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EFFECT OF REPLACING NON-FAT DRY MILK WITH GELATIN IN MAKING YOGHURT FROM COW'S MILK

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ABSTRACT

Ten batches of yoghurt were made from cow's milk. Control yoghurt (C_1) was made from cow's milk fortified with 3.0% non-fat dry milk (the total equal eleven batches). Another five batches were made from cow's milk fortified with non-fat dry milk at the rate of 1.5% and 0.0, 0.3, 0.35, 0.40 and 0.45% gelatin (C_2, T_1, T_2, T_3 and T_4), respectively. The other five batches were made from cow's milk fortified with 0.0, 0.45, 0.50, 0.55 and 0.60% gelatin (C_3, T_5, T_6, T_7 and T_8), respectively. All yoghurt treatments were sampled at 1, 3, 6, 9 and 12 days of storage period for chemical, rheological and sensory evaluation. The results showed that reduction of non-fat dry milk caused a significant decrease in total solids, total protein, ash, lactose and acetaldehyde contents of yoghurt as well as scores of organoleptic properties. While it did not affect the fat content of yoghurt. Addition of gelatin to yoghurt milk improved the organoleptic properties and increased acetaldehyde content and titratable acidity, while decreased pH values. Adding of gelatin did not affect significantly total solids, total protein, fat, ash and lactose contents of yoghurt for each type of milk. Total solids, ash and titratable acidity increased as storage period progressed, while total protein, lactose and pH values decreased. Scores of organoleptic properties did not change as storage period advanced up to the sixth day, thereafter, decreased up to the end of storage period. Syneresis of whey decreased up to the sixth day of storage, then it increased as storage period progressed. Total bacterial, streptococci and lactobacilli counts increased during the first three days of storage period, then decreased up to the end of storage period.
Keywords: Yoghurt, non-fat dry milk, gelatin, sensory evaluation.

INTRODUCTION

Yoghurt is the most popular fermented milk produced in Egypt and worldwide. Its consumption in Egypt has been increased tremendously. The value of yoghurt in human nutrition is based, non only on the nutritive value of the milk from which it is made and increased digestibility, but also on the beneficial effect of intestinal microflora, prophylactic and healing effects (Rasic & Kurman, 1978 and Buttriss, 1997).

Many health benefits have been attributed to yoghurt such as improved lactose tolerance, protection against gastrointestinal infections, effective treatment for specific types of diarrhea, relief of constipation, improved immunity, cholesterol reduction and protection against cancer (Rasic & Kurman, 1978; Agerbaek *et al.*, 1995; Schaafsma, 1996; Tvede, 1996 and Buttriss, 1997).

It is well known that making yoghurt from cow's milk has a weak body and texture. Therefore it has been recommended to fortify cow's milk with non-fat dry milk, stabilizers, whey products and ropy culture to

El-Salam *et al.*, 1996; Hassan *et al.*, 1999; Harby & El-Sabie, 2001 and Zedan *et al.*, 2001). Because of the higher price of non-fat dry milk and its availability at any time, other ingredients have been tried.

The objectives of this study were to evaluate the possibility of making a good quality yoghurt from cow's milk fortified with gelatin and to investigate the effects of the rate of replacing non-fat dry milk with gelatin on the physical, rheological, chemical and sensory evaluation of yoghurt.

MATERIALS AND METHODS

Starter culture:

Streptococcus salivarius subsp. *thermophilus* EMCC 1043 and *Lactobacillus delbrueckii* subsp. *bulgaricus* EMCC 1102 were obtained from Cairo Mircen (Ain Shams University, Egypt). These strains were activated by three successive transfers in sterile 10% reconstituted non-fat dry milk.

Manufacture of yoghurt:

Preliminary study was carried out to choose the best amount of non-fat dry milk that should be added to cow's milk to get the best yoghurt. The preliminary obtained results revealed that yoghurt made from cow's milk fortified with 3% non-fat dry milk was the most acceptable yoghurt.

Fresh cow's milk was obtained from the herd of Tokh Tanbisha Farm belonging to Fac. of Agric., Minufiya Univ. Milk was standardized to 3% fat and divided into eleven batches. One portion was used as a control and the milk was fortified with 3% non-fat dry milk (4).

Non-fat dry milk was added to five portions at the rate of 1.5%, one of them was used as control (C_2), while gelatin was added to the other four portions at each of them at the rate of 0.30, 0.35, 0.40 and 0.45% (T_1, T_2, T_3 and T_4), respectively. The other five portions were not fortified with non-fat dry milk, one of them was used as control (C_3), while the other four ones were fortified with gelatin at the rate of 0.45, 0.50, 0.55 and 0.60% (T_5, T_6, T_7 and T_8), respectively.

