Zagazig J. Agric. Res., Vol. 44 No. (2) 2017 583-590

Food and Dairy Research

http:/www.journals.zu.edu.eg/journalDisplay.aspx?JournalId=1&queryType=Master

IMPROVING PROPERTIES OF NON-FAT YOGHURT USING FAT REPLACERS

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Received: 02/01/2017 ; Accepted: 31/01/2017

ABSTRACT: The effect of adding different levels of fat replacers either "Dairy Lo" or "Maltrin" on the quality of nonfat yoghurt was studied. "Dairy Lo" or "Maltrin" were added to nonfat milk yoghurt at levels of 0.5 and 1%. Results showed that addition of fat replacers did not significantly affect the chemical composition of resultant nonfat yoghurt and increased the soluble nitrogenous compounds, formation of acetaldehyde, diacetyle and total volatile fatty acids (flavour compounds). Also, addition of fat replacers, improved rheological properties: (syneresis and viscosity of yoghurt). On the other hand, addition of both "Dairy Lo" and "Maltrin" increased the organoleptic properties of yoghurt. Maltrin was more effective in this respect. Overall, the nonfat yoghurt containing 0.5 and 1% Maltrin was similar in quality characteristics to full fat control yoghurt. So, it could be recommended using some fat replacers especially Maltrin to improve the flavour formation and body characteristics of nonfat yoghurt.

Key wards: Yoghurt, dairy lo, maltrin, organoleptic properties, low fat yoghurt.

INTRODUCTION

In recent years, low fat and non-fat dairy products including yoghurt have gained popularity because of consumer awareness about health concerns related to decreasing the risks connected with obesity and coronary heart diseases (Sandoval *et al.,* 2004). However, the partial or total removal of fat from yoghurt decreases the overall quality perceived by the consumers (Folkenberg and Martens, 2003). It was reported that reduction of fat content in yoghurt resulted in lower gel strength and firmness than full fat yoghurt, as a consequence of lower number of fat globules embedded in the protein network (Duboc and Mollet, 2003).

To improve textural and functional properties of non-fat yoghurt, the use of some additives has been widely investigated (Cayot *et al*., 2007). Fat replacers can be successfully used in the manufacture of reduced fat dairy products such as cheese, ice cream and yoghurt (Barrantes *et al*., 1994). Fat replacer is an ingredient that can be used to provide some or all the function of fat, yielding fewer calories (Tubasanli, 2015). Also, fat replacers can be used to solve some physical and textural problems originating from low-fat level in the dairy products. Dairy-Lo is a protein-based fat replacer which has a GRAS (Generally Recognized as Safe) status derived from whey protein concentrate (Kök-Tas and Cüzel, 2010).

Some investigators tried to improve the textural problem of nonfat low calorie yoghurt and low fat soft, semi hard and hard cheeses by incorporating certain additives *e.g.* various fat mimetic (Sucrose polyester, microparticulated protein-based fat replacers "Dairy Lo", carbohydrate-based fat replacers "Maltrin", emulsifying agent "soy lecithin" and whey protein concentrate (Kebary *et al*., 2006).

The objective of this study was to improve the nonfat yoghurt quality by using two types of fat replacers, *i.e.* Dairy Lo or Maltrin.

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MATERIALS AND METHODS

Materials

Milk

Fresh whole buffalo's milk was obtained from Dairy Technology Unit, Food Science Department, Faculty of Agricultural, Zagazig University.

Starter cultures

Yoghurt culture containing *Streptococcus salivarius* subsp. *thermophilus* EMCC104 and *Lactobacillus delbruekii* subsp. *bulgaricus* EMCC1102 Were obtained from the Microbiological Resources Center (MIRCEN), Faculty of Agric., Ain Shams Univ., Egypt.

Fat replacers

Two types of fat replacers have been used in this study:

A Protein-based fat replacer "Dairy Lo", consists of microparticulated whey protein concentrate, was obtained from the Nutra Sweet Company, California, USA, and Carbohydrate-based fat replacer "Maltrin " was obtained from FMC Corp, Philadelphia, PA, USA.

