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Research Paper

Sensory and Physico-chemical Analysis of Banana based Probiotic Soy Yoghurt toward Consumer's Acceptance

Dairy Science

KEYWORDS : Soy, yoghurt, banana.

Dilip Kumar* — Research Scholar, Department of Animal Husbandry and Dairying, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi - 221005, U.P., India
*Corresponding Author

S. N. Thakur — Asst. Professor, Warner School of Food and Dairy Technology, Sam igginbottom Institute of Agriculture, Technology and Sciences, Allahabad - 211007, U.P., India

ABSTRACT

With the current upward trend in nutritional and health awareness, the consumer's demand is for high quality probiotic product in the market with acceptable sensory characteristics. Soy yoghurt prepared with different levels 0, 5, 10 and 15% of banana puree. The samples were examine for chemical attributes of fat, pH, lactic acid and total solids percent. The organoleptic characteristics of color, flavour, consistency and overall acceptability employed for yoghurt evaluation. Supplementation of banana fortified soy yoghurts with 5, 10 and 15% of banana puree during storage at 4°C. Yoghurt with 10% banana fortified had the highest overall acceptability and become ideal formulation from physico-chemical attributes.

INTRODUCTION

The nutritional and potentially therapeutic value of food is a key characteristic in the development of new value–added products manufactured for health conscious consumers[1]. Dairy and soy foods may serve as the ideal systems for the delivery of probiotic bacteria to the human GIT, since they may provide a favorable environment, which promotes growth and enhances viability of these microorganisms[2]. The presence of viable lactic acid bacteria in a high concentration in fermented milks, such as yogurt, has been correlated with several consumer health benefits[3].

Soy yoghurt is a fermented soymilk made with a mixed starter culture consisting of *Streptococcus thermophilus* and *Lactobacillus delbrueckii* ssp. *bulgaricus*. Soybean is rich in nutritive elements like proteins, unsaturated fatty acids, lecithins, isoflavones, mineral substances, free amino acids and polypeptides[4]. Soybeans and most soy products contain large amounts of the isoflavones genistein and daidzein. These isoflavones might prevent hormone-dependent breast- and prostate cancers by virtue of their potential estrogen-antagonist activity[5].

Fruit mixes improve the nutritional value and the taste of yogurt, and fruit enhancement plays a considerable role in yogurt consumption and sales. Banana (*Musa sp.*) fruit contains considerable amounts of amylose, starch, dietary fiber, protein, vitamins, and minerals[6]. (Wall *et al*., 2006). Banana puree is the most important product and is used in the bakery, ice cream, and baby food industries[7]. In addition, banana puree is used in fruit-flavoured yogurt production.

The aim of this study was to investigate the possibility of using banana puree in the production of banana based soy yogurt products and to contribute to the manufacturing of new functional foods.

MATERIALS AND METHODS

Yoghurt culture (*S. thermophilus* NCDC 074 and *L. delbrueckii* ssp. *Bulgaricus* NCDC 009) was purchased from NDRI, Karnal, Haryana, India. The freeze dried culture was propagated by inoculating in skim milk which was heated at 90ºC for 30 min before the inoculation. The inoculated milk was incubated at 45ºC until pH 4.6 was reached, then stored overnight at 4ºC in refrigerator.

Soy milk preparation

The soaked beans blended in hot water (90°C) for 3 minutes and filtered with 3 sheets of cheese cloth then boiled for 10-15 minutes. The filtered mixed with 11% nonfat dry milk at the ratio of 80:20 (final concentration of 2.2%) for better fermentation. For soy yoghurt manufacturing, heat treatment of soymilk is usually carried out at 95-100°C for 30 min for soymilk[8].

Standardization of soy milk

Soy milk was standardized to 4.0% fat and 12.0% solids not fat by adding calculated amount of skim milk powder and cream. Soy milk was standardized as per procedure laid down in IS:1224 (1958) for fat and IS:1479 (1960) Part-I for Total solid.

