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Chemical, Microbiological, Rheological and Sensory Properties of Yoghurt Fortified with Selenium

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Abstract

Selenium (Se) is a trace element that is essential to human life. The present study was conducted to study the use of three levels of (Se) in manufacture of yoghurt as follows: 0.2, 0.4 and 0.6ppm treatments were coded T_1, T_2 andT_3 respectively. Beside of previous treatments control sample was carried out (without Se addition). The resultant products were stored at 6±2C$^{\circ}$ up to 10 days. All treatments subjected to chemical, microbiological, physical, rheological and organoleptic assessment. Results indicated that TS, TN and titratable acidity were slight increased with increasing the ratio of (Se), while the fat content is not affected. In samples at 0.6ppm (Se), it found a slight decrease in titratable acidity. During the cold storage for 10 days, the curd firmness and the density in all treatments had been increased, while the syneresis was decreased compared to control samples. Data also revealed that *Lactobacilli* and *Streptococci* counts increased with increasing the levels of (Se), but coliform bacteria were not detected in all treatments during the cold storage. The obtained data concluded that addition of (Se), up to 0.4ppm can be need in the manufacture of yoghurt without objectionable effect on the organoleptic properties.

Keywords: *Yoghurt, trace elements, sodium selenite (Na_2SeO_3).*

Introduction

Trace elements function an important role as a cofactor for certain enzymes implicated in metabolism and cell development, most of them implicated in the metabolism of proteins, carbohydrates, lipids, and energy. They are also necessary for growth, development, muscle and nerve function, normal cellular functioning, and synthesis of some hormones and connective tissue. As a role antioxidant and benefit from the therapeutic properties of many diseases and also create effective treatment modalities (Al-Fartusie and Mohssan, 2017).

Trace elements account for 4 % of total body lump and fraction of every tissue, liquid, cell and organ in human body. There is a sufficient evidence that metals, both independently or in proper equation with other metals, have structurally, biochemical and nutritional functions that are very significant for comprehensive human health, both mental and physical (Vahčić *et al.*, 2010). Furthermore, trace elements occur in milk and dairy products as inorganic ions and salts, as well as part of organic molecules, such as proteins, fats, carbohydrates and nucleic acids. The chemical form of mineral elements is important because it determines their absorption in the intestine and their biological utilization. The mineral composition of milk is not constant because it depends on lactation phase, nutritional status of the animal, and environmental and genetic factors (Zamberlin *et al*. 2012). Studies have confirmed that 70% of men and 80% of women consumed foods that have less than two-thirds of one or more essential minerals and vitamins (Redmon, 1999). Fish and other seafood are the main sources of Se but cereals, meat, nuts, onion, garlic, mushroom, and eggs are also important dietary sources of Se. Foods as fruit, vegetables, milk, milk products, and drinks are the poorest sources of Se (Maihara *et al*., 2004). In addition, Se is an essential nutrient for all living organisms. Under appropriate conditions lactic acid bacteria (LAB) are capable for accumulating large amounts of trace elements, such as Se, and incorporating them into organic compounds. (Pieniz *et al*., 2017). The inorganic and organic Se forms in dietary supplements are metabolized differently in animals. Organic Se, such as Se-Met, is actively transported through and absorbed in the intestine and nonspecifically incorporated into body proteins in place of Met during protein synthesis, providing a means of reversible Se storage in organs and tissues. (Schrauzer, 2003) produced kefir and yoghurt; cheese produced with different technologies, butter and butter creams from milk with high Se content, and examined how the Se passes from the milk to the various dairy products. The possible to produce milk and dairy products with high Se content in order to better supply the population with healthy Se sources. In addition, the role of Se in the prevention of a number of degenerative diseases including cancer, inflammatory diseases, thyroid disorders, cardiovascular diseases, neurological diseases, Alzheimer's disease, infertility and infections has been documented (Csapó *et al*., 2015). Also, the current investigation is an attempt to study the toxicity of three heavy metals, Al, Cd and Pb adult, male and female white mice that have adverse effects on the reproductive capacity of mice and their teratogenicity effects and the protective role of Se, as enriched Ras cheese when administered jointly with them (Abd El Monem, 2018).

