholesome some food for people, children and other people. Milk is one of the richest sources of calcium required by the body. But some people cannot in take milk due to lactose intolerance .Lactose is a sugar found in milk that is broken down by lactase enzyme[1] .The absence of this enzyme causes lactose intolerance and hence milk is not

digested by those people .Since in curd the lactose sugar is broken down into simpler sugars curd can be digested by people with lactose intolerance. Fruits are generally low in fat content but has a lot of dietary fiber .They are comparatively cheap and nutritious. Besides fruits are easily available and is suitable for all the age groups. If fiber is present in the curd then people with lactose intolerance can have a wholesome food. Fruits like banana have high fiber content that can be incorporated so that the nutritional value of the curd is enhanced.[2,4,5]

Materials –

- Four different curd and yogurt samples
- MSR agar media (16.3 gm)
- Banana pulp (Musa acuminata)
- Macconkey (6.4gm)
- Conical flask and beakers
- Pipette
- Test tubes and test tube holder
- Mixer
- Autoclave bags
- Old newspapers and rubber bands
- Petriplates
- Glass rod
- Pressure cooker for sanitization
- Non absorbant cotton

Sample Collection-

Four samples of curd and yoghurt were collected under aseptic conditions from different places (mess, different shops). They were collected with the help of sterile spoons and kept in sealed sterile containers and were cultured under the laminar airflow to prevent any sort of contamination. Each of the air tight containers were labelled [3] .The four different samples were –

1.Curd sample from Ladies Hostel mess
2. Curd sample from the a local brand.
3.Curd sample from Men's Hostel mess
4.Yoghurt sample from a local brand.

The taste of different curds vary mainly due to the amount of innoculem in them .The different amount of innoclum is a trade mark secret of the various brands [5,6,7] .Thus the samples that were collected all had different amount of innoculum and thereby were expected to have different strains of Lactobacillus.

Method –

- **Sterilization :**

Nine test tubes were filled each with 9 ml of distilled water. In a 500ml of conical flask, 16.43gm(as per the standard value given) of MRS agar was added to 100 ml of distilled water and 4 gm of nutrient agar to make the media. The nutrient agar was added to the MRS agar media so as to help the media solidify quickly and firmly. Non absorbent cotton was plugged to ensure air gap was sealed. This was done to prevent the constituents of the flask from evaporating out and casing a problem in measurement [8,9,10] .Everything was put in the autoclave bag and sterilised for one hour .After autoclaving , some amount of standing time was given for the media to cool down .Mean while the serial dilution of the 4 samples was performed. This was to ensure all the equipment used were free from contamination.

- **Serial dilution:**

The process of serial dilution was performed for ensuring the proper mixing of the sample followed by proper streaking for the lactobacilli strains .Each of the samples were taken and the steps were repeated for all the four samples. In 10 test tubes 9ml of distilled water was taken and to it 1ml of the sample was added. They were throughly mixed by pipetting gently repeatedly.1 ml from the first test tube was taken and it was transferred to the next test tube and then 1 ml from the third test tube was taken to be put into the next test tube .The 1ml misture from the 10th test tube was discarded carefully. The test tubes were then plugged with cotten to ensure minimal contamination as shown

in fig(1).

•Isolation of colonies :
Inside the laminar flow cabinet the medium while it is still in the liquid state is poured into ten petriplates including one as control petriplate. Four such sets of petri plates were taken. Then mixture of the serial dilution is poured and spread (spread plate technique) with the help of a glass rod evenly. It was made into a thin even layer .The petri plates were sealed and were marked .Then it was put for incubation at optimum temperature and pressure for one to two days to allow the growth of bacteria. In the asceptic incubators [11-13]. After the growth time, the petri plates were taken out and the petri dishes with contamination or any unwanted growth of fungus were eliminated .Later streaking was done in order to isolate the colonies. For streaking petri plates containing fresh media was prepared, a loopful of colony was transferred into the perit dishes and they were streaked using a streaking noodle. Then they were sealed and kept for incubation under optimum conditions. After 3-4 days white colonies were observed. fig(2)-right