Non-fat dry milk was added to warm milk and all batches were heated to 85°C for 20 min. gelatin which was dissolved in some milk was added to heated milks. Heated milks were cooled to 40 ± 2°C, then inoculated with 1% of *S. thermophilus* subsp. and 1% of *Lactobacillus delbrueckii* subsp. *bulgaricus*. The inoculates batches were packed in plastic cups and incubated at 40 ± 2°C for 3.0-3.5 hrs. until the desirable acidity was evaluated. All batches were stored at 6 ± 1°C for 12 days and sampled for analysis were picked at days 1, 3, 6, 9 and 12 days. These experiments were done in triplicated.

Bacteriological analysis:

Total viable bacterial counts were enumerated on standard plate count agar (Messer *et al.*, 1985). MRS medium was used to enumerate *Lactobacillus delbrueckii* subsp. *bulgaricus* (de Man *et al.*, 1960). *S. salivarius* subsp. *thermophilus* was enumerated on yeast lactose agar (Skinner and Quesnel, 1978).

Rheological analysis:

Syneresis was determined according to the method of Dannenberg and Kessler (1988) with slight modification. Hundred grams yoghurt in plastic cup was cut into four sections and transferred into a funnel fitted with 120 mesh metal screen. The whey was drained into a graduated cylinder. The amount of whey drained off was measured after 15, 30, 45, 60, 90 and 120 min. at room temperature (20 $\pm$ 1°C) on yoghurt stored for one day and after 2 h on yoghurt stored for 3, 6, 9 and 12 days.

Chemical analysis:

Yoghurt samples were analyzed at the first and twelfth days for total solids, total nitrogen, fat, ash contents, while analyzed during storage for titratable acidity and pH and according to Ling (1963). Lactose was determined according to the method described by Nickerson *et al.* (1976), while acetaldehyde was determined according to Lees and Jago (1969).

Sensory evaluation:

Yoghurt samples were evaluated for flavour, appearance, acidity and body and texture by 15 panelists of the staff members of Dairy Sci. and Tech. Dep., Fac. of Agric. Minufiya Univ. Results were recorded in a score sheet described by Kebary and Hussein (1999). Samples were presented to judges in plastic cups in random order. Judges were provided with room temperature rinse water, plastic spoons and score sheets.

Statistical analysis:

2 × 3 factorial design were used to analyze the data. Duncan's test was used to make the multiple comparisons (Steel and Torrie, 1980). Significant differences were determined at $p \leq 0.05$.

RESULTS AND DISCUSSION

Syneresis of all yoghurt batches was determined at different times on the first day of storage. Whey separation from all yoghurt treatments increased by increasing the time up to 2 hours (Fig. 1). Similar results were reported by Harwalkar & Kalab (1983); Kebary & Hussein (1999) and Harby & El-Sabie (2001). Therefore, it has been decided to measure whey syneresis during storage of all yoghurt treatments for 2 hours. Decreasing the rate of fortifying cow's milk with non-fat dry milk caused a significant increase of whey syneresis (Fig. 2 and Table 5) (C_1, C_2 and C_3). Fortification of cow's milk with gelatin even a companied by decreasing non-fat dry milk caused a significant ($p \leq 0.05$) reduction of whey syneresis (Fig. 2 and Table 5). This reduction of whey separation was proportional to the amount added of gelatin to each type of milk (T_1, T_2, T_3 and T_4) and (T_5, T_6, T_7 and T_8). Although, T_2, T_3 and T_4 fortified with only 1.5% non-fat dry milk, they exhibited lower whey separation than C_1 that fortified with 3.0% non-fat dry milk. Similar results were observed for treatments T_7 and T_8 which were not fortified with non-fat dry milk, but fortified with 0.55 and 0.60% gelatin,

Table (1): Gross composition of yoghurt fortified with gelatin.

