J. Agric. Sci. Mansoura Univ., 34 (1): 239 - 248, 2009

STUDY OF THE QUALITY OF ZABADY DRINK MADE BY DIFFERENT EXOPOLYSACCHARIDES

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ABSTRACT

The quality of zabady drink made by using different exopolysaccharides-producing cultures was investigated, Treatment I: Yo Mix 495 consisted of *S. thermophilus* + *L. bulgaricus*, Treatment II: Yo Mix 205 consisted of *S. thermophilus* + *L. acidophilus* + *Befedobacterium lactis*, and Treatment III: Star Six contained of *S. thermophilus were carried out,* compared with control (conventional yoghurt starter + pectin). Resultant products were analyzed when fresh and after storing for 14 days. These treatments had no effect on total solids, fat and protein contents, however acidity, pH, soluble nitrogen, acetaldehyde, TVFA contents and whey exuded were slightly increased and viscosity had an opposite trend with increasing the storage period. In treatment II zabady drink containing exopolysaccharides-producing cultures may contribute positively to the mouth-feel and had more desirable rheological properties, and taste, improved the functional characteristics and reduction of syneresis (wheying off), of zabady drink without the use of additives,. Treatment II had the best quality because it contains mixed cultures which produced EPS at a faster rate.

Keywords: Zabady drink, exopolysaccharides-producing cultures.

INTRODUCTION

During the last decade sugar polymers or exopolysaccharides (EPS) produced by great variety of bacteria including lactic acid bacteria (LAB) have gained increasing attention These polymers may be assembled as capsular polysaccharides that are tightly associated with the cell surface, or they may be liberated into the growth medium which called ropy polysaccharides *De Vuyst et al.* (2003).

Many reviews on (EPS) produced by (LAB) have been published in recent years, dealing with physiology, fermentation, chemical and structural characteristics of (EPS) molecules. Several of studies recommended that the application of (EPS) in dairy production industry because of their functional role in food system, such as enhancement of viscosity, suspension of particulates, inhibition of syneresis, stabilization and emulsification (*Hassan et al.,* 2001) and *Laws and Marshall* (2001). According to their physicochemical properties which are similar to those of plant (pectin, cellulose) being used to improve the rheological properties and to obtain a smooth texture and a good mouthfeel *(Sutherland 1998), Duboc and Mollet, (2001)* and *Hassan et al., (2004).* Zabady drink made by mild homogenization of yoghurt coagulum after fermentation possess a smooth flowed and creamy

texture. The presence of EPS in drink-type yoghurt make the product less susceptible to mechanical damage from pumping, blending, and filling machines (*De Vuyst and Degeest, 1999).* Mechanical processing steps also increase syneresis of the final product, but the use of EPS-cultures can help to control this defect (*Duboc and Mollet, 2001).* IN addition, certain (EPS) produced by (LAB) are thought to play a role in the beneficial effects on human health such as cholesterol-lowering ability (*Pigeon et al., 2002),* immunomodulating and antitumoral activities (*Kitazawa et al.,* 1998), *Chabot et al., (2001),* and prebiotics effects (*Marshall et al., 1995), Dal Bello et al., (2001)* and *Korakli et al., (2002).* The present study investigated the effect of using different exopolysaccharide-producing cultures on some chemical and reheological properties and the effect of that on the sensory evaluation and mouth feel of the resultant zabady drink.

MATERIALS AND METHODS

Fresh whole buffalo's milk was obtained from the herd of Gemmiaza Station, Animal production Research Institute, Ministry of Agriculture.Commercial grade granulated can sugar produced by Sugar and Integrated Industries Co. at Hawamdia, pectin, (BDH chemical LTD, pool, England, were used).Concentrated lyophilized mixed yoghurt starter culture consisting of (Control: conventional starter, Treatment I: Yo Mix 495 consisted of *S. thermop hilus* + *L. bulgaricus*, Treatment II: Yo Mix 205 consisted of *S. thermophilus* + *L. acidophilus* + *Befedobacterium lactis.* and Treatment III. Star six contained of *S. thermophilus*). Were obtained from laboratories, Danisco, France.

Buffalo's milk was adjusted to 3 % fat, then heat treated to 95° C for 5 min. and cooled to 40° C. Yoghurt cultures (2%) was added to the milk then incubated at 40 ± 1° C, until complete coagulation. 15% of pre-boiled chilled water were added to individual parts of the obtained zabady. 0.4% of pectin and 4% cane sugar were added to the previous four mixed parts. Samples were stored at 5 ± 1° for 14 days and analyzed when fresh and after 3, 5, 10 and 14 days.

