DEVELOPMENT AND SENSORY QUALITY DETERMINATION OF FUNCTIONAL YOGHURT

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ABSTRACT

Functional yoghurt containing guava pulp as the source of vitamin C, dietary fiber, omega-3 fatty acid and phenolic antioxidants and flaxseed oil as the source of omega-3 fatty acid and dietary fibre has been developed and subjected to analyses for sensorial attributes. During the preliminary trials, yoghurt was prepared by incorporating flaxseed oil at three different levels viz., 1.5%, 2 %, and 2.5 % with simultaneous reduction of milk fat at different levels viz., 2.5%, 2%, and 1.5% maintaining the fat at 4 per cent. During the preliminary trials, yoghurt was prepared by incorporating flaxseed oil at three different levels viz., 1.5%, 2 %, and 2.5 % with simultaneous reduction of milk fat at different levels viz., 2.5%, 2%, and 1.5% maintaining the fat at 4 per cent. On the basis of sensory evaluation, 2 % flaxseed oil incorporation was adjudged as the acceptable level in yoghurt and subjected to further studies. Accordingly, yoghurt with 2% flax seed oil was further incorporated with 3 different levels viz., 5 (T1), 10(T2) and 15(T3) per cent of guava pulp and subjected to organoleptic evaluation. On organoleptic evaluation a combination of 2% flaxseed oil and 10 per cent guava pulp was adjudged as the ideal combination for developing functional yoghurt and subjected to storage studies.It is noticed that, that during refrigerated storage, the sensory scores decreased after 7^{th} day of storage in control yoghurt, where as in treatment yoghurt there was no significant ($P<0.05$) reduction in the sensory scores up to 14 days of storage.

Keywords: Functional Yoghurt, Flaxseed Oil, Guava Pulp, Organoleptic Quality And Storage Period

I INTRODUCTION

Functional foods can be defined as foods that are similar in appearance to, or may be a conventional food that is consumed as part of a usual diet, with demonstrated physiological benefits and/or reduce the risk of chronic disease beyond basic nutritional functions.

As such, milk is not a significant source for vitamin C and omega 3 fatty acid. In addition, like any other dairy products, yoghurt also lacks in dietary fibre content. With the growing interest in the above nutrients and its health benefits, dairy industry has to gear up for fortifying the dairy products with fiber, vitamin C, omega-3 fatty acid and other functional ingredients to meet the requirements of human health. Omega-3 fatty acids are examples of bioactive substances whose interest has increased over the years in scientific research due to their proven health

benefits. They are essential fatty acids that the human body is not able to synthesize and hence have to be provided through the diet [1] or supplementation. Dietary recommendations for omega-3 fatty acids (2.2g of ALA/ day and 0.22g/day of EPA and DHA; International Society for the Study of Fatty acids and Lipids, (2004) can be obtained from the diet by the consumption of foods rich in these fatty acids [2] Major sources of ALA include the seeds and oils of flaxseed, soybean and canola, with flaxseed containing 50-60% ALA [3]. Guava is rich in tannins, phenols, triterpenes, flavonoids, essential oils, saponins, carotenoids, lectins, vitamins, fiber and fatty acids. Guava fruit is higher in vitamin C than citrus (80 mg of vitamin C in 100 g of fruit) and contains appreciable amounts of vitamin A as well. Guava fruits are also a good source of pectin - a dietary fiber [4].

In this regard, inclusion of fruits rich in dietary fibre and antioxidants and omega 3 rich oil in the preparation of yoghurt is expected to enhance the nutritional and therapeutic values of yoghurt and make it a super functional food.

II MATERIALS AND METHODS

Fresh cow milk obtained from the Dairy Farm, Veterinary College and Research Institute, Namakkal. Cream containing 25% fat was used for standardizing the fat in yoghurt. Skim milk powder testing 5per cent moisture and 95per cent solubility was purchased from Aavin. Commercially available good quality cane sugar was used. Guava pulp(*Psidium gujava*) purchased from guava pulp industry, krishnagiri district, Tamil Nadu. Flaxseed Oil (*LinumUsitatissimum,L.)* purchased from local market (Kovaipazhamuthirnilayam), Coimbatore.