Manufacture of nonfat yoghurt

Fresh bulk buffalo's milk was separated to skim-milk and cream. Cream was used to standardize the percentage of milk fat. Milk containing 3% fat was used in the preparation of control low fat yoghurt (C1). Nonfat buffalo's milk was divided into 5 portions (4 kg each). The first portion was left without additives as a second control (C2), Dairy Lo was added to the other two portions at the rate of 0.5 and 1% (T1 and, T2). Maltrin was added to the other two portions at the same rate 0.5 and 1% (T3 and T4). Each milk treatment was heated at 90˚C for 15 min, and then cooled to 42 ± 1˚C, inoculated with 2% of yoghurt starter culture, filled in plastic cups and incubated at 42˚C until a uniform coagulation was obtained. The resultant yoghurt from all treatments were stored at 5-7 ± 1˚C and analyzed after 1, 3, 6 and 12 days of storage for chemical composition rheological measurements and sensory evaluation. Results were also statically analysed.This experiment was carried out in triplicates.

Methods of analyses

Resultant yoghurt from all treatments were chemically analyzed for total solids, fat and titratable acidity as described by AOAC (2007). pH value was measured in all samples using a digital pH meter. Total and soluble nitrogen percentages were determined by semi-micro Kjeldhel method as described in the AOAC (2007). Acetaldehyde and diacelyle contents in all yoghurt treatments were determined as described by Less and Jago (1969). Acetaldehyde reacts with semi-carbazide to form semi-carbazone which has absorption value at 224 nm wave length meanwhile diacetyle has an absorption value at 270 nm. Total volatile fatty acids (TVFA) of all yoghurt treatments were estimated according to Kosikowski (1978).

Rheological Measurements

Syneresis

The released whey from yoghurt samples was measured according to the method of Aryana (2003). The quantity of whey collected from every sample in graduated cylinder after 2 h of drainage at 20˚C was used as an index of syneresis.

Viscosity

The viscosity of yoghurt samples were measured by the method of Aryana (2003) using Rotational Viscometer Type Lab. Line Model 5437. Results were expressed as Cps.

Sensory evaluation

Yoghurt samples were organoleptically examined after refrigeration storage for 1, 3, 6 and 12 days for flavour, body and texture, appearance, and acid taste represented by 45, 35, 10 and 10 degree, respectively according to Hamdy *et al*. (1972).

Statistical Analysis

Statistical analysis of the obtained data was carried out according to the method described by Clarke and Kempson (1997). Least significant differences (LSD) at 0.05 level was done.

RESULTS AND DISCUSSION

Chemical Composition

Table 1 shows that yoghurt made from milk containing 3% fat (C1) had the highest total solids (TS) and it was significantly ($P<0.05$) different from all yoghurt treatments, while the nonfat yoghurt (C2) exhibited the lowest TS content. This decrease in TS may be due to the low fat content in yoghurt milk. The TS content of nonfat yoghurt containing fat replacers either Dairy Lo or Maltrin increased by increasing the percentage added. However, the TS content of yoghurt from all treatments slightly increased during the storage period (Abd El-Salam *et al*., 1996; Omar and Abou El-Nour 1998; Kebary and Hussein, 1999; Hussein *et al*., 2004). The protein-based fat replacer (Dairy Lo) had the same effect of carbohydrate-based fat replacer (Maltrin) on the TS content of nonfat yoghurt treatments.

Also Table 1 shows that the nonfat yoghurt had a slight increase in the total protein (C2) compared with yoghurt control (C1). The total protein of nonfat yoghurt with fat replacers slightly increased by increasing the percentage added especially when the protein-based fat replacer (Dairy Lo) was used. On the other hand, the total protein of all treatments did not significantly change throughout the storage periods (Barrantes *et al*., 1994; Kebary and Hussein, 1999 ; Mehana *et al*., 2000).

Table 1 show that, the yoghurt (C1) contained the highest fat content significantly ($P<0.05$) compared with other treatments. On the other hand, addition of fat replacers to nonfat milk did not affect the fat content of the resultant yoghurt. The fat content of all treatments slightly increased as the storage period progressed.

The rate of proteolysis expressed as SN/TN (%) is illustrated in Table 2. The results show that, the rate of proteolysis slightly decreased in nonfat yoghurt (C2). These results are in agreement with Mehana *et al*. (2000). However, SN/TN (%) of yoghurt containing Dairy Lo gradually increased with increasing the percentage of Dairy Lo during the storage period (Zedan *et al*., 2001). On the other hand, nonfat yoghurt containing Maltrin had less effect on the proteolysis of the resultant yoghurt. During storage, the proteolysis increased in all treatments, this may be due to the limited hydrolysis of milk protein by lactic acid bacteria (Rasic and Kurmann, 1978 ; Hussein *et al*., 2004).