Total solids, fat, total nitrogen contents, pH, and titratable acidity were determined according to the methods described by *AOAC (1994).*The pH was measured using a pH meter (model PHM82.radiometer America, Cleveland, OH).Soluble nitrogen (SN) content was estimated according to *Ling (1963).* Total volatile fatty acids (TVFA) content was determined as given according to *Kosikowski (1978).* Whereas acetaldehyde content was estimated as given by *Lees and Jago (1969).* Viscosity was determined as given by Tobias and Tracy (1950). Samples were organoleptically assessed using the scoring sheet outlined by *Nelson and Trout (1964).*

Statistical analysis was carried out by using general linear model procedure, using SAS (version 6.1, SAS Institute, Cary, NC) and least square means of three replicate experiments were considered significantly different when $p < 0.05$.

RESULTS AND DISCUSSION

The results presented in Table (1) show the activity of yoghurt cultures during the fermentation period of zabady drink for the four different treatments. It could be noticed that no significant differences in pH values between treatments during the first 60 min. However, progressing incubation time had a noticeable differences between pH values for all treatments until the end of storage. Treatment III required a long time more than the other treatments to be set coagulum. That may be due to using a single strain in this treatment. These results agree with those obtained by ***Abdel-mageed*** *(1987), Hatem (1996)* and *Farahat (1999).*

Table (1): Activity of yoghurt cultures (pH values) during the fermentation period in making zabady drink.
(Average ± SE of 3 replicates).

Property	Treatments*			
	Control	I	II	III
Zero min.	6.55 ± 0.02^{a}	6.53 ± 0.01^{a}	6.57 ± 0.02^{a}	6.55 ± 0.03^{a}
30 min.	6.50 ± 0.03^{a}	6.49 ± 0.02^{a}	6.51 ± 0.04^{a}	6.49 ± 0.02^{a}
60 min.	6.38 ± 0.01^{ab}	6.40 ± 0.05^{a}	6.42 ± 0.02^{a}	6.39 ± 0.04^{ab}
90 min.	6.17 ± 0.04^{bc}	6.20 ± 0.03^{b}	6.25 ± 0.01^{a}	6.27 ± 0.05^{a}
120 min.	5.85 ± 0.02^{bc}	5.93 ± 0.03^{ab}	5.87 ± 0.03^{b}	6.00 ± 0.03^{a}
150 min.	5.28 ± 0.06^{b}	5.30 ± 0.05^{b}	5.25 ± 0.04^{c}	5.47 ± 0.02^{a}
180 min.	5.11 ± 0.03^{cd}	5.15 ± 0.04^{b}	5.10 ± 0.05^{c}	5.25 ± 0.01^{a}
210 min.	4.68 ± 0.05^{c}	4.72 ± 0.02^{b}	4.65 ± 0.03^{d}	4.80 ± 0.02^{a}
240 min.	–	–	–	4.62 ± 0.04^{a}

*** Control: conventional starter + pectin.**
Treatment I: yo mix 495 consisted of (*S. thermophilus* + *L. bulgaricus*)
Treatment II: yo mix 205 consisted of (*S. thermophilus* + *L. acidophilus* + *Befedobacterium lactis*).
Treatment III: Star six contained of (*S. thermophilus*).
Averages (a, b... etc.) within the same row with different superscripts differed significantly ($p<0.05$).

Changes in titratable acidity and pH values of fresh and stored zabady drink as affected by different starter cultures were displayed in Table (2). It could be seen that, acidity % for control and treatment II are approximately of the same values, but I and III treatments varied and lowered than the others. Advancing of storage period, acidity increased in all treatments till the end of storage. The differences in acidity between fresh and stored samples were significantly increased by increasing of storage period. The increased acid development was due to the continued fermentation of residual lactose by LAB cultures even during refrigeration over 14 days. Treatment III had a lower values in fresh and stored states than the other samples. On the contrary, pH values of fresh and stored zabady drink took an opposite trend of acidity. As an incubation time increases, treatment III owned a high pH values according to the used culture strain. This trend in results was in agreement with that by *Hatem (1996)*, and *El-Ghandour (2008)*.

