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Technology for manufacture of functional flavoured milk

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Abstract
The objective of this study was to evaluate the effect on physico-chemical and sensory properties flavoured milk by addition of Chia seeds as source of fiber. For preparation of flavoured milk containing Chia seeds, Chia seeds were soaked in skim milk at three different ratio of seeds to skim milk, at different time / temperature combinations to evaluate optimum Chia mucilage/fiber extraction. Such pre-soaked Chia seeds were added in flavoured milk varying from 2 - 4 per cent (w/w) and flavoured milk was sterilized at 121°C/15 min. Three different Chia seeds to skim milk ratio and time temperature combinations employed, skim milk to Chia seeds ratio of 20:1 and soking for 80 °C/2h was statistically better combination. Compositional evaluation of Chia seeds added flavoured milk for 2 to 4% showed significant effect on total solids, protein, ash and carbohydrate content and per cent fat increased with increasing amount of Chia seeds. Viscosity increased significantly in the treatment and flavoured milk containing 4.0% Chia seeds had 23.10 cP. Flavour score decreased significantly at each level of addition of Chia seeds, however body and consistency score was higher at 2.0% level of addition and later it decreased. The similar effect was observed for overall acceptability score. Chia seeds addition @ 2.0% (w/w) in flavoured milk is possible without negatively affecting sensory scores. Such addition increased dietary fiber content in flavoured milk by 0.41%.

Keywords: Flavoured milk, Chia seed, Dietary fiber, Sensory evaluation, Functional dairy beverages

Introduction
Milk occupies a special position among foods, being an animal food that has a vegetarian connotation. Milk plays an important role in meeting the requirements of many essential nutrients; however, it lacks fiber which has nutritional benefits include the regulation of bowel and intestinal health; dietary fiber content of Chia seeds varies from 34 to 40 g per 100 g depending on the source (Knez *et al*., 2020) [11]. Lack of some minerals like iron and zinc in milk, but Chia seeds contain 9.97 and 5.24 mg /100 g respectively (Kulkarni *et al*., 2020). Iron is involved in blood production, neurotransmitters and hormones and Zinc helps in enhancing the immune system, sense of taste and smell, and wound healing. Flavoured milk represents one of the most popular dairy-based beverages and is popular in different age groups around the globe. The minerals found in chia seeds are calcium, phosphorus, potassium, iron, zinc, and magnesium. The vitamins found in chia seeds are thiamine, riboflavin, niacin, folic acid, ascorbic acid, and vitamin A. Chia seeds have six times more calcium, eleven times more phosphorus, and four times more potassium per 100 g than milk (Muñoz *et al*., 2012; Suri *et al*., 2016) [16, 20]. In COVID - 19 era many flavoured milk manufacturers have launched novel herbal flavoured milks like Haldi milk (Arunkumar *et al*., 2022), Ginger, Tulsi milk (Gaur *et al*., 2019) [1, 9] and mixtures of spices in milk to boost immune. Milk beverages are considered among the most functional and nutritional foods (Bangar, 2011) [4]. Chia seeds are good source of omega fatty acids and omega 3 fatty acids content is of 55 - 60 % of total fat content (35-40% of dry weight) of chia seeds. The inclusion of natural fiber and other nutrients rich Chia seeds in foods can be beneficial to the whole society and in particular to the health-conscious consumers. In scientific literature application of chia seeds is found in bread, pasta, biscuits, and cakes. Chia seeds can also be used in dairy beverages like yoghurts, snacks and other products (Steffolani *et al*., 2014; Coelho *et al*., 2014) [19, 8], however, incorporation of chia seeds in flavoured milk is not found. Hence to make the flavoured milk more functional, incorporation of Chia seeds is articulated.

Materials and Methods

The various materials and ingredients used in the study are briefly narrated herein.