Slight differences were observed in the titratable acidity (%) of yoghurt between different treatments. The absence of fat slightly increased acidity with addition of fat replacer (Dairy Lo or Maltrin) with different concentrations as shown in Table 2, the titratable acidity slightly increased up to the end of storage period as observed for all yoghurt samples.

Changes in pH value of yoghurt from different treatments as affected by addition of fat replacers or by storage period followed almost opposite trend to acidity (Table 2). These results agree with Zedan *et al.* (2001) and Kebary *et al*. (2004).

Flavour compounds: some flavour compounds of yoghurt treatments were assessed by the determination of some volatile compounds *e.g.* acetaldehyde, diacetyle and total volatile fatty acids (TVFA) which have been reported as flavour compounds in yoghurt (Tamine and Deeth, 1980). It is evident from Table 3 that, nonfat yoghurt treatments significantly had lower flavour compounds than in full fat yoghurt. Treatments of nonfat yoghurt with fat replacers (Dairy Lo or Maltrin) especially at higher concentration had slight effect on these compounds. On the other hand, it was found that acetaldehyde values decreased as storage period progressed for all treatments, also diacetyle values increased up to 7 day of storage period and then decreased as storage period progressed. This may be due to the ability of lactic microorganisms to hydrolyse acetaldehyde and diacetyle to acetone (Zedan *et al.,* 2001; Tubasanli, 2015).

Total volatile fatty acids (TVFA) contents in all yoghurt samples increased during storage periods. This could be attributed to limited proteolytic and lipolytic action of yoghurt starter cultures during processing and storage of yoghurt. Similar results were obtained by Mehana *et al*. (2000). However, Dairy Lo had higher effect than Maltrin in this respect. These results agree with (Tubasanli, 2015).

Table 1. Chemical composition of nonfat yoghurt containing fat replacers

Yoghurt sample	Total solids (%)				Total protein (%)				Fat (%)			
	Storage period (day)				Storage period (day)				Storage period (day)			
	1	3	6	12	1	3	6	12	1	3	6	12
C1	11.50	12.10	12.61	13.06	3.49	3.67	3.82	4.12	3.10	3.12	3.15	3.22
C2	8.91	9.65	10.10	10.42	3.75	4.02	4.20	4.32	0.10	0.14	0.22	0.24
T1	9.35	10.02	10.50	10.67	3.94	4.19	4.37	4.44	0.10	0.13	0.20	0.24
T2	10.12	10.60	10.82	11.13	4.12	4.42	4.58	4.66	0.10	0.15	0.24	0.28
T3	9.61	10.12	10.63	11.04	3.80	4.16	4.34	4.50	0.20	0.18	0.28	0.32
T4	10.20	11.86	11.14	11.40	3.84	4.18	4.40	4.55	0.20	0.16	0.25	0.30
LSD	0.319	0.066	0.273	0.021	0.273	0.021	0.273	0.020	0.021	0.210	0.273	0.210

C1 = Control low fat yoghurt from buffaloes' milk containing 3% fat.

C2 = Nonfat yoghurt without fat replacer.

T1 and T2 : Nonfat yoghurt containing fat replacer (Dairy Lo) at the rate of 0.5 and 1%.

T3 and T4 : Nonfat yoghurt containing fat replacer (Maltrin) at the rate of 0.5% and 1%.

NS: Not significant.

Table 2. Proteolysis as SN/TN (%), Titratable acidity (%) and pH value of nonfat yoghurt containing fat replacers

Yoghurt sample	SN/TN (%)				Titratable acidity (%)				pH value			
	Storage period (day)				Storage period (day)				Storage period (day)			
	1	3	6	12	1	3	6	12	1	3	6	12
C1	5.88	7.18	7.38	7.93	0.80	0.86	0.90	0.96	4.43	4.27	4.10	3.96
C2	4.32	7.28	5.42	5.78	0.85	0.90	0.94	1.12	4.37	3.96	3.92	3.72
T1	7.88	8.22	8.42	9.20	0.87	0.92	0.96	1.14	4.35	3.94	3.90	3.70
T2	8.14	8.79	9.26	10.05	0.90	0.95	0.98	1.18	4.38	3.92	3.88	3.68
T3	4.75	5.26	5.60	5.82	0.92	0.95	0.96	1.22	4.35	3.90	3.90	3.66
T4	4.75	5.28	5.62	5.84	0.95	0.94	0.98	1.24	4.38	3.92	3.80	3.64
LSD	0.510	0.446	0.432	0.520	0.021	0.021	0.021	0.132	0.021	0.021	0.066	0.132