The aim of this work was to fortified yoghurt with Se, without using it as feed additives in animal rations. The fortification method no affected the different strains of bacterial which used and to improve the daily Se requirements for consumer. Therefore we can fortify the yoghurt with Se as a role antioxidant and benefit from the therapeutic properties of many diseases and without the affected occurrence of undesirable changes in the product.

Materials and Methods

Materials:

All chemicals used in this study were of analytical grade supplied by BDH, Sigma chemical companies.

Buffalo’s milk was obtained from the herd of the Animal Production Department, Faculty of Agriculture, Al-Azhar University (Branch of Assiut).

Skim milk was obtained from whole fresh buffalo's milk by defatted cream using the laboratory centrifuge at 3000 xg for 10 min at 20°C.

Starters:

The following bacteria strains were used in our experiments: *Lacto-*

bacillus delbrueckii subsp *bulgaricus* (EMCC 11102) and *Streptococcus thermophilus* (EMCC 11044) was obtained from Cairo Microbiological Resource Center (MIRCEN), Faculty of Agriculture, Ain Shams University. The bacteria were maintained by sub culturing in Skim milk medium.

Se element:

Sodium Selenite (Na_2OSe_3, M. W. 172.95, Purity 99.5%) were purchased from Electro Scient Chemical Company, Kasr El-Eieny, Cairo.

Methods:

Experimental procedure:

Manufacture of yoghurt:

Reduced fat buffalo milk (3% fat) was divided into four equal portions, were as following:

C: Control yoghurt was made without Na_2SeO_3.

T_1: yoghurt was made adding 0.2ppm, Na_2SeO_3.

T_2: yoghurt was made adding 0.4ppm, Na_2SeO_3.

T_3: yoghurt was made adding 0.6ppm, Na_2SeO_3.

Reduced fat buffalo milk (3% Fat)

↓

Divided into four equal portions`

↓

Heat treatment
(At 90ºC± 1°C for 15 min and cooling to 42-44ºC)

↓

Addition of Na_2SeO_3
(T1, T2 and T3), Plus the control without Se

↓

Inoculated with 2% active mixed growing culture

↓

Distribution into plastic cups

↓

Incubated at 42°C until complete coagulation

↓

Stored in refrigerator at 6 ± 2°C Up to10 days

Each part was inoculated with 2% active growing culture (mixed 1:1 *Lactobacillus delbrueckii* subsp *bulgaricus* (EMCC 11102) and *Streptococcus thermophilus* (EMCC 11044), according to (Tawfik *et al.* 2003). Na_2SeO_3 ratios were added to each fraction and the Inoculated milk of each portion was equally distributed into plastic cups (100 ml) incubated the mixture at 42°C until complete coagulation. After coagulation, samples were kept in the refrigerator at 6±2°C. The samples were tested when fresh and after 3, 7 and 10 days of storage period.

Chemical analyses:

Total solids (TS) and Titratable acidity were adopted according to A.O.A.C (2000). The pH values were measured and pH values for different milk products samples using a pH meter model STARTER 300, OHAUS USA. Total nitrogen (T.N) content of products was determined by the semi-micro kjeldahl as described by IDF (1993). Fat contents determined in milk and products by the conventional Gerber's method as described by Ling (1963). Se content of the digested samples was determined by inductively coupled plasma optical emission spectrophotometer (ICP-OES) (Perkin Elmer Ltd., Optima 3300 DV, USA) as described by Prokisch, *et.al.* (2006), Curd firmness was determined by using the penetration method described by Shalabi (1987). Determination of syneresis one hundred grams of sample was placed on a filter paper resting on a top of a funnel. After 2 hours of drainage at 7°C, the quantity of whey collected in a 50 ml graduated cylinder was used as in index of syneresis

Farooq and Haque (1992). Density was calculated using the regular equation as follows:-

$$\text{Density } (g/cm^3) = \frac{Weight}{Volume}$$

Total bacterial count, Coliform and Yeast & Moulds of samples were determined according to Marshall (1992). *Lactobacilli count* and *Streptococci count* was estimated on the selective medium for lactobacilli MRS and M17 agar medium respectively, as suggested by (IDF, 1997). The plates were incubated at 37°C for 48 hours.