Screening:
The colonies that were obtained after streaking had to be screened further to segregate the lactose tolerant and intolerant. The colonies were taken and they were again plated in the MacConkey agar. MacConkey agar is a differential media that contains bile salts and crystal violet .The bacteria which can metabolise(ferment) glucose are The petri plates were sealed and they were incubated for the colonies to grow. After an incubation period of 2 to 3 days ,the petri dishes were taken out and observed .The bacteria those were lactose tolerant turned pink and the rest didnot change colour[13].Therefore the lactose tolerant bacteria were isolated from the lactose intolerant ones . The lactose tolerant bacteria were then separated and they were subcultured.(fig.3)

•Preparation of fruit fiber -
banana has a very high content of fiber. The dietary fibre present in banana helps in relieving constipation ,loosing weight etc. The pulp of banana contains the essential minerals like iron phosphorus etc. Different types of banana were collected from the local market.

Fiber content in different types of bananas:

TABLE(2)

Type	Raw banana	Vellore local yellow banana	Green banana
Fiber content(in grams)	2.66	3.43	3.04

The banana were thoroughly washed and deskinned. The skin of the banana is believed to have the maximum fiber content [14,15].The banana peels were thus cut into thin slices. They were laid down in a flat layer and left for drying .They were checked on a regular basis .After a span of 2 weeks the banana peels were completely dried and were ready to be used. They were thus powdered in a grinder and the dust was kept aseptically in an air tight container.

•Preparation of curd-
Later the lactose tolerant bacteria were used to make curd. By comparing ,the strain that grew faster on the culture media among those that were isolated was chosen .Here it was found that the strain that was isolated from the curd from a local brand grew faster than that from the yoghurt [16] .It was selected ,so that the curd could be formed faster and could be economically important .Moreover to add nutritional value to the curd and also to enhance its taste, pulp of *Musa acuminata* (banana) was added. The fibre from the banana peels were then added to the 4 curd preparations in different concentration to study their relative effectiveness. Milk was taken and pasterurized. When the milk was cooled down to room temperature, innoculum from the curd sample was mixed with it in 100ml beakers. In the first setup ,1%of the banana peel powder was added, in the second setup 3% and in the 3rd and 4th setups 6% and 9% of the banana peel extract were added .The curd was then left to set under optimum conditions.
fig(4)

Addition of nutritious medium:
Musa acuminata which is the scientific name of yellow banana was added to 100ml of pasteurized milk . This was done to enhance the nutritional value of the curd that is being prepared. By incorporating the banana fibers the fiber content of the curd is increased. fig (4)

RESULTS AND DISCUSSION

Lactose that is generally found in milk, needs certain enzymes like lactase to be broken down into simpler compounds that could be digested by our body. However, some people fail to digest the same and hence are said to be intolerant to lactose. These people thus take in the dairy products in the form of curd or yoghurt where the bacteria ferments the lactose .Thus curd and yoghurt becomes an essential part of the diet of these people.

Fibers are referred to as the plant products that people cannot digest. The dietary fibers are of two types-

Soluble fibers -These are those type of fibers which dissolve in water and tend to become gum like and viscous.

Insoluble fibers-These are those type of fibers that do not dissolve in water and these promote bowel movement.

Certain compounds incuding cellulose, hemicellulose etc which are essentially found in plants and their products is called fiber. Meat, eggs, or the fluids secreated by the mammary glands doesnot contain fiber.However, fiber is an essential constitute of our diet. The daily requirements of fiber by an adult male and female and children are listed in the graph(2).The traditional milk didnot contain any fiber ,however in the recent times products are being made that act as alternative for milk, which contain some amount of fiber. Milk products such as curd and yoghurt contain contain little to no fiber at all .The fiber content of the various alternatives of milk are listed in the table(1).