Table 3. Flavour compounds of nonfat yoghurt containing fat replacers

Yoghurt sample	Acetaldehyde (µg/100 ml)				Diacetyle (µg/100 ml)				Total volatile fatty acids (0.1 N-NaOH/100 g)			
	Storage period (day)				Storage period (day)				Storage period (day)			
	1	3	6	12	1	3	6	12	1	3	6	12
C1	29.50	29.00	26.50	25.00	59.00	61.00	63.0	59.0	6.50	8.70	9.80	11.18
C2	20.00	18.00	15.00	13.00	40.00	46.00	48.0	41.0	1.30	2.20	3.10	3.62
T1	21.20	20.00	19.00	18.20	42.00	45.00	47.0	43.0	2.60	4.20	5.68	6.66
T2	21.32	20.80	20.18	19.30	42.00	48.00	52.0	46.0	2.80	4.76	5.90	6.90
T3	19.00	18.50	16.00	14.00	40.00	45.00	49.0	40.0	2.30	3.12	3.82	4.32
T4	20.26	19.50	18.60	14.40	40.00	46.00	51.0	42.0	2.40	3.20	3.90	4.34
LSD	0.5559	0.6232	0.3186	0.4698	0.0210	0.7458	0.278	0.209	0.2201	0.2660	0.6021	0.5210

Rheological Properties

Syneresis

Measurement of whey syneresis was carried out after 2 hrs drainage. Separation of whey increased by decreasing the fat content in yoghurt but yoghurt containing fat replacers (Dairy Lo or Maltrin) significantly reduced whey syneresis compared with nonfat yoghurt without additives (C2). Whey syneresis decreased with increasing the percentage of fat replacers during the storage period (Table 4). These results might be due to increasing the water holding capacity by fat replacers in the resultant yoghurt. Separation of whey (syneresis) from all yoghurt treatments decreased gradually as storage period progressed. These results agree with (Hussein *et al*., 2004; Radi *et al*., 2009; Nikoofar *et al*., 2013).

On the other hand, Maltrin showed higher effect on reduction of yoghurt syneresis than Dairy Lo. Tubasanli (2015), reported that low fat yoghurt with a carbohydrate-based fat replacer had a network structure more similar to full fat yoghurt than samples made with protein-based fat replacer.

Viscosity of nonfat yoghurt made with fat replacers (Dairy Lo or Maltrin) is shown in Table 4. Nonfat yoghurt samples were significantly less viscous than full fat yoghurt (control) but the use of fat replacers (Dairy Lo or Maltrin) significantly increased ($P \geq 0.05$) the viscosity of the resultant yoghurt. The increase of viscosity was slightly proportional to the rate of additions. This increase could be attributed to the water hydration of Dairy Lo or Maltrin. (Hussein *et al*., 2004; Radi *et al*., 2009). Maltrin treatments had higher viscosity than Dairy Lo treatments. Viscosity of all treatments increased gradually when the storage periods progressed, Tubasanli (2015) compared using both a carbohydrate-based fat replacer and protein-based fat replacer in manufacture of low fat yoghurt and found that low fat yoghurt with a carbohydrate-based fat replacer had a network structure more similar to full fat yoghurt than samples made with protein-based fat replacer.

Sensory evaluation

Scores of organoleptic properties (flavour, body and texture, appearance, acid taste and total scores) of nonfat yoghurt without additives or with added fat replacers (Dairy Lo or Maltrin) are shown in Table 5. It is evident from these results that, nonfat yoghurt without additives (C2) gained the lowest scores for organoleptic properties. Addition of fat replacers (Dairy Lo or Maltrin) to nonfat yoghurt improved the organoleptic properties and this improvement was proportional to the fat replacers ratio. Nonfat yoghurt containing Maltrin (0.5% or 1%) showed similar scores to the full fat yoghurt (control), but nonfat Dairy Lo treatments at the