The organoleptic evaluation of resultant yoghurt was evaluated according to the method of Khodear *et al.* (2018) when fresh, 3, 7 and 10 days of stored at 6 ± 2°C.

Results and Discussion

In this present investigation attempts have been made of yoghurt fortification with different doses of Na_2SeO_3, method was different levels (T1, T2 and T3) for yoghurt fortified with Se before the incubation of milk. The resultant Se-enriched yoghurt was stored at 6±2°C up to 10 days. The obtained final products were evaluated for its chemical, microbiological analysis rheological properties and sensory evaluation.

The chemical composition of yoghurt fortified with Se:

Data presented in Table 1 illustrate the chemical composition of Se-enriched yoghurt made with different levels of Na_2SeO_3, during storage periods at 6±2°C up to 10 days.

Table 1. Chemical properties of yoghurt Fortified with Se during storage period at refrigerator temperature 6±2°C up to 10 days.

Chemical properties	Storage (days)	Control	Se-enriched yoghurt		
			T1	T2	T3
TS %	Fresh	14.4	14.8	14.9	14.9
	3	14.6	15.0	15.5	15.7
	7	15.2	15.3	15.7	15.9
	10	15.5	15.7	16.0	16.2
Fat %	Fresh	3.01	3.01	3.01	3.01
	3	3.01	3.02	3.02	3.02
	7	3.00	3.02	3.02	3.01
	10	3.01	3.02	3.01	3.01
Acidity %	Fresh	0.64	0.64	0.63	0.60
	3	0.67	0.66	0.64	0.62
	7	0.70	0.68	0.67	0.64
	10	0.73	0.72	0.71	0.68
pH	Fresh	4.52	4.51	4.53	4.53
	3	4.39	4.39	4.45	4.49
	7	4.33	4.37	4.40	4.44
	10	4.32	4.33	4.39	4.46
TN %	Fresh	0.82	0.83	0.84	0.84
	3	0.83	0.85	0.85	0.86
	7	0.84	0.85	0.87	0.90
	10	0.85	0.87	0.89	0.92

Data in Table (1) revealed that, the total solids (TS) content of Se-enriched yoghurt was affected by addition of different levels of Na_2SeO_3 and during storage periods at refrigerator temperatures up to 10 days. The TS content of Se rich yoghurt found to be increase with increasing the storage periods up to 10 days in all treatments. The yoghurts fortified with Se have better water holding capacities harmony with of Achanta *et al*. (2007).

The control sample had lower value of TS than that of other treatments. This may be among yoghurts fortified with Se, casein and whey protein correlates with Se because it can replace sulfur in sulfur-containing amino acids Hekmat and McMahon (1997).

The presented data in the same Table revealed that, addition of different levels of Na_2SeO_3 had no affect on fat contents during storage periods at refrigerator temperature up to 10 days in Se-enriched yoghurt and control treatment. On the other hand, there was no affected in fat content in Se-enriched yoghurt samples compared to the control.

The effect addition of Na_2SeO_3 levels on the titratable acidity and pH values of Se-enriched yoghurt during storage periods at refrigerator up to 10 days shows in Table (1). It could be noticed that, titratable acidity behaves the opposite trend of pH.

The data demonstrated that the acidity percent and pH values are increase and decrease with increasing of storage periods up to 10 days at refrigerator temperatures in all treatments, respectively. On the other hand, the data showed that the acidity percent were decrease ineffective with increasing of Na_2SeO_3 levels. These results are in harmony with those of (Alzate *et al.,* 2010; Zommara and Prokisch, 2015) who reported that there is a decrease in acidity of milk fortified with Se with no significant change in its properties compared to the control.