Fiber content in milk and its products:

TABLE (1)

Product	Normal milk	Almond milk	Soy milk	Curd	Yoghurt
Fiber content in (grams)/ounce	0.00	1.34	1.25	0.07	0.27

Fruits contain essential nutients such as vitc, and they are a rich source of fiber that is needed in our daily diet.banana, apples and peaches are the best sources of fiber .The comparative fiber content of the three fruits are listed in the graph(1)Although the fiber content of apple is slightly higher than that of banana ,banana was choosen for the experiment for its relative easier availability and cheeper price. Graphs represent the relative content of fiber in the three fruits. By incorporating banana fibers the nutritional value of the curd is increased as it is a good scource of vitamin B6, potassium , dietary fibers , biotin, copper and managanese , vitamin c. The banana peel powder along with the peel gave a thicker texture to the curd and also increased its taste. The fiber content differed in the four samples of curd depending on the concentration of the amount of paste added.Addition of different concentrations of banana peel fiber in different sample:

TABLE(3)

Sample no.	1	2	3	4
Concentration of fiber added.(%)	1	3	6	9

The table(4) represents the increment of fiber content of 100gms of curd before and after the addition of the banana fiber

Estimation of fiber content in the curd prepared:

TABLE (4)

Sample no.	1	2	3	4
Fiber content in grams/100gm	0.1034	0.1729	0.2758	0.3982

Thus the enhanced nutritional qualities of curds are expected to help curd being consumed as a wholesome food with the fiber content. The increased fiber content will also help people with lactose intolerance to consume curd and also balance their nutritional requirements.