Yoghurt treatments*	Total solids (%)		Total protein (%)		Fat (%)		Lactose (%)		Ash (%)	
	1 day	12 day	1 day	12 day	1 day	12 day	1 day	12 day	1 day	12 day
C_1	14.68	15.06	4.52	4.48	3.30	3.20	4.72	4.09	0.99	1.07
C_2	12.31	12.46	4.04	3.99	3.20	3.10	3.96	3.18	0.92	0.96
T_1	12.58	12.71	4.29	4.24	3.20	3.10	3.94	3.21	0.95	0.96
T_2	12.61	12.75	4.33	4.30	3.20	3.10	3.95	3.20	0.95	0.97
T_3	12.70	12.78	4.38	4.32	3.20	3.10	3.93	3.22	0.96	0.97
T_4	12.74	12.84	4.43	4.37	3.20	3.10	3.94	3.22	0.96	0.98
C_3	11.72	12.18	3.72	3.68	3.10	3.00	3.11	2.51	0.83	0.86
T_5	11.99	12.48	3.99	3.94	3.10	3.00	3.13	2.53	0.84	0.86
T_6	12.04	12.56	4.04	4.01	3.10	3.00	3.11	2.53	0.84	0.88
T_7	12.44	12.63	4.08	4.05	3.10	3.00	3.14	2.52	0.85	0.89
T_8	12.49	12.70	4.13	4.07	3.10	3.00	3.12	2.53	0.85	0.90

* C_1 = yoghurt made from cow's milk fortified with 3.0% non-fat dry milk.

C_2, T_1, T_2, T_3 and T_4 = yoghurt treatments made from cow's milk fortified with 1.5% non-fat dry milk and 0.0, 0.30, 0.35, 0.40 and 0.45% gelatin respectively.

C_3, T_5, T_6, T_7 and T_8 = yoghurt treatments made from cow's milk without fortification with non fat dry milk, but fortified with 0.45, 0.50, 0.55 and 0.60% gelatin respectively.

Table (2): Changes in titratable acidity and pH values during storage of yoghurt fortified with gelatin.

Yoghurt treatments*	Titratable acidity (%)					pH value				
	Storage period (days)					Storage period (days)				
	1	3	6	9	12	1	3	6	9	12
C_1	0.96	1.08	1.13	1.22	1.26	4.63	4.33	4.18	4.04	3.98
C_2	0.88	0.96	1.04	1.16	1.18	4.68	4.36	4.20	4.12	4.10
T_1	0.90	0.97	1.05	1.18	1.20	4.61	4.33	4.17	4.12	4.10
T_2	0.93	1.01	1.08	1.20	1.22	4.56	4.32	4.16	4.08	4.00
T_3	0.97	1.03	1.10	1.22	1.24	4.49	4.30	4.16	4.05	3.98
T_4	1.00	1.06	1.12	1.22	1.24	4.37	4.26	4.12	4.02	3.96
C_3	0.83	0.91	0.98	1.05	1.13	4.70	4.43	4.28	4.19	4.13
T_5	0.85	0.94	1.02	1.09	1.17	4.68	4.38	4.25	4.17	4.11
T_6	0.88	0.96	1.06	1.11	1.20	4.66	4.35	4.21	4.13	4.10
T_7	0.92	1.00	1.09	1.13	1.24	4.62	4.30	4.19	4.09	4.06
T_8	0.94	1.01	1.12	1.15	1.26	4.60	4.28	4.18	4.04	4.00

* See Table (1).

respectively (Fig. 2 and Table 5). These results are in agreement with those reported by Abd El-Salam *et al.* (1996); Hassan *et al.* (1999); Harby & El-Sabie (2001). They found that addition of stabilizers to yoghurt milk decreased the whey separation from yoghurt. This reduction of whey syneresis might be due to increasing the water binding capacity of yoghurt curd. Whey separation of all yoghurt treatments decreased as storage period progressed up to the sixth day of storage period then increased. This increase might be due to the increasing of acidity during storage. Similar results were reported by Abd El-Salam *et al.* (1996); Hassan *et al.* (1999) and Kebary & Hussein (1999).

Gross composition of yoghurt is presented in Table (1). Total solids of yoghurt were significantly decreased ($p \leq 0.05$) by decreasing the rate of fortification of cow's milk with non-fat dry milk (Tables 1, 5). Control yoghurt that made with adding 3% non-fat dry milk had the highest total solids content followed with C_2 and C_3 (Tables 1, 5). On the other hand, fortification of cow's milk with gelatin did not affect significantly ($p > 0.05$) the total solids content of yoghurt either made with adding 1.5% non-fat dry milk (T_1, T_2, T_3 and T_4) or treatments which made without adding non-fat dry milk (T_5, T_6, T_7 and T_8) (Tables 1, 5). Total solids content of all yoghurt treatments increased significantly ($p \leq 0.05$) during storage period, which might be due to the evaporation of moisture. These results are in agreement with those reported by El-Nagar and Brennan (2001).

Table (3): Acetaldehyde content of yoghurt fortified with gelatin.