Table 4. Whey syneresis and viscosity of nonfat yoghurt containing fat replacers

Yoghurt sample	Whey syneresis (ml/100 g)				Viscosity (Cps)			
	Storage period (day)				Storage period (day)			
	1	3	6	12	1	3	6	12
C1	29.00	25.00	22.00	20.00	5100	5500	5800	5900
C2	37.00	35.00	32.00	30.00	4000	4200	4380	4500
T1	35.00	33.00	30.00	28.50	4200	4380	4450	4600
T2	32.00	31.00	28.00	26.00	4350	4420	4540	4630
T3	31.00	29.00	25.00	24.00	4540	4630	4720	4850
T4	30.00	28.00	23.00	21.50	4600	4710	4830	4920
LSD	0.306	0.021	0.701	0.701	0.021	0.340	0.021	0.021

Table 5. Sensory evaluation of nonfat yoghurt containing fat replacers

Yoghurt sample	Flavour (45)				Body and texture (35)				Appearance (10)				Acidity (10)				Total score (100)			
	Storage period (day)				Storage period (day)				Storage period (day)				Storage period (day)				Storage period (day)			
	1	3	6	12	1	3	6	12	1	3	6	12	1	3	6	12	1	3	6	12
C1	44	44	43	40	34	34	33	32	9	9	9	8	9	8	7	6	95	94	92	86
C2	35	33	32	30	27	26	24	22	6	6	5	5	8	7	6	5	76	73	69	62
T1	38	36	35	33	29	29	28	26	6	6	6	6	8	7	6	5	81	78	75	70
T2	40	38	36	35	31	30	28	27	7	7	6	6	8	7	6	5	86	82	76	73
T3	40	40	38	36	30	30	29	28	7	7	7	7	9	8	7	6	86	85	81	77
T4	42	41	40	38	32	31	31	30	8	7	7	7	9	8	6	5	90	86	83	80
LSD	0.338	0.027	0.021	0.0210	0.745	0.021	0.680	0.0210	NS	0.338	0.021	0.021	NS	0.021	0.021	0.021	0.525	0.036	0.412	0.321

same rate gained less scores compared with Maltrin treatments. The scores of all yoghurt treatments decreased gradually up to the end of storage period. These results are in agreement with those reported by Hussein *et al*. (2004), Marjan *et al.* (2011) and Tubasanli (2015).

From the forgoing result, it could be recommended to added Maltrin, as fat replacer, to improve flavour and body and texture of nonfat yoghurt.

REFERENCES

Abd El-Salam, M.H., H.M. El-Etriby and N.M. Shahein (1996). Influence of some stabilizers on some chemical and physical properties of yoghurt. Egypt. J. Dairy Sci., 24: 25 – 36.

AOAC (2007). Association of Official Analytical Chemists-official Method of Analysis (18th Ed.), Benjamin Franklin Station Washington, DC, USA.

Aryana, K.J. (2003). Folic acid fortified fat free plain set yoghurts. Int. J. Dairy Technol., 56: 219-222.

Barrantes, E., A.Y. Tammime, G. Davies and M.N. Barclay (1994). Production of low-calorie yogurt using skim milk powder and fat-substitutes 2: Compositional quality. Milchwissenchaft, 49:135-139.

Cayot, P., F. Schenker, G. Houze, C. Sulmont-Rosse and B. Colas (2007). Creaminess in relation to consistency and particle size in stirred fat-free yogurt. Int. Dairy J., 18 : 303-311.

Clarke, G.M. and R.E. Kempson (1997). Introduction to the Design and Analysis of Experiment. Arnold, a member of the holder headline group, 1st Ed., London, UK.

Duboc, P. and B. Mollet (2001). Applications of exopolysaccharides in the dairy industry. Int. Dairy J., 11: 759-768.

Folkenberg, D.M and M. Martens (2003). Sensory properties of low fat yogurts. Part A: Effect of fat content, fermentation culture and addition of non-fat dry milk on the sensory properties of plain yogurts. Milchwissenschaft, 58: 48-51.

Hamdy, A.M., L.A. El-Kousey and R. Abdel-Latif (1972). A study in the fermented milk (zabady). Agric., Res., Rev., 50: 159-168.

Hussein, S.A., R.M. Badawi, and I.I. Badran (2004). Quality of fat free yoghurt made with fat replacer. Minufiya J. Agric. Res., 29: 1295 – 1315.

Kebary, K.M.K. and S.A. Hussein (1999). Manufactur of low fat zabady using different fat replacers. Acta Alimetaria, 28: 1 – 14.

Kebary, K.M.K., A.I. Hamed, A.N. Zedan, and A.A.F. El-Beheary (2006). Manufacture of low fat Domiati cheese using Novagel Reg. Egypt. J. Dairy Sci., 34: 175 – 184.

