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PRELIMINARY STUDIES ON SENSORY EVALUATION AND NUTRITIVE VALUE OF SOYBEAN YOGHURT

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Pomegranate and raspberry flavoured soybean milk yoghurt was organoleptically evaluated by a 30 member panel. Sensory assessments of the two flavours show that pomegranate flavoured soybean yoghurt was acceptable to 88% of the panel members and raspberry flavour to 61%. The verdict on appreciation of soymilk based yoghurt by good 75% (average of two flavour) of panel members is encouraging and indicates future prospects for deriving protein from vegetable source such as soybean.

Key words: Soybean yoghurt, Pomegranate, Raspberry flavour, Organoleptic evaluation.

Introduction

Malnutrition, a major health hazard in Pakistan, is responsible for acute protein deficiency in about 70% of the population. This is due to inadequate supply and high cost of animal protein, wrong eating habits and ignorance on dietary requirements. Present and future protein deficiency, due to dependence on animal protein, may therefore, be gradually replaced with low cost plant materials.

Among vegetable protein sources investigated, soybean possesses high quality protein with balanced amino acid profile [1]. Due to its versatile nature, it can be processed and adopted into various food items to suit cultural and eating habits of different nations, without affecting palatability, acceptability, texture, and shelf life.

Orients have been using soybean milk as a popular beverage for centuries. As early as 1900, a Chinese doctor [2] had demonstrated that soymilk could adequately substitute cow's milk. Later it was observed that fermented products (yoghurt, cheese etc.) could be developed from soymilk using the same cultures and techniques as employed in dairy industry. The only setback in commercializing soy products has been its undesirable beany, chalky, or painty flavour. Though highly appreciated in China and Far East, soymilk still remains unacceptable to others.

Youghurt is the only item likely to be acceptable by Pakistanis among various soybean based products, because of its close affinity to the one prepared from cow's milk. Besides, protein and lipid contents of soymilk and its yoghurt can also be adjusted to values equivalent to cow's milk. Moreover, fermentation masks the undersirable beany odour to a great extent. Since yoghurt is most commonly used milk product in Pakistan by people of all walks of life, this study was undertaken to develop a high protein low cost soymilk yoghurt. The process is simple and can be adopted at household level without destroying its nutritive value. Organoleptic evaluation data on yoghurt thus prepared was collected prior to its commercial introduction. Acceptability trials were conducted on a group of consumers and their suggestions will be taken into consideration to produce an improved and acceptable product on commercial scale.

Materials and Methods

Preparation of soymilk. Soybean variety *Bragg* cultivated in Tandojam (Sindh) was used in this study. It has been reported [3, 4] that cracked and damaged soybeans or separated cotyledons, in presence of moisture and air, develop rancid and off flavours due to oxidation of polyunsaturated fats by lipoxygenase, hence utmost care was taken during soymilk processing to prevent such ill effects. Whole, cleaned, undamaged beans were soaked in three times its weight of tap water containing 0.25% sodium bicarbonate (based on weight of beans). Water from beans soaked for 16-18 hr. (at room temp.) was drained off. Dehulling of beans being optional, (its only purpose is to reduce fibre content and viscosity of final product) was avoided. Further precautions involved processing beans instantly, protecting them from exposure to air and treating with sodium bicarbonate, rinsing and keeping the beans in hot water (70-80°) during processing, and use of hot water in grinding. This significantly helped to eliminate the off flavours during preparation of soymilk. Soaked beans were rinsed in hot water and blanched for 15 mins in boiling water containing 0.25% sodium bicarbonate (based on weight of original beans). Further processing is described in Fig. 1.

Preparation of soymilk yoghurt. As reported by H. Kanda [3], yoghurt made from low protein content soymilk is soft in nature and one made from 3.5-4.5% protein had a desirable texture. Total solid content, therefore, in milk was adjusted to 12% instead of 10% so as to obtain a protein content of 4.2%.

Soymilk thus prepared was boiled with 2% sugar and food grade colour, Cooled to 45° and few drops of

pomegranate and raspberry essence were separately added to two different sets. 24 hrs old yoghurt with 48×10^5 count of *lactobacilli/gm.* material was used to inoculate the flavoured, sweetened soymilk preparations. The inoculated flavoured soymilk was then poured in 50 ml paper cups, covered and incubated at 40-45° for 4 ½ hrs to coagulate. The fermented coagulated product was cooled before serving. The product thus fermented was neither autoclaved nor pasteurized in this study, but could safely be refrigerated for 3-4 days without spoilage.

