

DEVELOPMENT OF VALUE ENRICHED YOGHURT WITH SOY MILK AND MUSA PARADISIACA PULP

V.Jayalalitha

* Department of Livestock Products Technology
Veterinary College and Research Institute, Orathanadu 614 625

ABSTRACT

An attempt has been made to develop value added yoghurt with soymilk by replacing cow milk with incorporation of 10,20 and 30% levels of soy milk. On physicochemical and sensory quality test 30 % level of soy milk incorporation found to be acceptable. Further another study carried out to enrich yoghurt by addition of banana pulp at the rate of 5,10 and 15% levels. The 15% banana pulp enriched soy yoghurt found to be acceptable. Further the protein and total solids content is significantly differ from the control yoghurt. An increase in lactose and total solids content has been observed in banana pulp enriched product than control.

Key words: yoghurt, sensory quality, , physico chemical properties, Banana (*Musa paradisiaca*)

INTRODUCTION

Yoghurt is a product obtained by the lactic fermentation of whole, skimmed or standardized milk by action of *Lactobacillus delbrueckii* sub sp. *bulgaricus* and *Streptococcus thermophilus*, and can be accompanied by other lactic bacteria which, for their part, contribute to the characteristics of the final product (Brasil 2007). Yoghurt can be enriched with milk powder, proteins, vitamins, minerals or fruits.

Soy milk is known for its high protein (40%) content and isoflavone compounds which have been known as a natural substance to replenish the female hormone oestrogen in order to relieve the menopausal symptoms which can be incorporated in yoghurt to reduce the level of cholesterol and saturated fat. The popularity of soy products becoming less due to the presence of unpleasant off-flavors and anti-nutritional factors, such as phytic acid, oligosaccharides, trypsin inhibitor etc., however these can be degraded by fermentation during preparation of yoghurt with

cultures and the nutritional value of soy milk can be largely enhanced by this process.

With the advent of health foods, there has been an increasing trend to fortify the milk product with fruits (Desai et al., 1994). India is the second largest producer of fruits in the world, and about 40 per cent of the world's mangoes and 30 per cent of the world's bananas and papayas are produced in India. (Indian Horticulture database, 2009). Hence, use of fruits in the preparation of value added dairy products is appreciable and will mask the beany flavour especially in soy yoghurt and improve texture of the products.

Based on the facts, this project is aimed to study the development of soy incorporated yoghurt enriched with fruit pulp.

MATERIALS AND METHODS

Fresh cow's milk was obtained from the Dairy farm at Veterinary College and Research Institute, Thanjavur, Tamilnadu. Skim Milk powder, Soy, fruits and cane sugar were also purchased from

*Corresponding author: Email: jayav99@gmail.com

local market. The yoghurt starter culture contains *Streptococcus thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus* was obtained from Chris Hansens Laboratories, Denmark and activated at 42°C using 12% sterilized reconstituted skim milk. After incubation at 42°C for 4-5 h, the obtained working culture was freshly used

To prepare banana pulp, fresh bananas were washed, peeled and mashed using an electrical mixer grinder without addition of any water. Then the homogenate is pasteurized for 90°C for 5 minutes and cooled immediately. This pasteurized pulp can be stored at refrigeration temperature until use in the stirred yoghurt.

Soy milk was prepared by soaking soybeans into potable water for 16-18 h, drained, washed with tap water, grinded, steeped for 4-5 h in water (100 g soybean mixed with 100 ml water) and filtrated through muslin cloth to obtain the soymilk and pasteurized at 85°C for 10 minutes then stored till further use.

Production of yoghurt with soy milk

Cow milk was heated to 90-95°C for 5 min and then rapidly cooled to 42°C. Yoghurt is prepared with different levels of soy milk inclusion viz., 10%, 20% and 30%. Yoghurt culture @ 2% (w/v) was added. The inoculated mix was filled into 100 g polysterene cups and incubated at 42-45°C till to set at 1% lactic acid (pH 4.5) and the product is stored in a refrigerator (4°C)

Production of yoghurt with soy milk and *Musa paradisica* (banana) pulp

The standard soy yoghurt is prepared as per the standard procedure in 2kg plastic containers and fermentation was terminated at 1% acidity. The yoghurt were then added with pre pasteurised fruit pulp at 5%, 10% and 15% and blended with electronic blender for the selection of acceptable blend.