Materials

Dairy and Non-Dairy Ingredients

Fresh toned milk (3.2% fat & 8.6% SNF) was procured from Vidya Dairy, Anand. Cane sugar (Madhur Brand, M/s Shree Renuka Sugars Ltd., Karnataka, non-sulphited, refined) of commercial grade was obtained from the local market of Anand. Chia seeds (Nutrivative foods Pvt Ltd., Hyderabad, Telangana) was procured from Hyderabad and used in the study.

Methods

To extract soluble dietary fiber from chia seeds, they were soaked with different skim milk to seed ratio and time temperature combinations. Different levels of skim milk to seed ratio [W1 (10:1), W2 (20:1), W3 (30:1)] was employed for ascertaining better extraction of mucillage. Chia seeds were soaked in pasteurized skim milk with three time/temperature combinations viz. T1 (80℃/2 h), T2 (40℃/4 h), T3 (8℃/12 h). The highest mucilage content obtained in the treatment was selected and used to prepare Chia seeds added flavoured milk.

Manufacture of Fiber Added (Chia Seed) Flavoured Milk

Toned milk (3.2% fat & 8.6% SNF) was added with sugar (@ 7.0%) and heated to 65°C prior to homogenization (2500+500 psi). Previously soaked Chia seeds were added (@ 0.0, 2.0, 3.0 and 4.0%) in the form of whole soaked seed and blended. The content was filled in the sterilizable glass bottles and subjected to sterilization at 121oC/15 min. The sterilized bottles were cooled to room temperature and stored for further analysis.

Equipment/ Instruments

Homogenizer

A two-stage homogenizer (M/s. Goma Engineering Pvt. Ltd., Mumbai) was used to homogenize the milk.

Autoclave

A vertical Laboratory Autoclave Make: Tempo Model No: T1 121 D (Std. Model), having capacity of 95 lit was used to sterilize the 200 ml glass bottles containing fiber added flavoured milk.

Viscometer

A Brookfield viscometer (DV II + Pro Viscometer, Model-LVDV- II + P, USA) was used for determining the viscosity of fiber added flavoured milk.

Analysis of Ingredients and Product

The fat content of milk was estimated by Gerber method (BIS, 1977). The total solids (TS) of milk was determined by the standard procedure (BIS, 1989) using Mojonnier Milk Tester (Model-D, Mojonnier Brothers Co., Chicago, USA). The titratable acidity of milk was determined by the standard method (BIS, 1961). The total nitrogen was determined using semi-micro Kjeldahl method (Jayaraman 1981) [10]. Kjel-plus digestion system (Model-KES 20LVA DLS) and Kjel-Plus semi-automatic distillation system (Model-Distil M) both from M/s. Pelican Instruments, Chennai. The ash content of samples was determined by standard method (BIS, 1989). The total carbohydrate content was calculated by difference. The pH values of samples were measured using electronic digital pH meter (M/s. Mettler Toledo AG, Schwerzenbach, Model CH-8603). The viscosity of samples was determined by the method of Lowenstein and Haddad (1972) [14] using a 'Brookfield' viscometer (DV II + Pro Viscometer, Model-LVDV- II + P, USA). The dietary fiber content of samples was analyzed through accredited external food laboratory. Completely randomized design (CRD and FCRD) ware used for data collected in the present study.

Results and Discussion

Inclusion of Chia seeds in flavoured milk could provide product diversification and therapeutic benefits to the health-conscious consumers. Average nutritional composition of Chia seeds is depicted in Table 1.

Table 1: Average nutritional composition of Chia seeds

Parameter	Nutritional value (per 100 g)
Protein	20.4 g
Total Fat	31.4 g
Carbohydrates	4.5 g
Dietary Fiber	37.5 g
Sodium	<1.0 g
Calcium	500 mg
Iron	9.5 mg
Magnesium	360 mg
Phosphorus	760 mg
Potassium	610 mg
Zinc	5.74 mg

Reyes-Caudillo *et al*. (2008); Ayerza (2013) [3, 17]

Chia seeds are an excellent source of dietary fiber, protein and fat. As milk is devoid of fiber, the major focus was to incorporate Chia seeds as a source of fiber were considered in the present study. A study of better extraction method of soluble fiber/mucilage was evaluated by soaking the Chia seeds in skim milk and various ratio of skim milk to Chia seeds at different time and temperature combinations is depicted in Table 2.