The presented data in Table (1) revealed that a slightly increase the total nitrogen percentages of Se-enriched yoghurt up to the end of storage periods at refrigerator temperature in all treatments. In addition, found the total nitrogen percentages of Se-enriched yoghurt ineffective with increasing of Na_2SeO_3 levels in most treatments.

Moreover, the obtained data showed that control samples had relatively low values of total nitrogen than that of Se-enriched yoghurt samples.

Determination of Total Se in Se-enriched yoghurt and control sample:

The presented data in Fig (1) showed that, the values of total Se concentration in milk used in manufacture of yoghurt, control yoghurt samples (without Se) and Se-enriched yoghurt. The analyzed data showed that the mean values, found decrease highly in control yoghurt samples on the first day and during 10 day storage at 6±2°C were to be 1.87 and 1.85µg/100g respectively, made from milk with 1.68 µg/100g Se content. A similar trend was observed in yoghurts and milk Pechova *et al*. (2008) the Se contents in yoghurts and milk were 17.13±5.40 $\mu g.kg^{-1}$ and 13.14±4.21 µg.l-1 respectively. These results are highest then the values of

Tammam, *et al.* (2012), Holland *et al.* (1995) and Cashman (2002) were the average content of Se 2.0 µg/100g in yoghurt. Al-Othman *et al.* (2012) found the Se content in yoghurt 2.0 µg/kg.

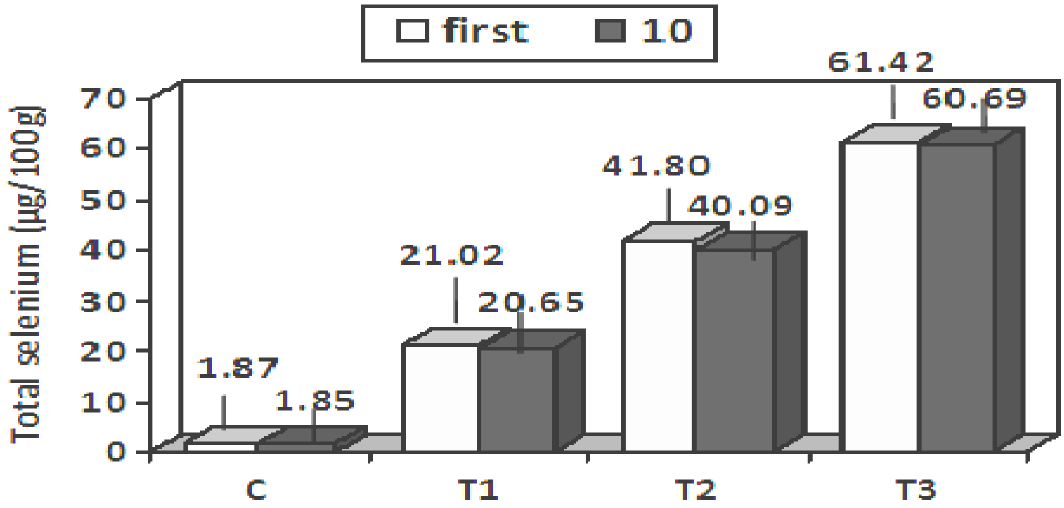

Fig. 1. Clear the total Se (µg/100g) in Se-enriched yoghurt and control yoghurt Samples on the first day and after 10 day storage at 6±2°C.

On the other hand, the data revealed that the gradual addition of levels Na_2SeO_3 led to gradual increased total Se values in treated samples compared to control in both fresh and after 10 days of storage at 6±2°C in all treatments.

The physical and rheological properties of yoghurt fortified with Se during storage:

The presented data in Table 2 showed that the addition of Na_2SeO_3 levels led to gradual increase in the curd firmness of Se-enriched yoghurt. So, addition of Na_2SeO_3 levels imparted Se-enriched yoghurt with higher curd firmness than that in the control yoghurt. Moreover, the values of curd firmness found to increase with increasing storage periods at refrigerator temperature up to 10 days in all treatments. Also, gradual increase with increasing of Na_2SeO_3 levels in all treatments. This might be due to the increase in water holding capacity of the curd mass as it affects the protein interaction during coagulation process, resulting into less yield of syneresis Achanta *et al.* (2007).