Physicochemical Analysis

All the samples were analyzed for fat, protein and total solids. The micro- Kjeldahl

method was used to determine total protein content of yogurt. Fat content was measured by the Gerber method and TS was determined using a drying oven (AOAC 1990). pH, acidity and syneresis were done during storage period in different time intervals. The pH was measured with a pH meter. Acidity was titrated by 0.1N NaOH solution and expressed in terms of % lactic acid. Degree of syneresis, expressed as proportion of free whey, was measured by method of Al-Kadamany et al., (2003). A 10 gram sample of mixed fruit yoghurt was placed on a filter paper resting on the top of a funnel. After 10 min of drainage in vacuum condition, the quantity of remained fruit yoghurt was weighted and syneresis was calculated as follows:

$$\text{Free whey (g/100g)} = (\text{weight of initial sample} - \text{weight of sample after filtration} / \text{weight of initial sample}) * 100$$

Sensory evaluation: Colour and appearance, flavor, body and texture, sourness and overall acceptability of all fruit yoghurt samples were evaluated by a semi trained personnels using nine-point hedonic scale system (Peryam and Girardot, 1952) (9-7 good, 6-4 average and 3-1poor). The sensory profiles were conducted on numbered samples after 1, 7, and 14 days of storage

Statistical analysis: The results were analysed using one way and two way ANOVA using software (VETSTAT).

RESULTS AND DISCUSSIONS

Results pertaining to the present study have been presented in Table 1 and 2 revealed that incorporation of soy milk in yoghurt and enriched with banana pulp has increased the protein content than control yoghurt due to high protein (12%) content of soy milk. Burrington (2000) noticed that, soy proteins are high in the amino acids glycine and arginine.

Similarly the total solids also has been increased in the yoghurt prepared with soy milk.

The soymilk has desirable characteristics as an ingredient for making soy yoghurt because of its high solid content. Tuitemwong et al., (1993) found high total solid content of processed soy yoghurt. Tamime and Robinson (1999) reported the total solids content of soy yoghurt ranged from 34.2-44.4%. In this study total solids content is ranged from 15-16%, which is due to the level of soy milk inclusion is only upto 30%.

Like wise soy milk addition alters the pH and acidity of yoghurt. The level of inclusion of soy milk negatively correlates with acidity and pH of yoghurt ; whereas addition of banana pulp positively correlates. The reason may be attributed to reduction of raffinose and stachyose in soymilk may vary from lactose which is present in cow milk.

Inclusion of banana pulp alters the pH and acidity of yogurt. Fruit pulp addition increase the acidity due to the nature of pulp's acidity. The observed acidity values in the present study are accorded with the results of Osman and Razig (2010) and Mahmood, Abbas and Gilani (2008).

The results revealed that with the addition of banana fruit pulp increased the lactose content significantly and the increase is attributed to the amount of reducing sugar (carbohydrate) present in banana fruit, (Forsyth, 1980). As Fehling solution was used to determine the amount of lactose, it also detected other reducing sugars present in the fruit yogurt which caused an increase in the lactose (carbohydrate) content. The level of addition of fruit pulp also positively correlates with percentage of total solids of yoghurt .

Amount of syneresis is volume of water oozed out on the surface of yoghurt. Syneresis value of plain yoghurt was 20%. The syneresis values were similar to the results of Farooq and Haque (1992). In addition, the syneresis degrees were lower than results of Katsiari et al., (2002).

CONCLUSION

The value enriched yoghurt can be manufactured with 30% soy milk and 15% banana pulp having high protein content. Since this yoghurt is highly delicious and having good nutritional value it is likeable by all age groups of consumers based on sensory scores.