Table 2: Effect of different pretreatments on extraction of mucilage/soluble fiber from chia seeds

Time/temperature Combination / Skim Milk to Chia Seeds Ratio	T1 (80 ℃/2h)	T2 (40 ℃/4 h)	T3 (8 ℃/12 h)	Mean
W1 (10:1)	9.66^{b}±0.02	9.25^{d}±0.03	9.11^{g}±0.01	9.51
W2 (20:1)	9.79^{a}±0.01	9.15^{f}±0.01	9.10^{gh}±0.01	9.52
W3 (30:1)	9.50^{c}±0.02	9.21^{e}±0.01	9.08^{gh}±0.01	9.39
Mean	9.65	9.20	9.10	
Sources	SEm ±	CD (0.05)		CV%
Time/temperature (T)	0.006	0.02		

Skim milk to Chia seeds ratio (R)	0.007	0.02	3.78
T × R	0.010	0.03	
*Mean ± SD (n=3); a-b denote significant difference (P<0.05) in same column/raw			

Selection of skim milk to Chia seeds ratio and soaking time/temperature combination.

The present study was carried out to select the best level of skim milk to Chia seeds ratio and Time/Temperature combination for ascertaining better extraction of soluble fiber [Three levels, W1 (10:1), W2 (20:1), W3 (30:1)] and three different time temperature combinations [T1 (80°C/2 h), T2 (40°C/4 h), T3 (8°C/12 h)] as shown in Table 2. Initial skim milk total solids were adjusted to 9.00 %. After designated treatment the skim milk was filtered and the total solids of the skim milk were determined.

The total solids (TS) content of skim milk soaked in Chia seeds was significantly (P<0.05) affected by different time/temperature combinations, water to seed ratio and interaction effect was also significant. The TS content of skim milk soaked with Chia seeds varied from 9.08 to 9.79 per cent. The mean values for TS of skim milk Chia seeds extract significantly (P<0.05) decreased with decrease in soaking temperature. The TS value of Chia seeds extract for T1 (9.65 per cent) was highest and significantly (P<0.05) higher than T2 (9.20 per cent) and T3 (9.10 per cent). The interaction effect showed that T1W2 treatment had significantly higher total solids content and it differed significantly compared to other treatments in the study. Thus treatment T1W2 was selected and employed in further study. Chia seeds being a good source of total dietary fiber including insoluble and soluble fiber, three levels of previously soaked chia seeds addition were decided on the basis of preliminary trials. Chia seeds were added @ 1.0, 2.0 and 3.0 per cent w/w of the tonned milk and coded as C2, C3 and C4. C1 was control flavoured milk without Chia seeds. All the flavoured milk samples were added with vanilla as base flavour.

Effect of different levels of Chia seeds on proximate compositions of flavoured milk.

The mean values of compositional constituents of chia (source of fiber) added flavoured milk i.e. TS, fat, protein, ash and carbohydrate as affected by different levels of chia seeds is presented in Table 3. All the parameters under study showed significant (P<0.05) effect with varying levels of chia seeds in fiber added flavoured milk.

Table 3: Effect of levels of Chia seeds on proximate compositions of flavoured milk

Levels of Chia seeds (% w/w)	Constituents (%)*				
	TS	Fat	Protein	Ash	Carbohydrate
C1 (0.0)	$18.84^{d} \pm 0.07$	$3.09^{c} \pm 0.04$	$2.93^{d} \pm 0.02$	$0.87^{d} \pm 0.02$	$11.98^{d} \pm 0.02$
C2 (2.0)	$19.69^{c} \pm 0.14$	$3.11^{bc} \pm 0.08$	$2.96^{c} \pm 0.01$	$1.09^{c} \pm 0.04$	$12.53^{c} \pm 0.02$
C3 (3.0)	$20.15^{b} \pm 0.17$	$3.22^{b} \pm 0.06$	$2.99^{b} \pm 0.02$	$1.18^{b} \pm 0.02$	$12.76^{b} \pm 0.01$
C4 (4.0)	$20.56^{a} \pm 0.10$	$3.36^{a} \pm 0.08$	$3.02^{a} \pm 0.01$	$1.26^{a} \pm 0.04$	$12.92^{a} \pm 0.01$