Yoghurt treatments*	Storage period (days)				
	1	3	6	9	12
C_1	33.1	35.2	34.3	27.1	24.1
C_2	30.0	32.1	33.1	26.8	22.6
T_1	31.3	32.9	29.2	23.9	20.4
T_2	32.9	35.0	32.4	27.4	23.2
T_3	33.8	35.8	31.6	27.6	23.9
T_4	34.2	36.2	33.8	28.2	24.1
C_3	28.6	30.1	33.1	25.9	23.2
T_5	29.3	31.8	28.5	22.6	19.9
T_6	30.4	32.6	29.3	23.4	21.3
T_7	31.0	33.9	30.1	26.6	23.6
T_8	31.9	35.0	32.2	28.2	24.2

* See Table (1).

Total protein content of yoghurt decreased significantly ($p \leq 0.05$) by decreasing the rate of fortification of cow's milk with non-fat dry milk (Tables 1, 5). Control yoghurt made with adding 3.0% non-fat dry milk contained the highest total solids followed by treatments C_2, T_1, T_2, T_3 and T_4 those made with adding 1.5% non-fat dry milk, then treatments C_3, T_5, T_6, T_7 and T_8 those made without fortification with non-fat dry milk (Tables 1, 5). Treatments C_2, T_1, T_2, T_3 and T_4 were not significantly ($p < 0.05$) different from each other. Also, treatments C_3, T_5, T_6, T_7 and T_8 were not significantly different from each other, which means that adding gelatin did not affect the protein content of yoghurt (Tables 1, 5) similar results were obtained by Mehanna and Mehanna (1989).