Table (2): Influence of using different starter cultures on acidity and pH values of fresh and stored Zabady drink. (Average ± SE of 3 replicates)

Property	Storage period (days)	Treatments*			
		control	I	II	III
Acidity, %	Fresh	0.75 ± 0.02^{a}	0.72 ± 0.03^{ab}	0.76 ± 0.02^{a}	0.70 ± 0.03^{b}
	3	0.86 ± 0.05^{a}	0.78 ± 0.05^{b}	0.88 ± 0.05^{a}	0.73 ± 0.07^{c}
	5	0.92 ± 0.03^{ab}	0.85 ± 0.07^{bc}	0.96 ± 0.03^{a}	0.80 ± 0.09^{c}
	10	0.97 ± 0.07^{ab}	0.92 ± 0.03^{b}	1.00 ± 0.04^{a}	0.88 ± 0.03^{c}
	14	1.08 ± 0.01^{b}	1.00 ± 0.05^{bc}	1.15 ± 0.00^{a}	0.95 ± 0.05^{c}
PH	Fresh	4.50 ± 0.31^{ab}	4.55 ± 0.42^{a}	4.51 ± 0.22^{ab}	4.57 ± 0.88^{a}
	3	4.42 ± 0.25^{b}	4.48 ± 0.09^{a}	4.40 ± 0.51^{b}	4.50 ± 0.51^{a}
	5	4.28 ± 0.09^{c}	4.34 ± 0.52^{b}	4.30 ± 0.09^{bc}	4.41 ± 0.72^{a}
	10	4.15 ± 0.22^{c}	4.22 ± 0.08^{b}	4.20 ± 0.35^{bc}	4.32 ± 0.35^{a}
	14	3.96 ± 0.08^{c}	4.10 ± 0.82^{b}	4.02 ± 0.09^{cd}	4.19 ± 0.22^{a}

*** See legend to Table (1) for details**
Averages (a, b, ... etc) within the same row with different superscripts differed significantly (P<0.05).

It is clear from the recorded data in Table (3) that TS content of all treatments were nearly the same and there is no significant effect between treatments during storage period. The slight decrease in TS was noticed in all treatments during storage may be due to fermentation of lactose and hydrolysis of protein with the formation of volatile substances. These results are in agreement with those obtained by *Hassan et al., (1999)* and *Abdel-Khair et al., (2000).*

Table (3): Effect of using different starter cultures on Total solids, Fat and Total protein contents (%) of fresh and stored Zabady drink. (Average ± SE of 3 replicates)

Property	Storage period (days)	Treatments*			
		control	I	II	III
Total Solids (%)	Fresh	13.46 ± 0.20^{a}	13.45 ± 0.09^{a}	13.47 ± 0.05^{a}	13.45 ± 0.04^{a}
	3	13.46 ± 0.05^{a}	13.45 ± 0.06^{a}	13.45 ± 0.06^{a}	13.45 ± 0.03^{a}
	5	13.46 ± 0.05^{a}	13.42 ± 0.20^{a}	13.44 ± 0.02^{a}	13.43 ± 0.03^{a}
	10	13.43 ± 0.07^{a}	13.40 ± 0.06^{a}	13.42 ± 0.07^{a}	13.42 ± 0.06^{a}
	14	13.42 ± 0.04^{a}	13.39 ± 0.02^{ab}	13.40 ± 0.09^{a}	13.40 ± 0.04^{a}
Fat, %	Fresh	3.70 ± 0.03^{a}	3.60 ± 0.04^{ab}	3.70 ± 0.10^{a}	3.70 ± 0.07^{a}
	3	3.70 ± 0.02^{a}	3.60 ± 0.05^{ab}	3.70 ± 0.03^{a}	3.70 ± 0.05^{a}
	5	3.70 ± 0.05^{a}	3.60 ± 0.04^{ab}	3.70 ± 0.03^{a}	3.70 ± 0.05^{a}
	10	3.60 ± 0.03^{ab}	3.50 ± 0.03^{b}	3.60 ± 0.08^{ab}	3.70 ± 0.01^{a}
	14	3.60 ± 0.01^{a}	3.50 ± 0.01^{ab}	3.60 ± 0.12^{a}	3.60 ± 0.07^{a}
Total protein, %	Fresh	3.15 ± 0.05^{a}	3.17 ± 0.08^{a}	3.15 ± 0.07^{a}	3.16 ± 0.03^{a}
	3	3.13 ± 0.07^{ab}	3.17 ± 0.07^{a}	3.17 ± 0.08^{a}	3.16 ± 0.03^{a}
	5	3.12 ± 0.11^{ab}	3.16 ± 0.03^{a}	3.15 ± 0.05^{a}	3.15 ± 0.09^{a}
	10	3.12 ± 0.05^{b}	3.15 ± 0.05^{a}	3.13 ± 0.02^{ab}	3.13 ± 0.12^{ab}
	14	3.10 ± 0.07^{b}	3.15 ± 0.12^{a}	3.11 ± 0.02^{b}	3.13 ± 0.07^{ab}