*Mean ± SD (n=4); [a-d] denote significant difference (P<0.05) in same column

The highest TS content was found in sample C4 (20.56 %) which was significantly (P<0.05) higher than rest of the samples in the study. The TS content of control was 18.84 per cent which was significantly (P<0.05) lower. In C2 (19.69 %) and C3 (20.15 %) samples TS content increased and such increase was significant (P<0.05) at each level of addition of chia seed. It was obvious that when Chia seeds with higher TS (Table 1) compared to flavoured milk would result in increased TS of resultant flavoured milk. Attalla and El-Hussieny (2017) [2] incorporated Chia seeds in yoghurt mousse varying from 1 to 3 % and reported similar increasing trend for TS content in yoghurt mousse.

Fat content of fiber added flavoured milk was significantly (P<0.05) affected by three levels of Chia seeds addition and it increased with increase in each level of Chia seeds in milk. The highest fat content was found in sample C4 (3.36 %) which was significantly (P<0.05) higher. The fat content of control (C1) was lowest (3.06 %) which statistically remained at par with C2 (3.11 %), and was significantly lower than C3 (3.22 %). Sample C3 (3.22 %) and C2 (3.11 %) remained statistically at par with each other. Yoghurt mousse containing chia seeds with varying levels of 1 - 3 % had similar increasing trend for fat content that increased from 7.80 to 8.56 % (Attalla and El-Hussieny, 2017) [2].

The protein content of Chia seeds added flavoured milk was significantly (P<0.05) affected by three levels of Chia seeds and it increased with increase in each level of Chia seeds addition in milk. The highest protein content was found in sample C4 (3.02 %) which was significantly (P<0.05) higher. The protein content of control sample was 2.93 per cent which was significantly (P<0.05) lower and remained lowest among other samples in the study. Sample C3 (2.99 %) and C2 (2.96 %) also were significantly (P<0.05) different with each other. A similar increasing trend for crude protein was reported by Kowaleski *et al*. (2020) [12] in the yoghurt containing chia seeds.

The ash content of fiber added flavoured milk increased significantly (P<0.05) and that the ash of fiber added flavoured milk rose as the quantity of chia seeds in milk increased. Sample C4 (1.26 %) had the highest ash content, which was significantly (P<0.05) higher and control sample had an ash content of 0.87 %, which was significantly lower and it increased in samples C2 (1.09 %) and C3 (1.18 %) and such increase was significant at each increasing level of additions of chia seeds.

Varying amounts of chia seeds affected the carbohydrate content of fiber added flavoured milk significantly (P<0.05) and that the carbohydrate content rose as the quantity of chia seeds in milk increased. Sample C4 had the highest carbohydrate content (12.92 %), which was significantly (P<0.05) higher and control had a carbohydrate content of 11.9 per cent, which was significantly lower (P<0.05) and in samples C2 (12.53 %) and C3 (12.76 %) significant increasing effect on the carbohydrate content was observed.

Effect of different levels of Chia seeds on physico-chemical parameters of flavoured milk

The mean values of physico-chemical parameters of Chia seeds added flavoured milk i.e. pH, acidity and viscosity as affected by different levels of Chia seeds addition is presented in Table 4. All the parameters show significant (P<0.05) effect with different levels of Chia seeds in flavoured milk.