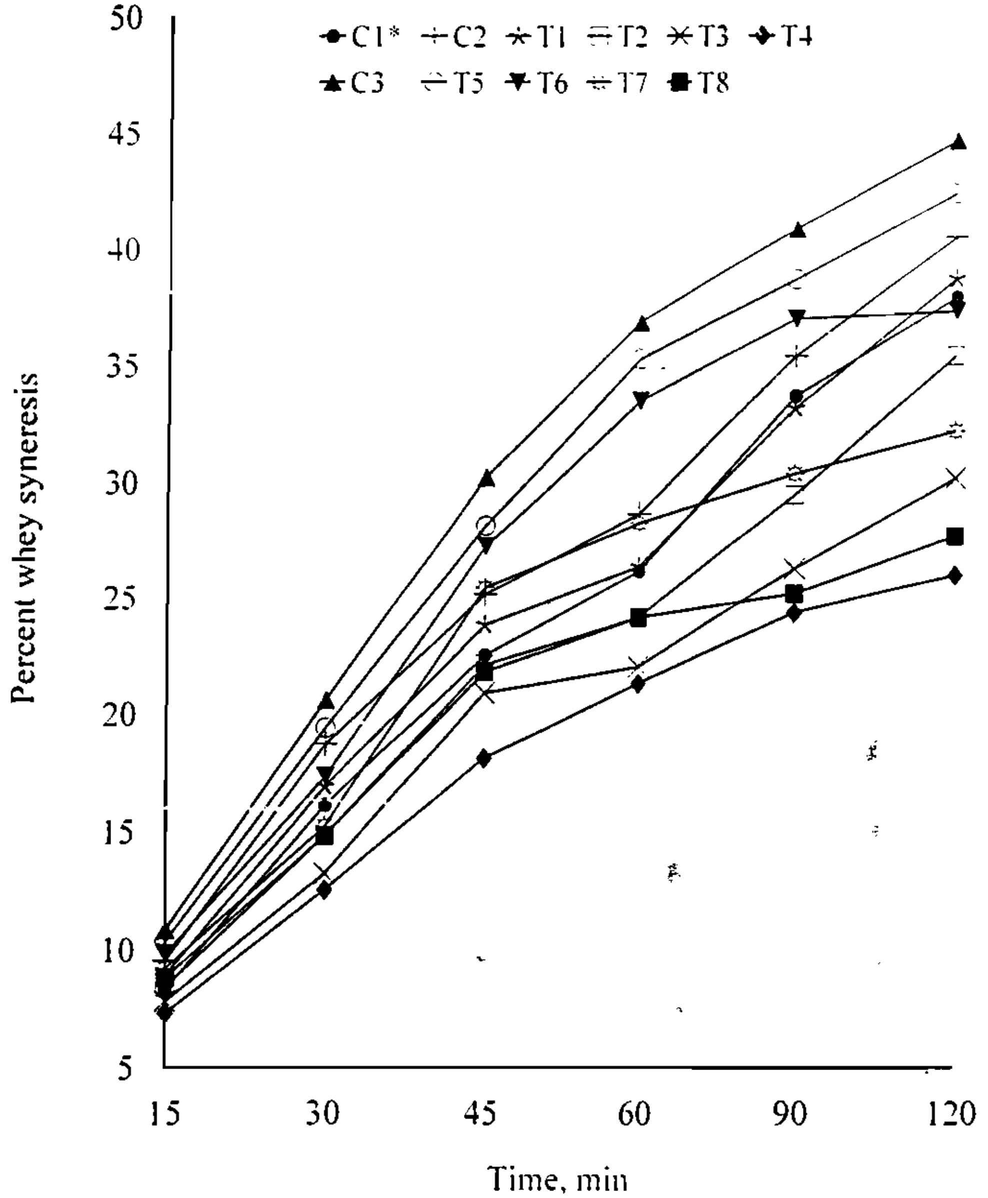

Fig. (1): Effect of replacing non-fat dry milk with gelatin on syneresis of yoghurt.

* See Table 1.

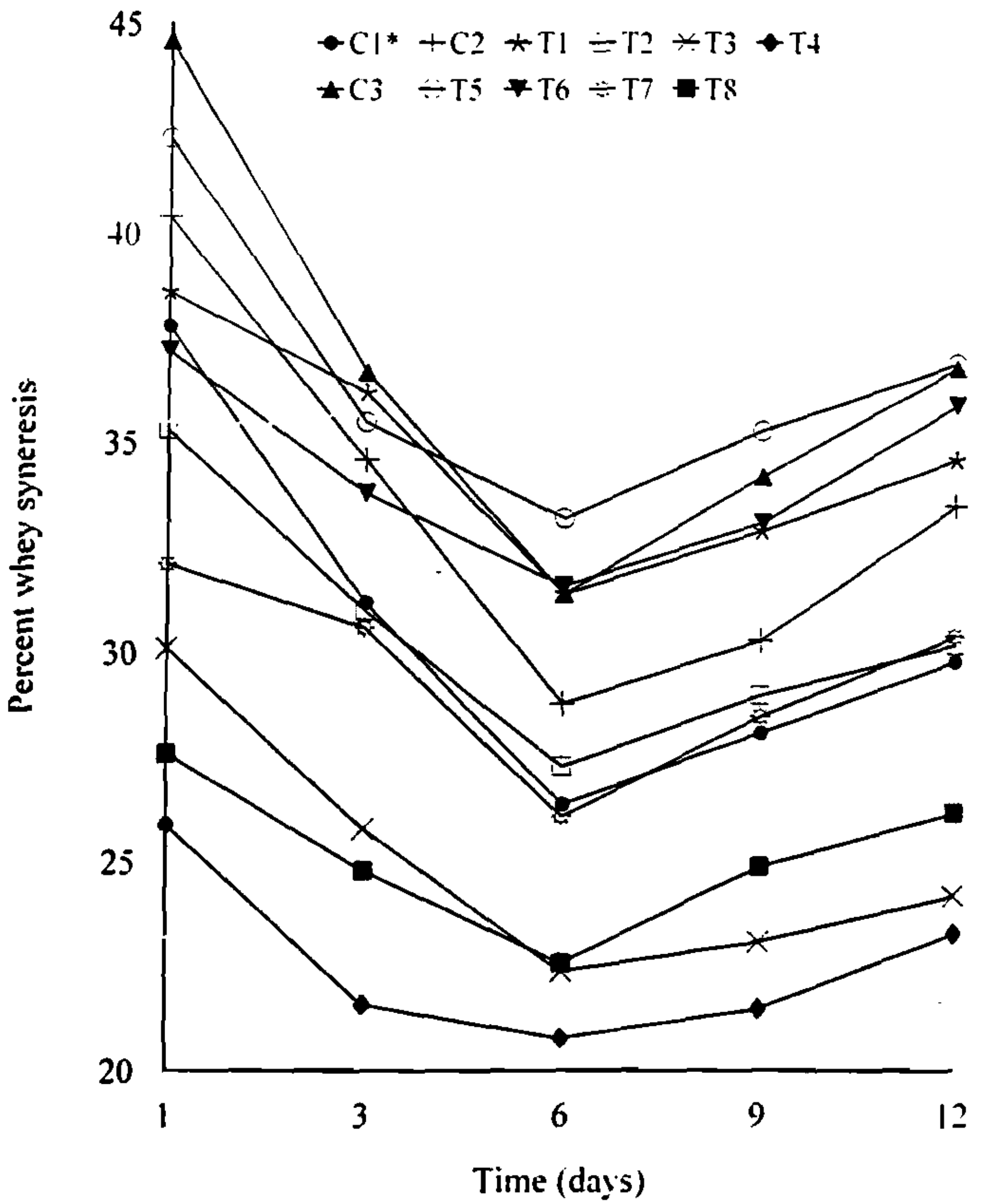

Fig. (2): Effect of replacing non-fat dry milk with gelatin and storage on syneresis of whey (%) of yoghurt (test was carried out for 2h).