Procedure Adopted for Manufacturing Soy Yoghurt

Both control (T_0) and experimental (T_1, T_2 and T_3) soy yoghurt mix were standardized to 4.0% fat, 12% serum solids, 6% sugar and total solids adjusted to 22.06% by dissolving cream and SMP in soy milk at 85°C for 30 min. followed by cooling (42°C) and aseptically inoculating with 1% (v/v) of each *L. bulgaricus* and *S. thermophilus* and incubated 8 to 12 hrs at 43±1°C. The fermentations were terminated when the acidity level reached a pH value of 4.9. Following incubation, yogurt samples were cooled to 5°C and held at this temperature for 1 day. During the first 24 hrs of storage, a distinct change occurs in the set yoghurt. The Banana puree was added at the 0, 5, 10 and 15% for treatments T_0, T_1, T_2 and T_3 respectively, of soy yoghurt. All soy yogurt samples were subjected to sensory and physico-chemical analysis. The sensory evaluation of soy yogurt samples were conducted by a panel of judges using a 9-point Hedonic scale[9].

Fat percentage was determined by Gerber Method as per the procedure laid down in IS–1224(58).Part-I. Determination of total solids of samples was done gravimetrically as per the procedure for milk laid down in IS-1475. Part-I. Acidity and pH of the product were also determined by dilution method and pH meter respectively. Data obtained from analysis of the samples were evaluated by variance analysis, and the differences among means were detected by multiple range tests (SPSS 1999).

RESULT AND DISCUSSION

Sensory Analysis

The sensory scores of flavour, color, consistency and overall acceptability obtained by a panel of judges for different level of banana puree are presented in Table No. 1. The sensory scores of flavour, color, consistency and overall acceptability are spread in Figure. 1 for different level of banana puree. The highest mean flavour score was recorded sample of 7.76±0.28, and these score were significant differences for other formulation. It was observed that 10% banana puree returned maximum flavour scores and significantly (P< 0.05) counted. Color scores were significantly (P< 0.05) counted least simultaneously while on increasing added puree level. Consistency score was recorded higher of 7.98±0.48, and these score were significant differences for other formulation. It was observed that 10% banana puree returned maximum flavour scores and significantly (P< 0.05) counted. The highest mean overall acceptability score was obtained sample of 7.90±0.25, these scores were significantly (P< 0.05) counted for other formulation.

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Physico-chemical Analysis

The Physico-chemical scores of fat percent, pH, acidity percent and total solid percent obtained by determining process for differ levels of banana puree present in Table No. 1 and Figure No. 2. The highest mean fat percentage score was recorded 4.02±0.13 at 0% of banana puree and these score scores were significantly (P< 0.05) counted least simultaneously while on increasing added puree level. pH score was recorded 5.01±0.01 at 0% of banana puree and these scores were significantly (P< 0.05) counted least simultaneously while on increasing puree level. Lactic acid percentage scores were significantly (P< 0.05) counted slightly increases simultaneously while on increasing added puree level and the highest mean of total solids percentage score was obtained 24.48±0.13 at 15% of banana puree and these scores were significantly (P< 0.05) counted for other formulation.

DISCUSSION

Sensory analysis results

The sensory quality of banana soy yogurts was higher than that of the control soy yogurts with due to overall acceptability. Soy yogurts with banana puree were preferred to soy yogurt samples by the panelists. At the beginning level of banana puree, all yogurts were superior, mainly because of their more intense flavour and better consistency. A descriptive sensory analysis results showed that an increase in banana contents significantly increased the perceptions of flavour , consistency and overall acceptability but decreased the perceptions of color among different soy yoghurt samples.

Changes in fat, acidity, pH and total solids values of the banana soy yogurt samples

Addition of banana puree, significant differences were found between the control and banana soy yogurt samples for fat percentage. The fat percent was least while increase the banana puree percent simultaneously. The titratable acidity values were found significant different. Titratable acidity values of the control and other yogurts tended to slightly increases while on increasing added puree level. The initial pH values of the control and banana soy yogurts with 5%, 10%, and 15% were 5.01, 4.96, 4.93, and 4.91, respectively. The pH of the control and other yogurts continued to decrease up until next day at refrigeration condition. Significant differences were found between the pH of the control and banana yogurts. The total solid percent were found significant differences between control and banana soy yoghurt. The percent of total solids increases while increase the banana puree percent simultaneously.

Fat, pH, acidity, and total solid of banana based soy yoghurt were measured. The results indicated that banana increased the acidity and total solid, but decreased the fat and pH of soy yoghurt. The viscosity of soy yoghurt samples was highly correlated to consistency sensory attributes. Thus, formulations with 10% and 15% banana puree was found more acceptable like by the judges and obtained best formulation for physico-chemical aspects.

