PRELIMINARY STUDIES ON SENSORY EVALUATION AND NUTRITIVE VALUE OF SOYBEAN YOGHURT

NASEEM F. USMANI, RADIA KHATIB, FARHAT R. MALIK AND S. SHAHID HUSSAIN PCSIR Laboratories Complex, Karachi 75280, Pakistan

(Received September 3, 1990; revised June 3, 1992)

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 48x10⁵ count of lactobacilligm. 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 $4\frac{1}{2}$ 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].

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

Soybean (Bragg) (Variety) Sorting 80 Whole, cleaned, dried beans Soaked in (1:3)Tap water + 0.25% NaHCO, 70 Drained, rinsed in hot water Beans blanched in boiling water (1 3) +0.25% NaHCO, (15 minutes) 60 ME MBERS Crushed in electrical blender with water initially (1:2) PANEL and then sufficient water added to get 12% slurry Slurry cooked for 20 mins at 80-90° \$ 50 Homogenized for 30 mins in the blender Filtered through cheese cloth 40 Boiled with 2% sugar Cooled to 45° 30 Essence and colour added Prepared on fresh milk 20 APPEARANCE TEXTURE FLAVOUR TASTE OVERALL ACCEPTABILITY PARAMETERS OF ACCEPTABILITY

> 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.

Inoculated with 24 hrs old lactobacillus seed culture

Mixture poured in cups and incubated at 40° for 4 1/2 hrs.

Yoghurt cooled before serving

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

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. Aı	VALYSIS	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 PA	NEL MEMBERS ON APPEAREN	CE, TEXTURE	, FLAVOUR,	TASTE AND	OVERALL	ACCEPTABILITY	OF	
POMEGRANATE AND RASPBERRY FLAVOURED YOGHURT.								

Flavour	Rating	Perc	Overall				
	%	Appearance	Texture	Flavour	Taste	acceptability	
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	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

15 cm, the scalings are transplanted in May. If transplanting would be unscessful under Multan conditions, it could be whileset (or gap filling. The present study was initiated to see the affect of transplanting on could under Multan conditions.

Material and Wollings

Be on MNH -91 at the Cotion Proserve Institute, Matter aurgery was planted on tune 1981 and tune 1985. The direct aurgery was planted on tune 1981 and tune 1985. The direct abbeiing 4 or 5 access per hill with 30 cm between plants and now width of 75 cm. The net plot size was 7.6 x 3.1 m. Thin hing in the nursery was completed on 25th tune, 1984 and 20th func, 1985, to provide space for proper nourishment of the objects to be transplanted inter on in the field. Final difficulty

1985, to provide space for pusper nount
to be transpianted fater on in the field, Fig

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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planes had lower seedcotton yield that each or the diffectsown plants. They also determined that yields were higher where other seedings were transplanted. Patel and Shah [2] bags and transplanted hat entern soedlings grown in palythene bags and transplanted hat entern soedlings grown in palythene seedcotten yield as compared that transplanting in mid-April ating 20 days old seedlings produced the highest number of plants, successful tills, fruiting branches and open bolts. The plants, successful tills, fruiting branches and open bolts. The seed output sold seedlings produced the highest number of plants, successful tills, fruiting branches and open bolts. The atom plants give increased seedcotton yield and yield compotion sold seedlings can't ransplanting and carlier dipathprometer seedlings can't ransplanting and carlier dipathprometer seedlings and flatter yields that sold comporents. Gopalaswang et al. [4] observed that transplatting 20erothods increased with a delay in sowing/frankglauting the same dates; the difference in yield between the two or set of rains observed that field with the sowing match as delay by manplanting colon seedlings with the raised seedleds gave by manplanting colon seedlings with the stand and sewdas an optimum date. Salam [6] reported transtraised seedleds gave better seed-outen yield than sowing planting of colton after the barees of wheat in souther colton seedlings in this filter traising colton seedlings with the tents of sewdas an optimum date. Salam [6] reported transtion pois and filter transplatting filter wheat planting of colton after the barees of wheat in souther colton atom pois and filter transplatting filter wheat the south and the manplatting gave to the first wheat planting of colton after the barees of wheat in souther wheat tensod. 30–40 dates before wheat her reported transterior called Poi mater used to make poin from dot wheat in souther wheat the south called Poin mater used to make poin from the wheat there wheat here wheat her rest of ma