Table 4: Effect of different levels of Chia seeds on physico-chemical parameters of flavoured milk

Levels of Chia seeds (% w/w)	Parameters*			
	pH	Acidity (% LA)	Viscosity (cP)/20°C	Total Dietary Fiber (%)
C1 (0.0)	$6.38^{a} \pm 0.01$	$0.17^{d} \pm 0.01$	$02.92^{d} \pm 0.03$	$0.00^{d} \pm 0.00$
C2 (2.0)	$6.28^{b} \pm 0.06$	$0.19^{cb} \pm 0.01$	$12.64^{c} \pm 0.25$	$0.41^{c} \pm 0.01$
C3 (3.0)	$6.25^{b} \pm 0.04$	$0.20^{b} \pm 0.01$	$16.70^{b} \pm 1.37$	$0.59^{b} \pm 0.01$
C4 (4.0)	$6.20^{c} \pm 0.07$	$0.22^{a} \pm 0.01$	$23.10^{a} \pm 1.47$	$0.76^{a} \pm 0.01$

*Mean ± SD (n=4); [a-d] denote significant difference (P<0.05) in same column

Effect of addition of Chia seeds on pH of flavoured milk was significant (P<0.05). It decreased with increase in level of Chia seeds in flavoured milk but such decrease was non-significant among the experimental samples. The highest pH value was found in sample C1 (6.38) which was significantly (P<0.05) higher, however, Sample C2 (6.28), C3 (6.25) and C4 (6.23) remained statistically (P>0.05) at par with each other. The acidity and pH are having inverse relationship. As pH decreases acidity generally increases. Data presented in Table 4 reveals that the acidity (% LA) of chia seeds added flavoured milk was significantly (P<0.05) affected by different levels of Chia seeds and it increased with increase in level of Chia seeds in milk. The highest acidity was found in sample C4 (0.21 % LA) which was significantly (P<0.05) higher than C1 (0.17 % LA) and statistically (P>0.05) remained at par with C3 (0.20 % LA) and C2 (0.19 % LA). Thus, different levels of addition of Chia seeds brought about significant effect on pH/acidity and such effect was more at higher rate of additions, though minor non-significant decrease/increase was observed within the treatment. The viscosity of Chia seeds added flavoured milk rose as the level of Chia seeds in milk increased. Sample C4 had the highest viscosity (23.10 cP), which was significantly (P<0.05) higher than rest of the samples in the present study. Control sample had a viscosity of 2.92 cP, which was significantly (P<0.05) lower and it increased significantly with each incremental level of addition of chia seed. Similar trend in increase in viscosity is reported by Samah (2020) in probiotic frozen Goat's yoghurt. The fiber content of Chia seeds added flavoured milk was significantly (P<0.05) affected by three levels of Chia seeds incorporation and it increased with increase in level of Chia seeds in flavoured milk. The highest fiber content was found in sample C4 (0.66 %) which was significantly (P<0.05) higher than others. As milk is devoid of fiber content and addition of fiber rich component Chia seeds in flavoured milk would obviously increase fiber content in the product it is added. A similar increasing trend for fiber content in yoghurt mousse is reported by Attalla and El-Hussieny (2017) [2]. When Chia seeds were added from 2 - 4%, it resulted in increase of fiber content from 0.34 to 1.26 % respectively.

Effect of different levels of Chia seeds on sensory scores of flavoured milk

The mean values of sensory scores of Chia seeds added flavoured milk, i.e. flavour, body and consistency, colour and appearance and overall acceptability as affected by three levels of Chia seeds are presented in Table 5. Sensory evaluation was carried out on 9 point hedonic scale. All the sensory attributes showed significant (P<0.05) impact of addition of three levels of Chia seeds in flavoured milk.