Table 2. Some physical and rheological properties of yoghurt fortified with Se during storage period at 6±2°C up to 10 days.

Components	Storage (days)	Control	Se-enriched yoghurt		
			T1	T2	T3
Syneresis (ml/100 gm)	Fresh	31.9	30.8	30.3	30.1
	3	35.8	32.3	31.7	30.6
	7	37.6	33.6	32.7	31.3
	10	39.3	36.5	33.8	32.7
Firmness (gm)	Fresh	15.2	15.9	16.5	16.7
	3	17.3	18.0	18.5	18.8
	7	18.1	18.9	19.2	19.4
	10	18.4	19.8	20.1	20.3
Density (gm/cm^3)	Fresh	1.22	1.23	1.24	1.26
	3	1.24	1.25	1.26	1.27
	7	1.25	1.26	1.28	1.29
	10	1.28	1.29	1.30	1.32

On the other hand, the data revealed that the gradual addition of Na_2SeO_3 levels led to gradual decrease in the syneresis of Se-enriched yoghurt and the values of syneresis in the control sample were higher than that treated samples. These results are in harmony with of Achanta *et al.* (2007) reported that The mean syneresis values of yoghurts fortified with iron, Se and magnesium were significantly ($P< 0.05$) lower than the control yoghurt. This indicates that yoghurts fortified with Se, magnesium and iron has better water holding capacities. Pehrson (1993) reported that Se when combined with Vitamin E and glutathione peroxidase improved the integrity of the cell membranes in pork, thereby reducing moisture loss from the cell. In addition, the values of syneresis were increase with increasing storage period up to 10 days in all treatments. This may be explained by the decrease in pH during storage Kosikowski (1982) which may have had contracting effect on the casein micelle matrix causing more serum to be released. Similar, observations of low syneresis initially followed by increased syneresis over an increased storage was observed by Farooq (1997) and Ji (2000).

The obtained data in the same Table revealed that the density was slightly higher in Se-enriched yoghurt sample than that in the control yoghurt. In addition, the values of density were slight increasing with increasing storage period up to 10 days, and increase addition of Na_2SeO_3 levels in all treatments. These results are in harmony with of Achanta *et al.* (2007) they reported that the apparent viscosity of yoghurts fortified with minerals did not vary significantly ($P<0.05$) when compared to the control.

Generally, the Se-enriched yoghurt was slightly increased than control for firmness as well as density and slightly less syneresis. However, curd firmness, density and syneresis are increase through the storage periods till 10 days at refrigerator temperatures of all treatments. So, when addition of Na_2SeO_3 levels for yoghurt gave best results of some physical and rheological properties.

The microbiological properties of yoghurt fortified with Se:

The presented data in Table 3 showed that total bacterial, *Lactobacilli* and *Streptococci* and Yeast & Moulds counts of Se-enriched yoghurt were influenced by addition of Na_2SeO_3 during kept at 6 ± 2°C up to 10 days.

The total viable bacterial counts found to slightly increase up to 3 days and then slightly decrease up to the end of storage periods in all treatments. In addition, there were slight decreases of total bacterial counts with increasing of Na_2SeO_3 levels in most treatments.

However, total bacterial counts of Se-enriched yoghurt were higher than that of control samples. These results are in accordance with those reported by Hashim (2007) and Salman *et al*., (2012).

Table 3. Counts of some microbial groups (Log cuf/gm) of yoghurt fortified with Se during storage period at 6±2°C up to 10 days.