Chemical analysis. Soybean, soymilk and flavoured soymilk yoghurt were chemically analysed for nutritive value. Moisture content was determined by AOAC method; protein as total nitrogen (multiply by factor 6.25) using the semi-micro Kjeldahl procedure; fat by Soxhlet extraction using petroleum ether 60-80° and the ash by burning the dried sample in muffle furnace at 600° for 4 hrs, then weighing the residue [5]. Destruction of trypsin inhibition activity was tested by using casein digestion method [6].

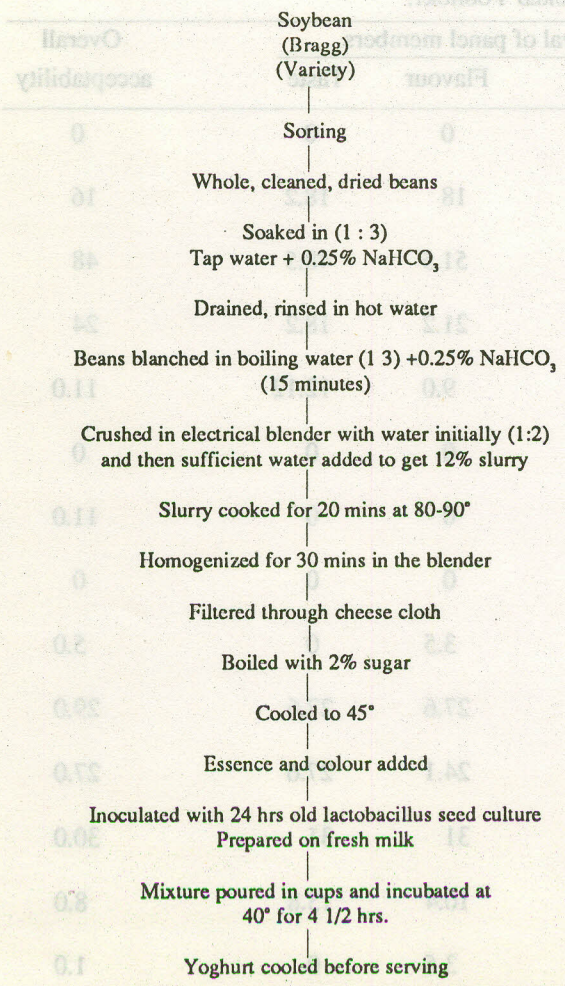

Fig. 1. Preparation of soymilk and flavoured yoghurt there from.

Organoleptic evaluation. Sample of soymilk yoghurt thus prepared were evaluated by a 30 member panel, both men and women. The panel was previously briefed about the nutrition of soymilk and yoghurt prepared therefrom, and was asked to evaluate the product organoleptically on the merits of its nutritive value and not to compare it with dairy yoghurt; i.e. to judge the product as an alternative source of protein rich low cost food product. Panel members were instructed to describe the intensity of acceptability regarding appearance, texture, flavour and taste by assigning values from 0-10. A score of 10 was considered as excellent, 9-8 very good, 7-6 good, 5 moderate, 4-3 fair, 2-1 poor and 0 highly repulsive.

The percent scores were calculated and the average figures thus obtained from panel of 30 judges were statistically analysed. Mean difference was adjudged by analysis of variance using Randomized complete block design at 0.05 and 0.01 level of significance [7].

Results and Discussions

The proximate composition of raw soybeans, soybean milk and flavoured sweetened yoghurt prepared therefrom is

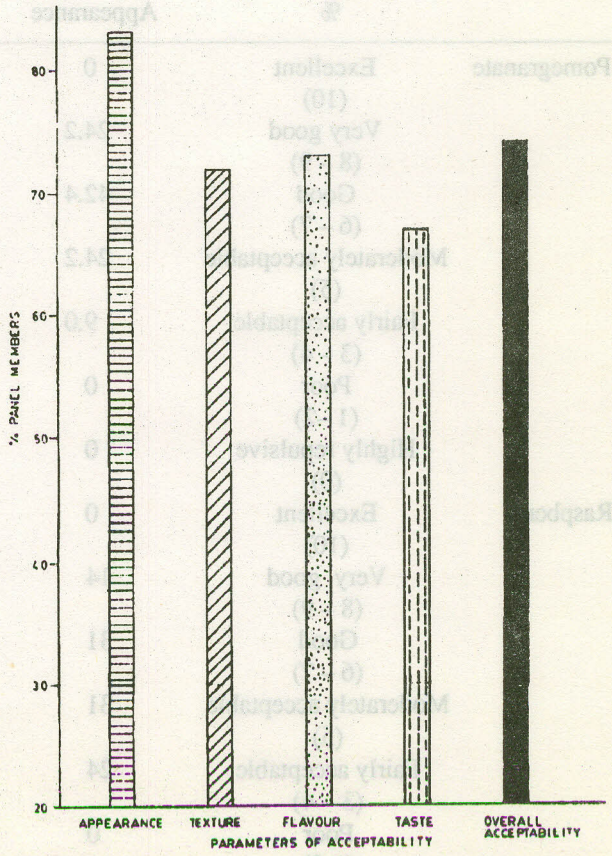

Fig. 2. Percent of panel members showing overall average and separate acceptability with respect to appearance, texture, flavour and taste based on both the flavours.

presented in Table 1. Composition and feed value of yoghurt is generally the same as that of milk, with which it is prepared. However, in case of sweetened and flavoured soymilk yoghurt, an increase in carbohydrate from 5.3-6.4%, with subsequent increase in calories from 60-61 has been noted. This increase in calories is due to the addition of 2% sugar , used as sweetening agent.