Table 5: Effect of levels of Chia seeds on sensory scores of flavoured milk

Levels of Chia seeds (% w/w)	Sensory scores*			
	Flavour	Body and Consistency	Colour and Appearance	Overall Acceptability
C1 (0.0)	$8.68^{a} \pm 0.13$	$8.37^{b} \pm 0.06$	$8.58^{a} \pm 0.06$	$8.39^{a} \pm 0.05$
C2 (2.0)	$8.45^{b} \pm 0.13$	$8.56^{a} \pm 0.04$	$8.43^{b} \pm 0.05$	$8.46^{a} \pm 0.04$
C3 (3.0)	$8.08^{c} \pm 0.13$	$8.40^{b} \pm 0.04$	$8.30^{c} \pm 0.08$	$8.22^{b} \pm 0.05$
C4 (4.0)	$7.68^{d} \pm 0.10$	$7.78^{c} \pm 0.14$	$8.20^{c} \pm 0.08$	$7.93^{c} \pm 0.09$

*Mean ± SD (n=4); [a-d] denote significant difference (P<0.05) in same column

It can be seen from Table 5 that flavour score of Chia seeds added flavoured milk significantly (P<0.05) decreased by incremental levels of chia seed. The highest flavour score was found in sample C1 (8.68) and subsequently it decreased with each increasing level of addition of chia seed. The flavour score of C4 was 7.68 which was significantly (P<0.05) lower and remained lowest among all samples. The preference for flavour score was in the order of C1 (8.68) > C2 (8.45) > C3 (8.08) > C4 (7.68). Such decrease in flavour score observed in present study is in line with the reports of Attalla and El-Hussieny (2017) [2] for yoghurt mousse incorporated with varying levels (1 - 3%) of Chia seeds. The body and consistency scores of Chia seeds added flavoured milk initially increased significantly (P<0.05) in C2 level, and there after it decreased in C3 level and remained statistically (P>0.05) at par with control sample. Further addition of Chia seeds, it decreased significantly (P<0.05) and remained lowest for C4 level. Such mix trend observed in the present study might be due to excessive increase in consistency as a result of increase in viscosity as observed in Table 4, which was not appreciated by the selected panel of judges and the comments received were slimy and slight ropy product. Similar trend was noted by Moussa *et al*. (2020) [15] when they added chia seeds from 1.5 - 6.0% in stirred yoghurt and more than 3.0 % level of chia seeds decreased the overall acceptability scores.

The data presented in Table 5 reveals that colour and appearance scores of Chia seeds added flavoured milk was significantly (0.05) affected by three levels of Chia seeds and though colour was not much different but appearance differed and thus combination of these two attributes score decreased with increase in level of Chia seeds in milk. The

highest colour and appearance score was found in control sample C1 (8.58) which was significantly ($P<0.05$) higher and it decreased significantly as the level of Chia seeds increased. Such effect could be due to increased amount of suspended Chia seeds and higher viscosity in the samples with increase in level of Chia seeds addition.

Overall acceptability score is the reflection of other attributes covered in sensory evaluation. Table 5 shows that varying levels of Chia seeds affected the overall acceptability scores of Chia seeds added flavoured milk and that the overall acceptability score of flavoured milk declined as the level of Chia seeds in flavoured milk increased. The highest overall acceptability score was found in sample C2 (8.46) which was non-significantly ($P<0.05$) higher than C1 and further increasing level of addition of Chia seeds resulted in significant decrease in the scores and sample C4 received the lowest score. The preference for samples as per overall acceptability score was in the order C2 (8.46) > C1 (8.39) > C3 (8.22) > C4 (7.93).

Conclusion

The study revealed that Chia seeds being good source nutrients like protein, fat, fiber and minerals like calcium, potassium, phosphorous and magnesium, its addition in flavoured milk could enhance the nutritional and therapeutic value. Previously soaked Chia seeds addition in the flavoured milk at the rate of 2.0 % were successful and received higher sensory scores, however at higher rate of addition of Chia seeds led to decreasing the sensory acceptability and judges commented being viscous product and though it increased mouth feel, however, such criteria (Body and Consistency score) was negatively judged at the higher level of incorporation of Chia seeds by the selected panel of judges.