Microbial type	Storage (days)	Control	Se-enriched yoghurt		
			T1	T2	T3
Total bacterial count	Fresh	9.24	9.24	9.27	9.29
	3	9.26	9.29	9.31	9.33
	7	9.25	9.26	9.29	9.32
	10	9.22	9.24	9.26	9.26
***Lactobacilli* count**	Fresh	7.72	7.60	7.72	7.82
	3	7.80	7.78	7.79	7.83
	7	7.78	7.73	7.73	7.80
	10	7.78	7.72	7.73	7.80
***Streptococci* count**	Fresh	7.79	7.73	7.82	7.90
	3	7.64	7.51	7.62	7.73
	7	7.88	7.47	7.59	7.66
	10	7.65	7.45	7.57	7.62
Yeasts & Moulds count	Fresh	ND	ND	ND	ND
	3	ND	ND	ND	ND
	7	2.36	2.21	2.10	1.80
	10	3.69	3.12	3.00	2.63
Coliform bacteria group	**ND***				

* Not- detected

Also, showed approximately similar pattern for counts of *Lactobacilli* found to slightly increase up to 3 days and slightly decrease in the end of storage periods of control samples and all treatments. In addition, there were slight increases of *Lactobacilli* and *Streptococci* counts with increasing of Na_2SeO_3 levels in some of Se-enriched yoghurt samples, and with progressing of storage periods up to 10 days in some treatments. These results are agreement with those previously reported by (Xia *et al.,* 2007) and (Alzate *et al.,* 2010).

Yeast and Moulds were not detected in fresh samples and after 3 days of storage in all treatments, there microorganisms appeared after 7 days and with progressing of storage periods up to 10 days of storage period in all treatments. In addition, their counts were decrease with increasing of Na_2SeO_3 levels in most treatments. This agreement with Yang *et al*., (2009) reported that the antibacterial activity of prebiotics with organic Se was nearly the same as that of the antibiotics group.

Additionally, the coliform bacteria were not found in all treatments, which this might be due to the severity of heat treatments of milk and preventive action of lactic acid bacteria and their metabolites on the growth of coliforms. These results are in harmony with those of Fayed *et al*. (2001); El-Nagar and Brennan (2001); Tammam *et al*. (2011).

The organoleptic properties of yoghurt fortified with Se during storage:

Data presented in Table 4 showed that the organoleptic properties of Se-enriched yoghurt were influenced by addition of Na_2SeO_3 levels during kept at 6 ± 2°C up to 10 days.

The data observed that, mean values of organoleptic scores within each treatment, were examined as mentioned in methodology. The control yoghurt had lower flavor than that of Se-enriched yoghurt at any Na_2SeO_3 levels after fresh and up to 10 days storage in all treatments. In addition, T2 had the superior flavor, while, T3 at 7and 10 days storage had lower flavor than that in other treatments. These results are disagreement with those of Hekmat and McMahon (1997). Zhang and Mahoney (1991) reported that there were no significant differences in flavor scores among Se fortified yoghurt and control yoghurt.

Table 4. Organoleptic properties of yoghurt Fortified with Se **during storage period at 6±2°C up to 10 days.**

Properties	Storage (days)	Control	Se-enriched yoghurt		
			T1	T2	T3
Flavor (50)	Fresh	44.0	45.0	46.2	45.4
	3	42.6	43.2	45.0	45.1
	7	42.9	42.9	47.4	42.0
	10	42.4	42.4	43.9	42.9
Body & Texture (30)	Fresh	27.4	27.5	27.6	29.0
	3	26.5	26.8	28.7	27.8
	7	26.9	27.9	28.7	28.8
	10	26.2	27.1	27.3	27.3
Appearance and color (20)	Fresh	18.3	18.3	18.3	18.3
	3	18.9	18.8	19.0	18.8
	7	18.2	18.5	18.7	18.7
	10	18.4	18.4	18.5	18.6
Total score (100)	Fresh	89.7	90.8	92.1	92.7
	3	88.0	88.8	92.7	91.7
	7	88.0	89.3	94.8	89.5
	10	87.0	87.9	89.7	88.8

As regarded to body and texture, the data showed that Se-enriched yoghurt gained variable scores for body & texture and obvious interactions between Se add and storage time on body and texture scores. The samples with high levels of Na_2SeO_3 had higher values than that in lower levels and control yoghurt samples. This may be a change in casein structure when Se binds to micellar casein. This probable change in the structure of casein may explain better water holding capacity/less released whey in Se fortified yoghurt or this might be due to the unseparated of whey at high level of Na_2SeO_3 levels and production of acids, to give the reduced coagulation and formation of soft and loose textured curd. These results are disagreement of Achanta. *et al*. (2007) reported that there were no significant differences in texture scores among Se fortified yoghurt and control yoghurt.