TABLE 1. ANALYSIS OF RAW SOYBEAN, SOYBEAN MILK AND FLAVOURED AND SWEETENED SOYBEAN YOGHURT.

	Soybean (%)	Soybean milk (%)	Yoghurt (%)
Protein	38	4.22	4.4
Fat	21.0	2.3	1.84
Ash	8.5	0.36	0.23
Carbohydrate	31.7	5.3	6.4
Calories	478	60.0	61.0

48% Panel of judges rated pomegranate flavoured soymilk yoghurt as 'good', and 16% members as 'very god', and was moderately' and ' fairly acceptable' by 24% and 11% members respectively. Only 1% showed highly repulsive attitude.

Likewise raspberry flavoured soymilk yoghurt received 'very good', and 'good' appreciation from 5 and 29% panel members respectively. 7% Panel members demonstrated 'moderate liking', and to 30% and 8% members it was 'fairly' and 'poorly' acceptable.

The F value calculated on the basis of sensory evaluation rating (Table 2) suggests that results obtained from pomegranate flavoured soymilk yoghurt where the calculated F value is 28.6 and raspberry flavoured soymilk yoghurt with F value 14.7 are both significantly higher than the corresponding F value of 2.5 and 3.9 obtained from the table at 0.05 and 0.01 level of significance.

It is, therefore, obvious that pomegranate flavoured soymilk yoghurt had higher significant liking than raspberry

TABLE 2. PERCENT APPROVAL OF PANEL MEMBERS ON APPEARENCE, TEXTURE, FLAVOUR, TASTE AND OVERALL ACCEPTABILITY OF POMEGRANATE AND RASPBERRY FLAVOURED YOGHURT.

Flavour	Rating %	Percentage approval of panel members				Overall acceptability
		Appearance	Texture	Flavour	Taste	
1. Pomegranate	Excellent (10)	0	0	0	0	0
	Very good (8 – 9)	24.2	3	18	18.2	16
	Good (6 – 7)	42.4	51.5	51.5	48.5	48
	Moderately acceptable (5)	24.2	30.3	21.2	18.2	24
	Fairly acceptable (3 – 4)	9.0	15.1	9.0	12.12	11.0
	Poor (1 –2)	0	0	0	0	0
	Highly repulsive (0)	0	0	0	0	11.0
2. Raspberry	Excellent (10)	0	0	0	0	0
	Very good (8 – 9)	14	3.5	3.5	0	5.0
	Good (6 – 7)	31	31	27.6	27.6	29.0
	Moderately acceptable (5)	31	24.1	24.1	27.6	27.0
	Fairly acceptable (3 – 4)	24	34.5	31	31	30.0
	Poor (1-2)	0	6.9	10.4	13.8	8.0
	Highly repulsive (0)	0	0	3.5	0	1.0

flavoured soymilk yoghurt. More likings for pomegranate flavoured soymilk yoghurt could be ascribed to its sweet and sour characteristics, which is *akin* to sourness of cow milk yoghurt, whereas raspberry having a different taste does not blend with the taste of milk yoghurt.

Total average assessment of soymilk yoghurt based on both flavours indicate that 39 and 10.6% of panel judges demonstrated an overall acceptability of good and very good and 25% as moderate. Average assessment data based on moderate and above acceptable (Fig. 2) demonstrates that high ratio of the panel i.e. 83.4% appreciated the appearance, 72 and 73% of panel the texture and flavour respectively, whereas on the basis of taste, only 67% of the panel showed their liking, for soymilk based yoghurt in general.

The verdict on appreciation of soymilk yoghurt by good 75% of panel members is encouraging, and indicates promising future for deriving protein from vegetable source such as soybeans. This data alongwith suggestions received from the panel members will form the basis for future pilot plant studies.

These laboratory studies were carried out without the use of any additives as is generally done in commercial production. Soymilk yoghurt if commercialized with the addition of whey solids, gelatin etc. will have an improved texture and a promising market. Hence, it can be safely said that soymilk yoghurt has potential in Pakistan for filling the present and future nutritional gap.

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