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References

1. Arunkumar R, Vignesh K, Sanjaikannan A. Turmeric - The golden milk. Agric Lett. 2022;3(7):67-69.
2. Attalla NR, El-Hussieny EA. Characteristics of nutraceutical yoghurt mousse fortified with chia seeds. Int J Environ Agric Biotechnol. 2017;2(4):238-873.
3. Ayerza R. Seed composition of two chia (Salvia hispanica L.) genotypes which differ in seed color. Emirates J Food Agric. 2013;25(7):495-500.
4. Bangar S. Effects of oat beta glucan on the stability and textural properties of beta glucan fortified milk beverage [dissertation]. Wisconsin: Univ Wisconsin, Stout; 2011.
5. Bureau of Indian Standards. Methods of testing for dairy industry: rapid examination of milk. BIS 1479 (Part 2). New Delhi: BIS; 1961.
6. Bureau of Indian Standards. Determination of fat by the Gerber method. BIS 1224 (Part 1). New Delhi: BIS; 1977.
7. Bureau of Indian Standards. Handbook of food analysis. SP:18 (Part XI - Dairy Products). New Delhi: BIS; 1989.
8. Coelho MS, Salas-Mellado M. Chemical characterization of chia (Salvia hispanica L.) for use in food products. J Food Nutr Res. 2014;2(5):263-269.
9. Gaur GK, Rekha Rani, Dharaiya CN, Solanki K. Development of herbal milk using tulsi juice, ginger juice and turmeric powder. Int J Chem Stud. 2019;7(2):1150-1157.
10. Jayaraman J. Laboratory manual in biochemistry. New Delhi: Wiley Eastern Ltd; 1981. p. 75.
11. Knez HM, Ivanovski M, Cor D, Knez Z. Chia seeds (Salvia hispanica L.): an overview—phytochemical profile, isolation methods, and application. Molecules. 2020;25(1):1-30. doi:10.3390/molecules25010011
12. Kowaleski J, Quast LB, Steffens J, Lovato F, dos Santos LR, da Silva SZ, *et al*. Functional yogurt with strawberries and chia seeds. Food Biosci. 2020;37:1-11.
13. Kulkarni AT, Agarkar BS, Sawate AR, Kshirsagar RB. Determination of physicochemical properties of chia seeds (Salvia hispanica L.). J Pharmacogn Phytochem. 2020;9(2):1858-1861.
14. Lowenstein M, Haddad GS. High temperature pasteurization of ice cream: Part I. Effect of various heat treatments on solubility of components. Am Dairy Rev. 1972;34(2):82.
15. Moussa OB, Rouissi E, Boulares M, Hassouna M. Effects of chia seed levels on quality and bio-functional profile of stirred yoghurt. Acta Aliment. 2020;49(4):398-405. doi:10.1556/066.2020.49.4.5
16. Muñoz L, Cobos A, Diaz O, Aguilera J. Chia seeds: microstructure, mucilage extraction and hydration. J Food Eng. 2012;108(1):216-224.
17. Reyes-Caudillo E, Tecante A, Valdivia-López MA. Dietary fibre content and antioxidant activity of phenolic compounds present in Mexican chia (Salvia hispanica L.) seeds. Food Chem. 2008;107(2):656-663.
18. El-Shafei SMS. Manufacture of functional and healthy probiotic frozen goat's yoghurt using chia flour. Pak J Biol Sci. 2020;23:753-768. doi:10.3923/pjbs.2020.753.768
19. Steffolani E, De la Hera E, Pérez G, Gómez M. Effect of chia (Salvia hispanica L.) addition on the quality of gluten-free bread. J Food Qual. 2014;37:309-317.
20. Suri S, Passi SJ, Goyat J. Chia seed (Salvia hispanica L.)—a new age functional food. In: 4th Int Conf Recent Innovations Sci Eng Manag; 2016. p. 286-299.
21. Carrillo W, Cardenas M, Carpio C, Morales D, Álvarez M, Silva M. Content of nutrients component and fatty acids in chia seeds (Salvia hispanica L.) cultivated in Ecuador. Asian J Pharm Clin Res. 2018;11(2):1-4.