*** See legend to Table (1) for details.**
Total protein = TN x 6.38 Averages (a, b, ... etc) within the same row with different superscripts differed significantly (P<0.05).

Data in the same Table (3) shows that fat and total protein of all treatments were not affected with using deferent starter cultures. The slight decrease in fat and protein contents were noticed during storage might be due to some proteolysis, and lipolysis action and liberation of volatile component during the storage period. This trend was observed in the study given by *Mehanna et al. (1988)* and *El-Ghandour (2008)*.

The results presented in table (4) illustrates the SN% in zabady drink when fresh and during storage period. Fresh case control and tretement II had the same SN%, whereas I and III were also the same. Progressing the storage period, SN% were gradually increased till the end of storage, the highest values were recorded in control and treatment II, treatment III gained the lowest values. There were significant differences between treatments especially during the storage period than the fresh. The proteolysis occurred during processing and storage of yoghurt was recorded in the literature by *Tamime and Deeth (1980)* and *Tamime and Robinson (1999)*.

Table (4): Soluble nitrogen %, total volatile fatty acids and acetaldehyde contents of fresh and stored zabady drink as affected by using different starter cultures. (Average ± SE of 3 replicates)

Property	Storage period (days)	Treatments*			
		control	I	II	III
SN, %	Fresh	0.14 ± 0.02^{a}	0.13 ± 0.05^{ab}	0.14 ± 0.09^{a}	0.13 ± 0.05^{ab}
	3	0.15 ± 0.05^{ab}	0.15 ± 0.03^{ab}	0.16 ± 0.00^{a}	0.14 ± 0.07^{b}
	5	0.18 ± 0.03^{ab}	0.18 ± 0.07^{ab}	0.20 ± 0.02^{a}	0.17 ± 0.08^{b}
	10	0.24 ± 0.01^{a}	0.20 ± 0.08^{b}	0.23 ± 0.01^{a}	0.19 ± 0.09^{bc}
	14	0.28 ± 0.07^{a}	0.25 ± 0.01	0.29 ± 0.03^{a}	0.21 ± 0.00
TVFA**	Fresh	6.45 ± 0.22^{a}	6.38 ± 0.34^{b}	6.45 ± 0.07^{a}	6.33 ± 0.18^{c}
	3	6.62 ± 0.51^{b}	6.45 ± 0.22^{cd}	6.73 ± 0.08^{a}	6.54 ± 0.15^{c}
	5	6.89 ± 0.07^{a}	6.75 ± 0.26^{b}	6.90 ± 0.21^{a}	6.77 ± 0.20^{ab}
	10	7.15 ± 0.31^{ab}	6.93 ± 0.37^{bc}	7.22 ± 0.25^{a}	6.98 ± 0.31^{b}
	14	7.50 ± 0.04^{a}	7.25 ± 0.09^{b}	7.45 ± 0.20^{a}	7.05 ± 0.25^{bc}
Acetaldehyd***	Fresh	80.51 ± 0.30^{a}	76.28 ± 0.35^{b}	81.00 ± 0.83^{a}	73.76 ± 0.90^{bc}
	3	85.33 ± 0.7^{a}	80.57 ± 0.09^{ab}	87.82 ± 0.71^{a}	75.95 ± 0.83^{b}
	5	92.37 ± 0.85^{b}	87.35 ± 0.55^{bc}	95.20 ± 0.52^{a}	80.31 ± 0.52^{c}
	10	105.85 ± 0.22^{b}	100.73 ± 0.35^{c}	110.77 ± 0.45^{a}	92.56 ± 0.62^{d}
	14	101.62 ± 0.11^{ab}	97.52 ± 0.07^{b}	105.20 ± 0.07^{a}	90.37 ± 0.51^{c}

*** See legend to Table (1) for details.**
**** Determined as ml 0.1 N-NaOH/ 100 g sample**
***** Determined as μ mol/ 100 g sample.**
Averages (a, b, ... etc) within the same row with different superscripts differed significantly(P<0.05).