*** See Table 1.**

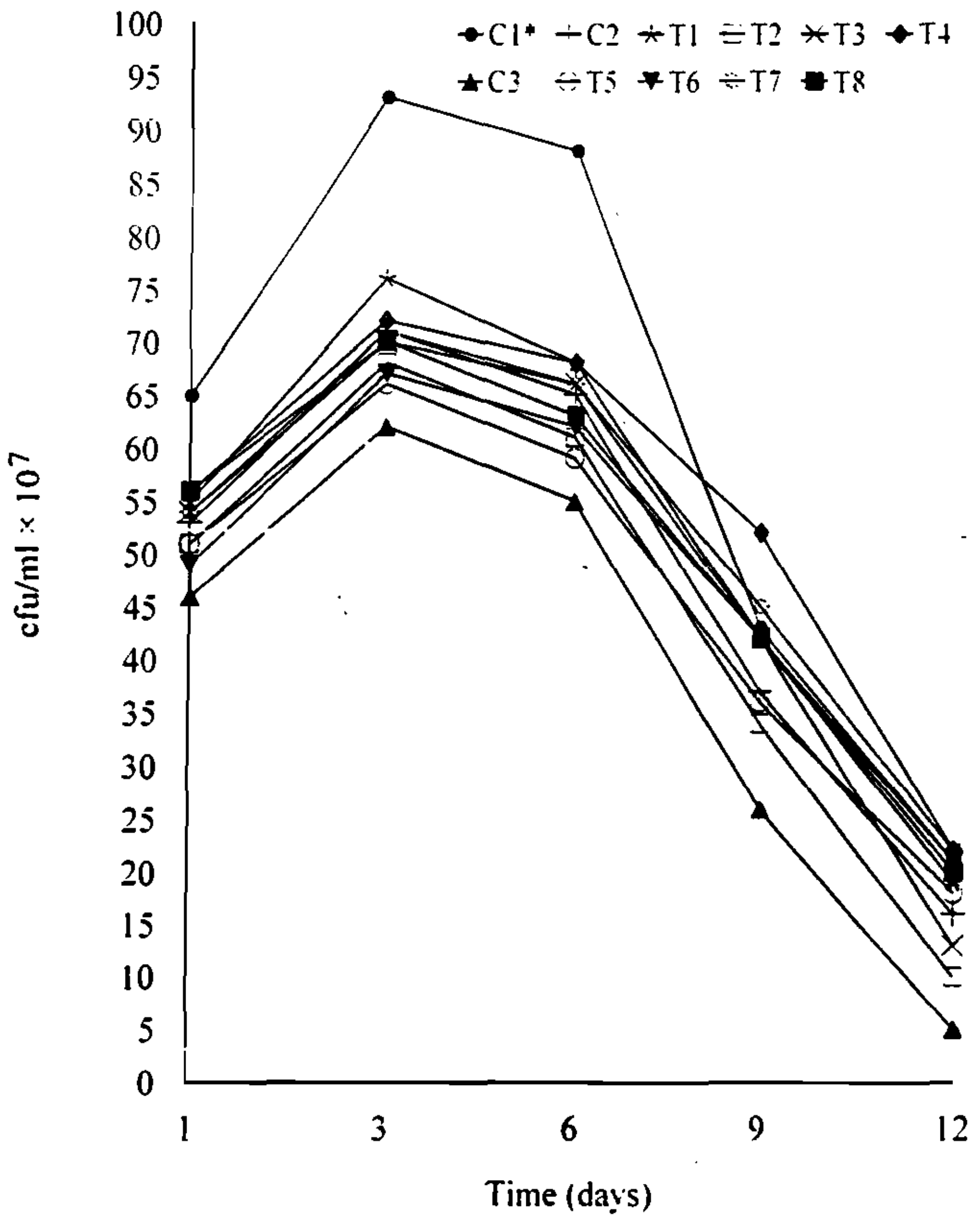

Fig. (3): Effect of replacing non-fat dry milk with gelatin and storage on total bacterial counts of yoghurt.