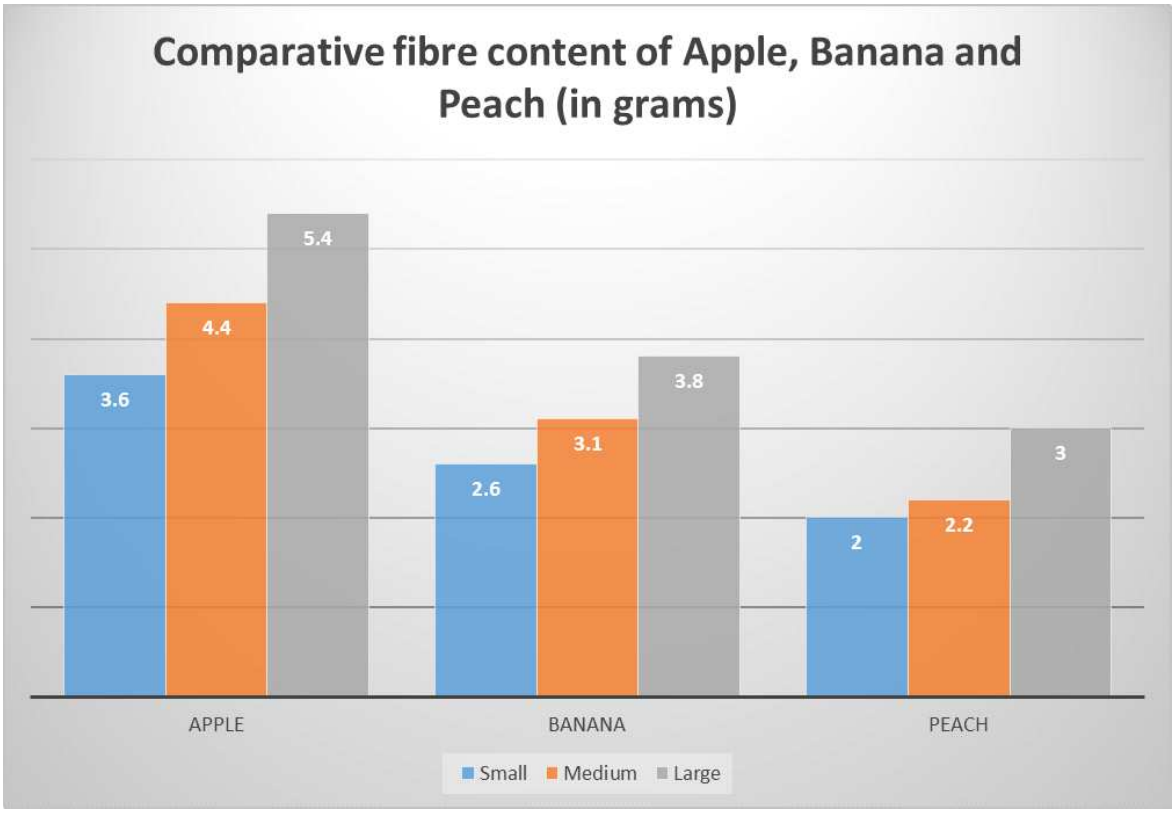
Fig(1):Serial dilution of the samples

Fig(2):Isolation of colonies of bacillus sp.

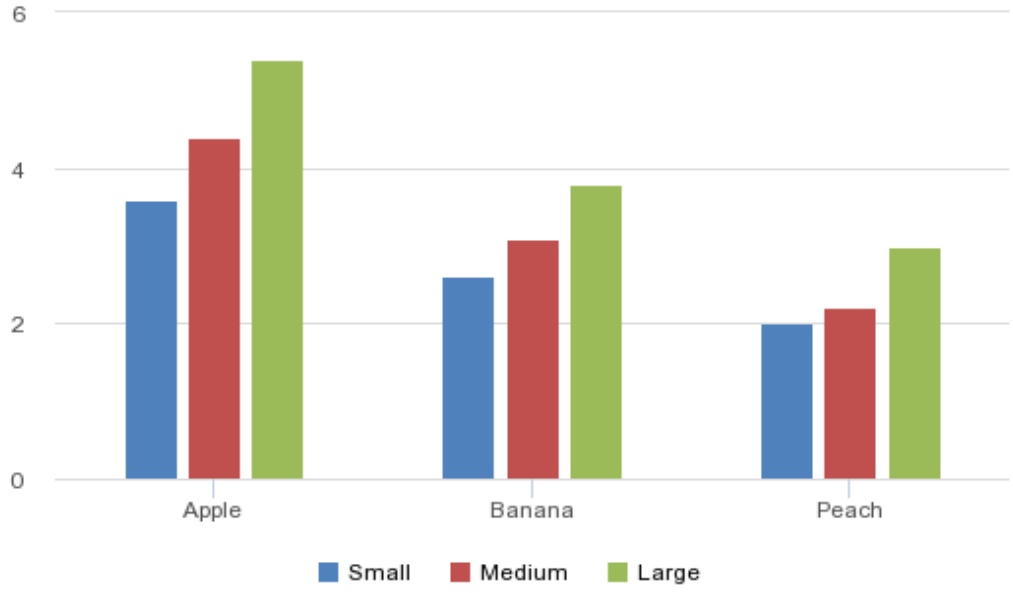
Fig(3):Screening of lactose tollerant bacteria by plating in MacConkey agar