Kebary, K.M.K., S.A. Hussein and R.M. Badawi (2004). Impact of fortification of cow's milk with a modified starch on yoghurt quality. Egypt. J. Dairy Sci., 32: 111 – 124.

Kök-Taş, T. and Z. Cüzel (2010). Determination of effects of using fat replacers and probiotic on Ayran quality. J. Food, 35 (2):105-11.

Kosikowski, F.V (1978). Cheese and Fermented Milk Foods 2nd Ed, cornell Univ., Inthacu, New York, USA.

Less, G.J. and G.R. Jago (1969). Methods for the estimation of acetaldehyde in culture dairy products. Aust. J. Dairy Technol., 24: 181.

Marjan, N., H. Ezzatpanah and S. Abbasi (2011). Application of renneted skim milk as a fat mimetics in nonfat yoghurt. Food and Nutr. Sci, 2, 541-548.

Mehana, N.M., M.T. Saleh, S.A Mehanna and M.A. El-Asfory (2000). The quality of low calorie bufaloe Zabady. Egypt. J. Dairy Sci., 28 : 59 – 71.

Nikoofar, E., M. Hojjatoleslamy and A. Shakerian (2013). Surveying the effect of oat beta glucan as a fat replacer on rheological and physicochemical characteristics of nonfat set yoghurt. IJFAS J., 2 (20): 790-796.

Omar, M.M. and Abou El-Nour (1998). Rheological properties of yoghurt enriched with whole milk protein. Egypt. J. Dairy Sci., 26 : 77 – 88.

Radi, M., M. Niakousari and S. Amiri (2009). Physicochemical, textural and sensory properties of low-fat yogurt produced by using modified wheat starch as a Fat Replacer. J. App. Sci., 9: 2194-2197.

Rasic, J.L. and J.A. Kurmann (1978). Yoghurt, Scientific Grounds, Technology, Manufacture and Preparations. Technical dairy publishing house, Copenhagen, Denmark, 445-460.

Sandoval, C.O., C. Lobato-Calleros, E.A. Mandujano and R.J. Vernon-Carter (2004). Microstructure and texture of yogurt as influence by fat replacers. Int. Dairy J., 14: 51-159.

Tamine, A.Y. and H.L. Deeth (1980). Yoghurt, technology and biochemistry, J. Food Prot., 43 : 939 – 977.

Tubasanli (2015). Effects of using transglutaminase and fat replacer on functional properties of non-fat yoghurt. Kafkas Univ. Vet. Fak. Derg., 21 (6): 907-913.

Zedan, M.A., A.N. Zedan, K.M.K. Kebary and S.F. Mahn (2001). Effect of fortification of cow's milk with acetylated whey protein concentrates on the quality of set yoghurt. Egypt. J. Dairy Sci., 29: 285 - 297.

تحسين خواص اليوغورت خالى الدسم باستخدام بدائل الدهون

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تم دراسة تأثير إضافة بعض بدائل الدهون (Maltrin or Dairy Lo) إلى اللبن الجاموسى خالي الدسم والمستخدم فى صناعة اليوجورت بنسب ٠,٥ و ١% على خواص جودة اليوجورت خالي الدسم، وأظهرت النتائج أن إضافة بدائل الدهون لم تؤثر بشكل ملحوظ على التركيب الكيماوى لليوجورت خالى الدسم كما أدى إضافة بدائل الدهون إلى زيادة المركبات الآزوتية القابلة للذوبان والاسيتالدهيد والداى اسيتيل ومحتوى الأحماض الدهنية المتطايرة (مركبات النكهة)، والى تحسين الخواص الريولوجية مثل (معدل انفصال الشرش واللزوجة) وتحسين الخواص الحسية لليوجورت الناتج حيث كان اليوجورت خالى الدسم المضاف إليه ١% Maltrin مماثلاً في الخواص الحسية لليوجورت كامل الدسم (الكنترول)، لذا يستنتج مما تقدم أنه يمكن استخدام بعض بدائل الدهون خصوصاً Maltrin بمعدل ١% فى صناعة اليوجورت خالى الدسم حيث أدى استخدام Maltrin إلى إنتاج يوجورت خالى الدسم يحتوى على زيادة فى مركبات النكهة والى تحسين الخواص التركيبية والحسية عن اليوجورت خالى الدسم بدون إضافات.

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