* See Table 1.

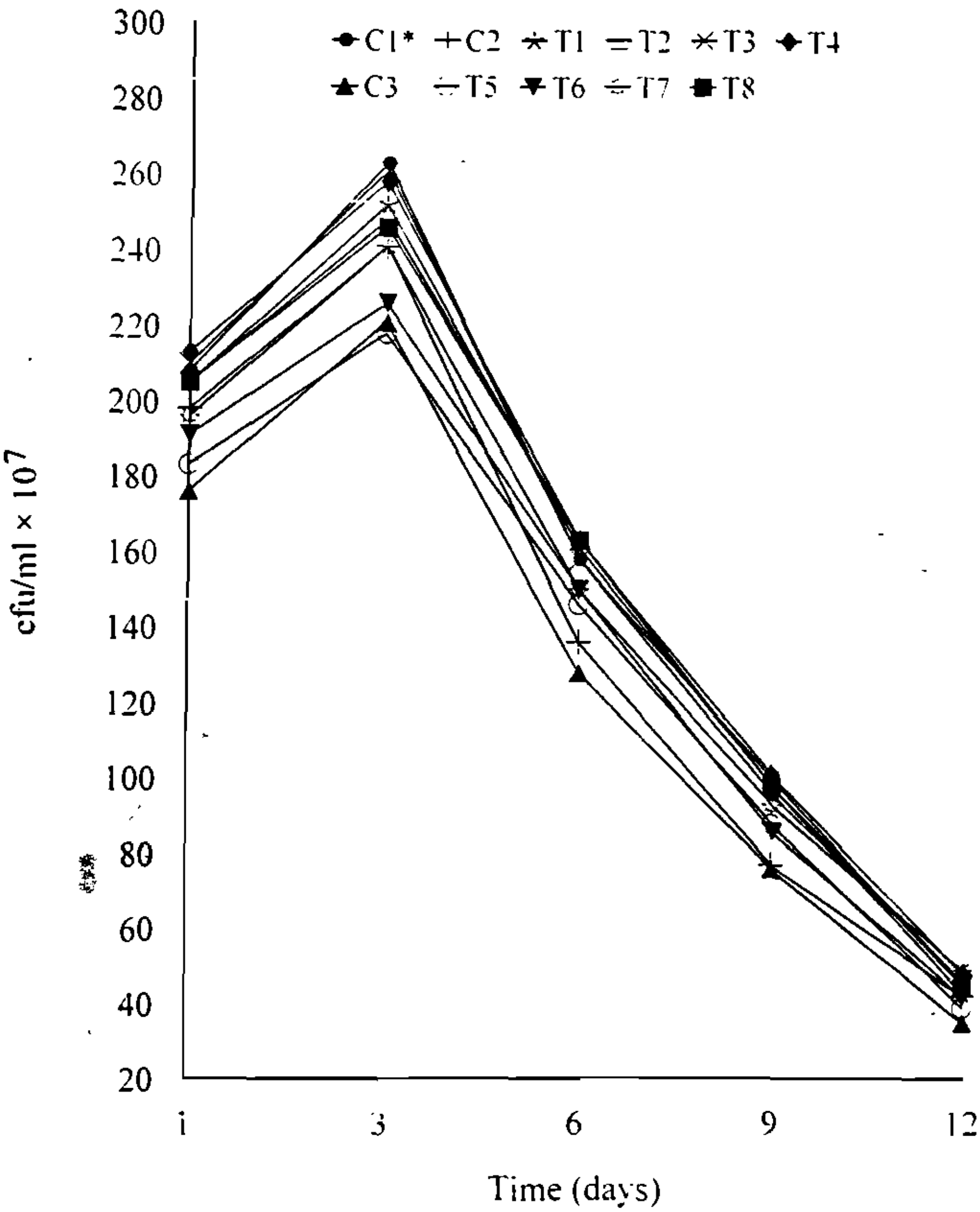

Fig. (4): Effect of replacing non-fat dry milk with gelatin and storage on streptococci counts of yoghurt.

* See Table 1.