The results given in Table (4) for total volatile fatty acids content revealed a slight differences between fresh treatments. Prolonging of storage period led to a remarkable differences between treatments during storage. The maximum TVFA contents were recorded in control, and II had the nearest

value to control, still treatment III recorded a lowest values according to starter activity as in above mentioned parameters, this agrees with the finding of *Sakr (2004)* and *El-Asfory (2007)*.

The same Table show the changes in acetaldehyde, contents in fresh and stored zabady drink as affected by using different starter cultures. It is obvious from the data that, in fresh samples all treatments had a significant differences between fresh samples. Using starter culture in treatment II caused a significant increase in the production of acetaldehyde specially after storage, whereas, treatment III had the lowest values. The recorded values were gradually increased by increasing of storage period until 10 days then decreased for all treatments. These results were agree with those finding by *Mehanna et al., (1988)* and *El-Ghandour (2008)*.

Data displayed in Table (5) demonstrated the amount of whey exuded (ml) from zabady drink as affected by using different starter cultures in fresh and during storage in refrigerator. There was no whey separation in all treatments and control in fresh case. After 5 days, control exuded a high amount of whey than the other treatments and continued until the end of storage period. The differences between control and treatments were significant. On the other hand, remarkable differences in whey exuded between the three treatments were observed during storage especially after 10 to 14 days. Treatment III caused a significant increase in the amount of whey exuded, specially after storage, and II had the lowest. Increasing the amount of whey exuded in all treatments in refrigerator was in agreement with *Hatem (1996)*, and *El-Ghandour (2008)*.

Table (5): Amount of whey exuded (ml) and viscocity from the same volume of zabady drink as affected by using different starter cultures storage in refrigerator. (Average ± SE of 3 replicates)

Property	Storage period (days)	Treatments*			
		control	I	II	III
whey exuded	Fresh	Nil	Nil	Nil	Nil
	3	0.25 ± 0.1^{a}	Nil	Nil	Nil
	5	0.80 ± 0.4^{a}	0.30 ± 0.2^{c}	0.30 ± 0.1^{c}	0.45 ± 0.3^{b}
	10	1.90 ± 0.5^{a}	1.00 ± 0.3^{bc}	0.80 ± 0.2^{c}	1.20 ± 0.4^{b}
	14	3.60 ± 0.2^{a}	2.20 ± 0.4^{bc}	1.60 ± 0.1^{c}	2.50 ± 0.3^{b}
viscosity	Fresh	59.31 ± 0.3^{b}	60.11 ± 0.2^{a}	58.78 ± 0.4^{bc}	60.22 ± 0.3^{a}
	3	54.81 ± 0.3^{b}	56.75 ± 0.2^{a}	57.00 ± 0.3^{a}	54.60 ± 0.2^{bc}
	5	50.46 ± 0.1^{b}	53.94 ± 0.3^{ab}	54.21 ± 0.4^{a}	51.30 ± 0.2^{b}
	10	46.70 ± 0.4^{cd}	49.25 ± 0.1^{b}	51.70 ± 0.2^{a}	47.12 ± 0.3^{c}
	14	41.00 ± 0.2^{d}	46.76 ± 0.4^{b}	50.10 ± 0.3^{a}	44.10 ± 0.1^{c}

*** See legend to Table (1) for details.**
Averages (a, b, ... etc) within the same row with different superscripts differed significantly (P<0.05).

Values of viscosity are shown in Table (5) of fresh and stored zabady drink as produced by using different starter cultures. In fresh case, there were a slight differences between control and other treatments. The viscosity trend decreased during storage, but treatment II gave zabady drink with viscosity

higher than that made using the conventional starter and other treatments.