ACKNOWLEDGEMENT

Author presents her thanks to the Tamilnadu Veterinary and Animal Sciences University, Chennai, India for it's financial support to carry out this research work at Veterinary College and Research Institute, Orathanadu as TANUVAS corpus fund project

REFERENCES

- Al-Kadamany E M Khattar T Haddad and Toufeili I (2003) Estimation of shelf life of concentrated yoghurt by monitoring selected microbiological and physiological changes during storage. *Lebensm-Wiss-Technol*, 36: 407-414
- AOAC (1990) Official Methods of Analysis 15 th ed. AOAC, Arlington, VA.
- Brasil (2007) Ministério da Agricultura, Pecuária e Abastecimento. Instrução Normativa 46 de 23/10/2007 Regulamento Técnico de Identidade e Qualidade de Leites Fermentados.
- Burrington K (2000) Nutritional and beneficial ingredients Food Product Design pp 1-12
- Desai SR Toro VA and Joshi SV (1994) Utilization of different fruit in the manufacture of yogurt. *Indian J. Dairy Sci.* 47: 870-874
- Farooq H and Haque ZU (1992) Effect of sugar esters on the textural properties of nonfat low calorie yoghurt. *J. Dairy Sci.* 75: 2676-2680.
- Flinger K Landomood JB and Hasan PMT (1988) Fortification of low fat plain yogurt with calcium gluconate. *Cultured Dairy Product J.* 23(1): 5-9

- Forsyth WGC (1980) Banana and plantain. In Tropical and Sub-Tropical Fruits S Nagy and PE Shaw (eds) pp 258-278. AVI Publishing, Westport, Conn.
- Katsiari CM Voutsinas PL Kondyli E (2002) Manufacture of yoghurt from stored frozen sheep's milk. Food Chemistry. 77: 413-420
- Mahmood A Abbas N and Gilani AH (2008) Quality of stirred buffalo milk yogurt blended with apple and banana fruits. Pak. J. Agri Sci. 45(2): 275-279
- Osman MMD and Razig KAA (2010). Quality Attributes of Soy-yoghurt During Storage Period. Pak. J. Nutr. 9 (11): 1088-1093
- Peryam DR and Girardot NF (1952). Advanced taste-test method. Food Engineering, 24: 58-61.
- Tamime AK and Robinson RK (1999) Yoghurt Science and Technology. Woodhead publishing Ltd and CRC press LLC Boca Raton Florida pp 619
- Tuitemwong P Erickson LE Fung DY Setser CS and Perng SK (1993) Sensory analysis of soy yoghurt and frozen soy yoghurt produced from rapid hydration hydrothermal cooked soy milk J Food Quality 16 223-239

Table - 1
Physico Chemical Properties of Yoghurt with Soy Milk @

Properties	SMY0	SMY1	SMY2	SMY3	F value
Fat (%)	3.5±0.13	3.3±0.15	3.3±0.21	3.2±0.18	0.12 ^{NS}
Protein (%)	3.5±0.08	6.0±0.35	6.5±0.71	7.0±0.52	14.22**
Lactose (%)	3.5±0.12	3.6±0.13	3.5±0.10	3.6±0.14	0.52 ^{NS}
Total solids (%)	12.0±0.50	15.0±1.01	15.80±1.30	16.6±1.0	26.22**
Acidity (%)	1.0±0.11	0.92±0.11	0.85±0.12	0.8±0.12	23.14**
pH	4.6±0.03	4.8±0.01	4.9±0.00	4.9±0.01	20.35**
syneresis (%)	20±0.25	21±0.50	22±0.22	21±0.35	15.02*

@ (Values given are mean values of three trials)

NS Not significant; * Significant at 5 % level; ** Significant at 1% level

SMY0 – Soy milk inclusion @0% (Control); SMY1-Soymilk inclusion @10%;