CONCLUSION

The flavour profile is useful for formulating any banana based food product. Moreover, consumers' degrees of liking among banana based soy yoghurt were measured by a hedonic sensory study. Consumers received three different banana based soy yoghurt which were labeled only indicated the flavour of the soy yoghurt. The result indicated that consumers preferred 10% and 15% banana based soy yoghurt over the 5% and 0% banana puree soy yoghurt. In conclusion, even though 10% banana soy yoghurt differed from 0% soy yoghurt in some of the descriptive and instrumental analyses, Therefore, soy yoghurt which contained 10% of banana puree can be considered an ideal formulation to make banana based soy yoghurt.

Table 1: Mean sensory scores and Physico-chemical scores of different level of banana puree

Banana Puree Percent	Sensory Attributes				Physico-chemical Attributes			
	Flavour	Color	Consistency	Overall acceptability	Fat (%)	pH	Acidity (%)	Total Solids (%)
0%	7.10±0.43^{a}	7.92±0.083^{b}	6.66±0.75^{a}	7.58±0.14^{ab}	4.02±0.13^{c}	5.01±0.01^{c}	0.79±0.0^{a}	22.06±0.11^{a}
5%	7.42±0.14^{ab}	7.74±0.16^{ab}	7.2±0.74^{ab}	7.44±0.37^{ab}	3.80±0.10^{b}	4.96±0.01^{b}	0.81±0.0^{b}	22.86±0.08^{b}
10%	7.76±0.28^{b}	7.68±0.30^{ab}	7.98±0.48^{b}	7.90±0.25^{b}	3.68±0.08^{b}	4.93±0.0^{a}	0.83±0.0^{c}	23.68±0.08^{c}
15%	7.74±0.89^{b}	7.54±0.89^{a}	7.92±0.68^{a}	7.73±0.51^{a}	3.38±0.08^{a}	4.91±0.01^{a}	0.84±0.0^{d}	24.48±0.13^{d}

Means bearing different superscripts with in the row differ significantly (P< 0.05)

Figure 1: Sensory scores of different level of banana puree

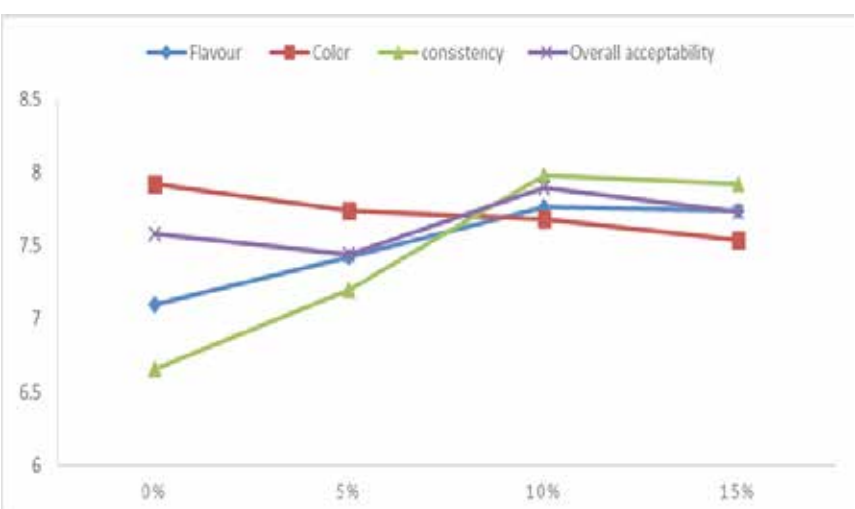
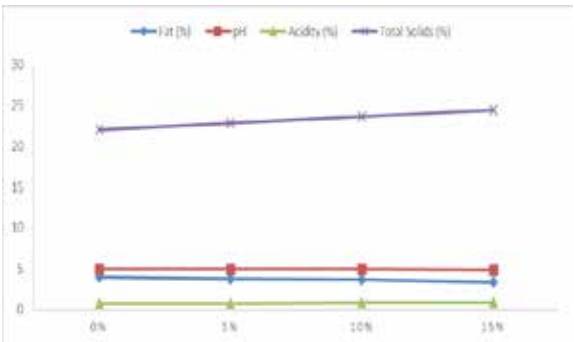


Figure 2: Physico-chemical scores of different level of banana puree



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