2.1 Starter cultures

Freeze dried DVS cultures containing yoghurt bacteria *Lactobacillus delbrueckii*ssp. *bulgaricus* and *Streptococcus salivarius*sssp.*thermophilus* obtained from Chr. Hansen, Denmark was used in this study.

2.2 Chemicals used

All chemicals were of analytical grade and were purchased from Sigma Aldrich.

2.3 Yoghurt preparation

Plain yoghurt was prepared by employing the procedure given by De[5].

2.4 Preparation of flaxseed oil and guava pulp enriched yoghurt

Flow diagram of flaxseed oil and guava pulp enriched yoghurt

Skim milk
↓
Milk preheating (45 ±2 ºc)
↓
Addition of cream(25%fat), skim milk powder (5.760 per cent) and Sugar (6%)
↓
Addition of Flaxseed oil (2 per cent)
(Standardized to 4% fat)
↓
Homogenization at 65°C(2500 psi)
↓
Pasteurization (85˚C for 30 min)
↓
Cooling (42˚C)
↓
Addition of guava pulp (at the rate of 5, 10 and 15%)
↓
Inoculation (2 per cent yoghurt culture)
↓
Incubating at 42°C /4-5 hrs till it reaches the pH 4.5
↓
Stored at 5°C

2.5 Sensory evaluation

Panelists were asked to evaluate the yoghurt quality on a 9-point hedonic scale, where 9 indicates extremely like and 1 extremely dislike [6]

2.6 Statistical analysis

The data obtained in all the experiments were analyzed statistically by applying the methods described by Snedecor and Cochran[7]

III RESULT AND DISCUSSION

3.1Sensory properties of functional yoghurt during refrigerated storage

Sensory properties of functional yoghurt during refrigerated storage is presented in table 1.

3.2 Colour

It was noticed that in T2 there was no significant (P≥0.05) difference observed up to 14th day of storage but highly significant (P≤0.05) difference was noticed on 21st day of storage. In control yoghurt there was

Table 1: AVERAGE SCORES OF SENSORY EVALUATION OF THE DEVELOPED YOGHURT DURING REFRIGERATED STORAGE (MEAN±SE)

Days	PY	T2
Colour		
zero day	$8.12^{c} \pm 0.13$	$7.78^{b} \pm 0.13$
7th day	$8.01^{c} \pm 0.09$	$7.61^{b} \pm 0.10$
14th day	$7.76^{b} \pm 0.12$	$7.56^{b} \pm 0.11$
21st day	$6.71^{a} \pm 0.11$	$6.21^{a} \pm 0.09$
Appearance		
zero day	$7.83^{c} \pm 0.11$	$7.57^{b} \pm 0.14$
7th day	$7.67^{c} \pm 0.09$	$7.40^{b} \pm 0.09$
14th day	$7.20^{b} \pm 0.13$	$7.32^{b} \pm 0.12$
21st day	$6.02^{a} \pm 0.12$	$5.83^{a} \pm 0.09$
Flavour		
zero day	$7.91^{c} \pm 0.15$	$7.55^{b} \pm 0.11$
7th day	$7.73^{c} \pm 0.08$	$7.41^{b} \pm 0.07$
14th day	$7.37^{b} \pm 0.11$	$7.27^{b} \pm 0.15$
21st day	$5.81^{a} \pm 0.09$	$4.73^{a} \pm 0.09$
Taste		
zero day	$7.66^{c} \pm 0.11$	$7.58^{b} \pm 0.14$
7th day	$7.54^{c} \pm 0.09$	$7.49^{b} \pm 0.07$
14th day	$7.27^{b} \pm 0.08$	$7.36^{b} \pm 0.10$
21st day	$5.10^{a} \pm 0.11$	$4.92^{a} \pm 0.09$
Body and texture		
zero day	$8.08^{c} \pm 0.12$	$7.75^{b} \pm 0.10$
7th day	$7.89^{c} \pm 0.10$	$7.58^{b} \pm 0.07$
14th day	$7.62^{b} \pm 0.07$	$7.51^{b} \pm 0.15$
21st day	$5.65^{a} \pm 0.08$	$5.39^{a} \pm 0.10$
Overall acceptability		
zero day	$7.50^{c} \pm 0.09$	$7.42^{b} \pm 0.11$
7th day	$7.45^{c} \pm 0.05$	$7.25^{b} \pm 0.07$
14th day	$7.18^{b} \pm 0.1.2$	$7.18^{b} \pm 0.13$
21st day	$5.62^{a} \pm 0.09$	$5.47^{a} \pm 0.09$