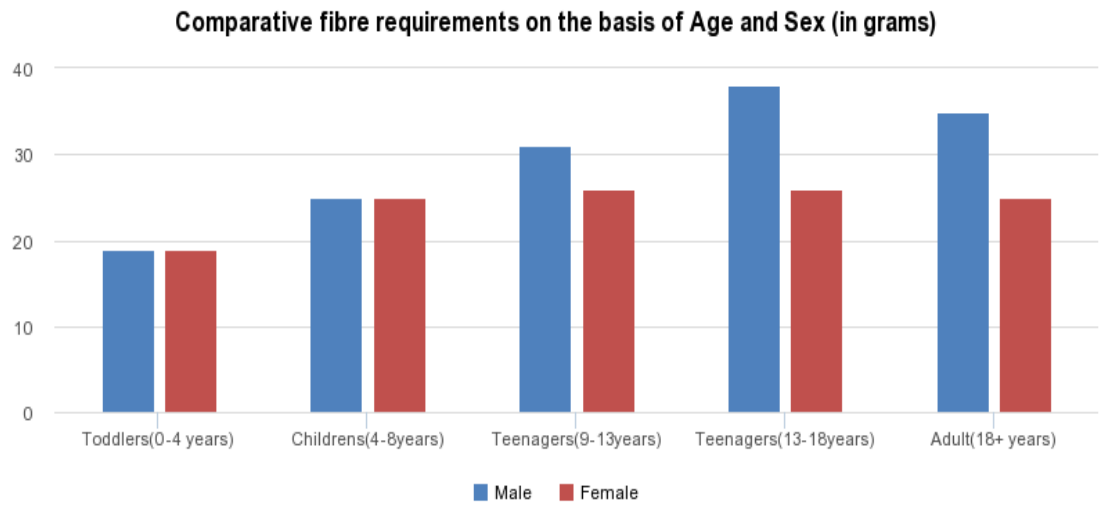
Fig(4):Addition of banana pulp and banana peel powder

Fig(5):Finished product



Comparative estimation of fiber in apples, bananas, peaches





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REFERENCES

[1] Signoretto C, Lleo MM, Tafi MC, Canepari P. *Appl Environ Microbiol*. **2000**;**66**(5):1953-9.
[2] Wenda, S., Illner, S., Mell, A. &Kragl, U. *Green Chem*. 13, 3007–3047 (**2011**)
[3] Ward, O. and Young, C., *Enzyme Microb. Technol*., 12, 482, **1990**.79.
[4] Csuk, R. and Glanzer, B., Yeast mediated stereoselective biocatalysis, in Stereoselective Biocata-lysis, Patel, R.N., Ed., Marcel Dekker, New York, **2000**.80.
[5] Rattanachaikunsopon P, Phumkhachorn P. *Ann Biol Res.* **2010**;**1**:218-28.
[6] *3* Sneath PHA, Mair NS, Sharpe ME, Holt JG. *Bergey s manual of systematic bacteriology*. Baltimore: Williams & Wilkins; **2009**.17-19
[7] Tannock GW, Tilsala-Timisjarvi A, Rodtong S, Ng J, Munro K, Alatossava T *Appl Environ Microbiol.* **1999**;**65**(9):4264-7.
[8] Boot HJ, Kolen CP, van Noort JM, Pouwels PH. *J Bacteriol.* **1993**;**175**(19):6089-96.
[9] Lleo MM, Tafi MC, Canepari P. *SystApplMicrobiol.* **1998**;**21**(3):333-9.
[10] 7 Frizzo L, Zbrun M, Soto L, Bertozzi E, Signorini M, Sequeira G. *J Anim Vet Adv.* **2010**;**9**(16):2113-22.
[11] Van Thu T, Foo HL, Loh TC, Bejo MH. . *Afr J Biotechnol*. **2011**;**10**(8):1359-63.
[12] Ogunbanwo S, Sanni A, Onilude A. . *Afr J Biotechno.* **2004**;**2**(8):219-27.
[13] Todorov SD. *Braz J Microbiology.* **2008**;**39**(1):178-87.
[14] Płaza GA, Zjawiony I, Banat IM. *J Petrol Sci Eng.* **2006**;**50**(1):71-7.
[15] Youssef NH,, Duncan KE, Nagle DP, Savage KN, Knapp RM, McInerney MJ. *J Microbiol Methods.* **2004**;**56**(3):339-47.
[16] Suneetha, V.**;** Ritika, S.; Abhishek, G.; Rahul, G. *Res. J. Pharm. Biol. Chem. Sci.* **2012,***3*(4), 40-48.