Regarding appearance and color of Se-enriched yoghurt were not affected by addition of Na_2SeO_3 levels in all treatments and control yoghurt samples. The storage of Se-enriched yoghurt and control yoghurt samples, Uninfluential in appearance and color during kept at 6 ± 2°C up to 10 days in all treatments. These results are in agreement with of Alzate *et al*., (2010) and Achanta *et al*. (2007) reported that there were no significant differences in appearance and color among Se fortified yoghurt and control yoghurt.

Minerals are known to alter dairy protein structure, reported that mineral salts alter the partitioning of the caseins between the colloidal and serum phases of milk and the ionic environment of the proteins. The minerals may have altered the casein micelle matrix structure of the yoghurts in such a way as to have contributed to the white opacity of the yoghurts leading to the increased values (Augustin, 2000).

The obtained data concluded that addition of (Se), up to 0.4ppm can be need in the manufacture of yoghurt without objectionable effect on the organoleptic properties.

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الخواص الكيميائية والميكروبيولوجية والريولوجية والحسيه للزبادي المدعم بالسلينيوم

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الملخص

يهدف البحث إلى انتاج زبادي مدعم بعنصر السلينيوم لما له من فوائد تغذوية وصحية عالية وايضا لانخفاض اللبن ومنتجاته من عنصر السلنيوم. ودراسة مدي تأثير هذا العنصر علي بعض الخواص الكيميائية والميكروبيه والريولوجية والحسية للزبادي المدعم به حيث تم إضافة ثلاث تركيزات مختلفة (٠,٢، ٠,٤، ٠,٦ جزء في المليون) من سيلينات الصوديوم غير العضوي الي اللبن المعد لعمل الزبادي، مع عمل عينة للمقارنة دون اضافة سيلنيوم وتخزينه علي درجة حرارة الثلاجه حتي١٠ ايام. أوضحت النتائج أن هناك زيادة طفيفه في كلا من الجوامد الكلية والنتروجين الكلي والحموضه بزيادة إضافة السيلينوم، بينما نسبة الدهن لم تتأثر بهذه الإضافة. عند إضافة ٠,٦ جزء في المليون سلينيوم غيرعضوي أدي إلي إنخفاض طفيف في الحموضه اثناء التخزين حتي ١٠ أيام، وكان هناك زيادة في التماسك والكثافة وانخفاض التشريش في الزبادي المدعم مع إضافة السلينيوم مقارنة بعينة الكنترول. أوضحت النتائج زيادة كلا من بكتريا حامض اللاكتيك الكرويه والعصويه عند التركيزات المذكورة مقارنة مع الكنترول خلال فترات التخزين المختلفة مع عدم ظهور اي تأثير سلبي علي العدد الكلي للبكتريا، لكن ليس هناك نموات لبكتريا القولون في كل المعاملات بالإضافه إلي الكنترول خلال التخزين علي البارد. أظهر التحكيم الحسي للزبادي المدعم بالسيلنيوم تحسين في القوام والتركيب مع ثبات المظهر العام واللون للزبادي مقارنة بالكنترول. لذلك يمكننا تدعيم اللبن لتصنيع الزبادي بعنصر السيلنيوم حتي ٠,٤جزء في المليون كأحد العناصر النادره المضاده للاكسدة والاستفاده من خواصه العلاجيه لكثير من الآمراض دون تأثير واضح علي البادئ المستخدم أو حدوث تغيرات غير مرغوب فيها بالمنتج.