PY: Plain Yoghurt, T2: 2% flaxseed oil with 10% guava pulp yoghurt.

highly significant (P≤0.05) difference noticed after 7th day of storage till 21st day. This may be attributed to the lowered pH owing to the metabolic activity of the residual yoghurt starter culture storage period. Raju and Pal[8] observed that the control mistidahi had higher colour and appearance score in comparison with mistidahi containing fibers. Among fiber containing samples, T4 (1.5g oat fiber) samples received significantly low score (5.39) from the panelists (p<0.01) due to the formation of a clear layer of settled oat fiber.

3.3 Appearance

There was no significant (P≥0.05) difference observed in appearance up to 14th day of storage but a highly significant (P≤0.05) difference was noticed on 21st day of storage in T2. Highly significant (P≤0.05) difference was noticed after 7th day of storage till 21st day in the control yoghurt. However, Fernandez-Garcia and McGregor [9] observed that addition of sugar beet fiber and rice fiber significantly lowered the appearance scores of sweetened plain yoghurt.

3.4 Flavour

There was no significant (P≥0.05) difference observed up to 14th day of storage in T2, but a highly significant (P≤0.05) difference was noticed on 21st day of storage. Whereas in control yoghurt, highly significant (P≤0.05) difference was noticed after 7th day of storage till 21st day. On the contrary, Raju and Pal [8] reported that fiber incorporation significantly decreased the flavour scores of misti dah. Inulin and oat fiber significantly (p<0.01) lowered the flavour scores of mistidahi. However, the flavour score of soy fiber containing samples (T3) was not different from the control (p>0.05).

3.5 Taste

No significant (P≥0.05) difference was noticed up to 14th day of storage in T2, but a highly significant (P≤0.05) difference was noticed on 21st day of storage. On the other hand, a highly significant (P≤0.05) difference was noticed after 7th day of storage till 21st day in the control yoghurt. On the contrary, Salvador and Fiszman (2004) found no significant changes in skimmed sweetened, strawberry flavoured yoghurt in colour, flavour intensity or sweetness, but noticed an increase in acidity, astringency and chalky taste during storage which were perceived as negative attributes.

3.6 Body and texture

No significant (P≥0.05) difference was noticed up to 14th day of storage in the body and texture values of T2, but a highly significant (P≤0.05) difference was noticed on 21st day of storage. There was a highly significant (P≤0.05) difference was noticed after 7th day to 21st day of storage. Walkund*et al*.[10] reported that the control sample secured maximum score (29.22 out of 30) for body and texture, which was significantly higher than the rest of the samples. A decline in body and texture scores was observed increase in the level of incorporation of guava pulp in yoghurt. This may be attributed to the presence of gritty particles in guava pulp even after passing through muslin cloth.

3.7 Overall acceptability

The present study revealed nosignificant (P≥0.05) difference up to 14th day of storage in the overall acceptability values of T2, but a highly significant (P≤0.05) difference was noticed on 21st day of storage. Highly significant (P≤0.05) difference was noticed after 7th day to 21st day of storage. This is in agreement with the findings of Ashaye*et al*. [11] and Salvador and Fiszman[12], who reported that there was a concomitant decrease in the sensory score and general acceptability of the yoghurt during the storage period.

IV CONCLUSION

From the above study it can be concluded that, the functional yoghurt can be prepared by incorporating flaxseed oil at the rate of 2.5 % and guava pulp at the rate of 10 % without altering their sensory properties of functional yoghurt further also sensory scores decreased after 7th day of storage in control yoghurt, where as in treatment yoghurt there was no reduction in the sensory scores up to 14 days of refrigerated storage. Further, it is notice that,based on the physicochemical and functional attributes, it is concluded that functional yoghurt developed had a keeping quality of 14 days, while the control had a shelf life of only 7 days.

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