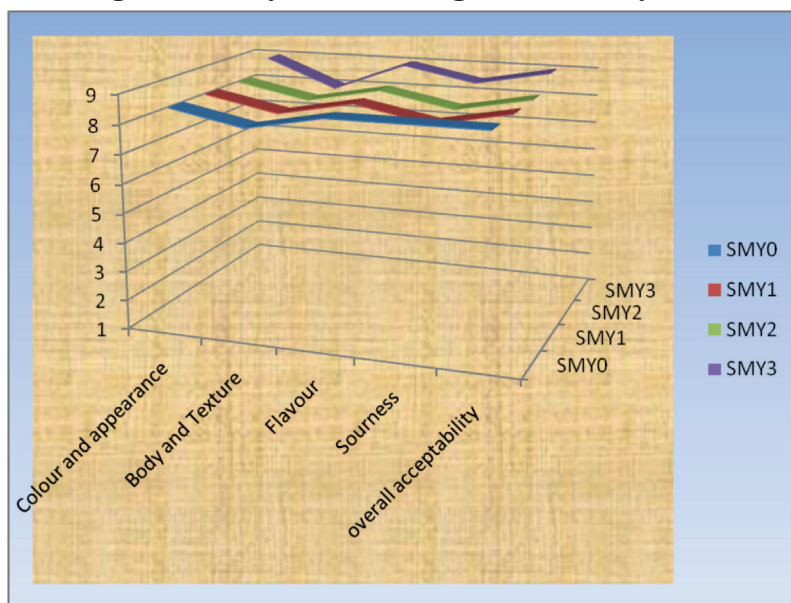
SMY2- Soymilk inclusion @20%; SMY3- Soymilk inclusion @30%

Table - 2
Physico chemical properties of yoghurt with 30% Soy milk and Banana pulp

Properties	SMBY1	SMBY2	SMBY3	F value
Fat (%)	3.5±0.15	3.4±0.17	3.4±0.12	0.01 ^{NS}
Protein (%)	7.1±0.11	7.2±0.03	7.5±0.21	0.56 ^{NS}
Lactose (%)	3.6±0.31	4.2±0.22	4.8±0.01	24.22**
Total solids(%)	16.5±0.25	18.5±0.25	19.2±0.22	23.51**
Acidity (%)	0.8±0.11	0.9±0.10	1.1±0.01	21.12**
pH	4.9±0.10	4.8±0.11	4.6±0.11	25.11**
Syneresis (%)	21±0.32	22±0.31	22±0.24	20.01*

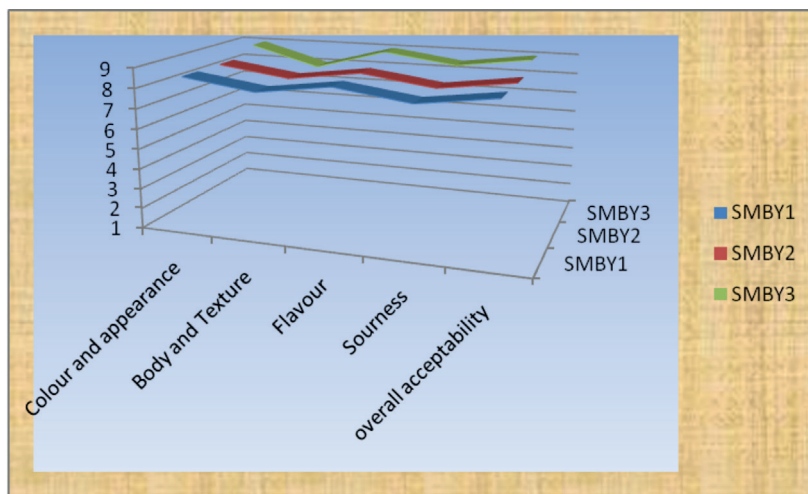
@ (Values given are mean values of three trials) ; N.S Not significant; * Significant at 5 % level; ** Significant at 1% level; SMBY1-Soymilk Banana yoghurt with 5% banana pulp; SMBY2- Soymilk Banana yoghurt with 10% banana pulp; SMBY3- Soymilk Banana yoghurt with 15% banana pulp

Fig.1 Sensory scores of Yoghurt with Soy milk



SMY0 : Soy milk inclusion @0% (Control); SMY1-Soymilk inclusion @10%;
 SMY2 : Soymilk inclusion @20%; SMY3- Soymilk inclusion @30%

Fig.2 Sensory scores of Yoghurt with 30% Soy milk and Banana pulp*



SMBY1-Soymilk Banana yoghurt with 5% banana pulp; SMBY2- Soymilk Banana yoghurt with 10% banana pulp; SMBY3- Soymilk Banana yoghurt with 15% banana pulp