This means that this starter have a greater role in improving the viscosity of zabady drink, the reason could be due to the production of EPS's by mixed cultures at a faster rate, because EPS's have excellent water-binding properties, and moisture retention. This was supported by *Bouzar et al., (1997).*

Using trained taste panels, assessment of the four treatments showed that small sensory differences were claimed between treatments and the total score slightly decreased during storage period (fresh had higher score than stored zabady drink). Treatment II had a high total score (flavor, body & texture, appearance) in fresh and stored than others.Treatment II seemed to have a greater influence on the physical properties than the others, the possible reason could be due to production of EPS's by mixed cultures at a faster rate, because EPS's have excellent water-binding properties, and moisture retention. This was supported by *Bouzar et al., (1997).* In a similar study on yoghurt, apparent viscosity increased in samples containing EPS-producing bacteria compared to non EPS-producing bacteria *Kosikowska et al., (1979).*

All treatments exhibited higher syneresis on day 0 than 14, whereas control had higher syneresis than others.

Table (6): Organoleptic properties of fresh and stored zabady drink as affected by using different starter cultures.
(Average of 10 panelists and from 3 replicates)

Property**	Storage period (days)	Treatments*			
		control	I	II	III
Flavour (50)	fresh	45	47	48	48
	3	42	46	46	47
	5	40	44	45	45
	10	39	42	43	42
	14	38	40	42	40
Body & Texture (35)	fresh	32	33	34	34
	3	30	32	33	33
	5	29	32	33	32
	10	27	30	32	31
	14	25	30	32	30
Appearance (15)	fresh	15	15	15	15
	3	15	15	15	15
	5	13	15	15	15
	10	12	14	14	14
	14	10	14	14	13
Total (100)	fresh	92	95	97	97
	3	87	93	94	95
	5	82	91	93	92
	10	78	86	89	87
	14	73	84	88	83

*** See legend to table (1) for details.**
**** Values in parenthesis represent the maximum attainable score.**

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دراسة على جودة مشروب الزبادى المصنع باستخدام بادئات منتجة للسكريات العديدة

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يهدف هذا البحث الى مقارنة استخدام ثلاثة أنواع من البادئات المنتجة للسكريات العديدة فى تصنيع مشروب الزبادى حيث صممت كالاتى:-

الكنترول باستخدام بادىء الزبادى العادى و البكتين.

المعاملة الأولى باستخدام (Yo Mix 495) المكون من *S. thermophilus* + *L. bulgaricus*.

المعاملة الثانية باستخدام (Yo Mix 205) المكون من *S. thermophilus* + *L. acidophilus* + *Befedobacterium lactis*.

المعاملة الثالثة باستخدام Star six عبارة عن *S. thermophilus*

وأضيفت البادئات بنسبة ٠,٠٥/ لتر على التوالى وقورنت بالكنترول وتم تحليل المنتج النهائى طازجا وعلى فترات من التخزين فى الثلاجة حتى ١٤ يوما

وتم التوصل الى النتائج التالية:

حدثت زيادة معنوية فى نشاط البادئ وتمثل ذلك فى زيادة قيم الحموضة و انخفاض الرقم الهيدروجينى بالبادئات المستخدمة سواء كان مشروب الزبادى طازج أو مخزن.

لم يكن هناك تأثيرا معنويا على محتوى مشروب الزبادى الطازج من الدهن و الجوامد الكلية و البروتين الكلى بينما حدثت زيادة طفيفة غير معنوية فى الغالب خلال فترة التخزين.

زاد المحتوى من الأحماض الدهنية الطيارة و النيتروجين الذائب زيادة معنوية لمشروب الزبادى الطازج بزيادة فترة التخزين لزيادة معدل التحلل الدهنى و البروتينى و كانت هذه الزيادة أكثر وضوحا مع المعاملة رقم (٢).

تأثر المحتوى من الأسيتالدهيد معنويا بالمعاملات المذكورة وكان أعلى محتوى للمعاملة رقم (٢).

لم يكن هناك اختلافات معنوية بين العينات الطازجة من حيث المحتوى من الشرش المنفصل ولكن ظهرت الفروق مع زيادة فترة التخزين وكانت المعاملة رقم (٢) الأقل.

أخذت اللزوجة عكس اتجاه الشرش المنفصل وخاصة مع تقدم فترة التخزين.

حصل مشروب الزبادى الطازج على أعلى الدرجات فى جميع الخواص الحسية بينما حدث انخفاض فى جميع الخواص خلال فترة التخزين ومن النتائج السابقة نستنتج أن استخدام المعاملة رقم (٢) التى تحتوى على خليط من السلالات كانت الأفضل و لها أثر فى تحسين خواص وتركيب مشروب الزبادى الناتج.