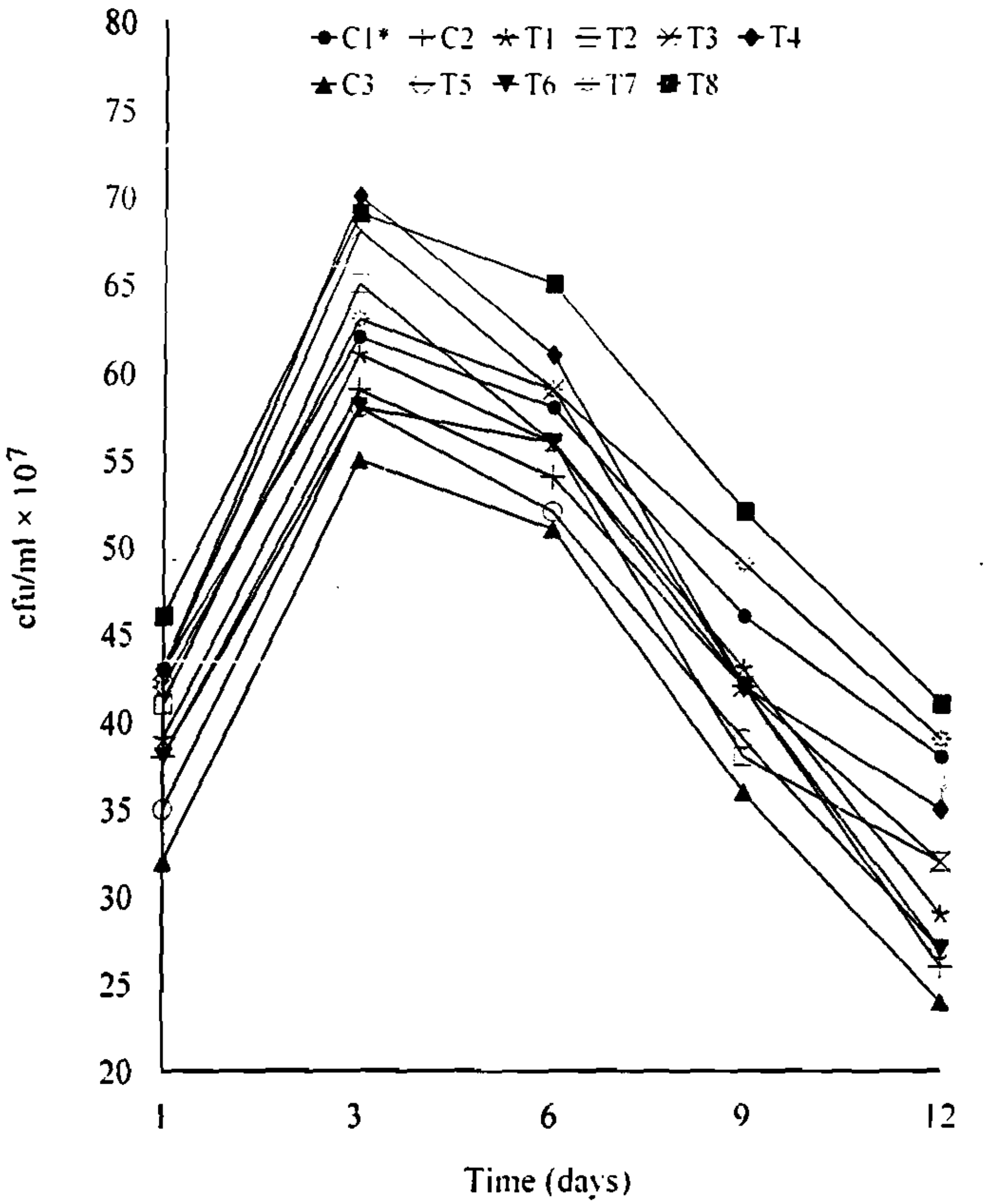

Fig. (5): Effect of replacing non-fat dry milk with gelatin and storage on lactobacilli counts of yoghurt.

* See Table 1.

Table (4): Organoleptic scores of yoghurt fortified with gelatin.

Yoghurt treatments*	Flavour (out of 45)					Body and texture (30)					Appearance (15)					Acidity (10)					Total score (out of 100)				
	Storage period (days)					Storage period (days)					Storage period (days)					Storage period (days)					Storage period (days)				
	1	3	6	9	12	1	3	6	9	12	1	3	6	9	12	1	3	6	9	12	1	3	6	9	12
C_1	43	42	40	40	39	27	27	26	25	24	13	12	12	11	10	9	9	8	8	7	92	90	86	84	80
C_2	40	40	39	39	37	25	25	24	23	22	11	11	10	10	9	8	8	7	7	7	84	84	80	79	75
T_1	40	40	40	39	38	25	25	24	24	23	12	12	11	10	9	8	8	7	7	7	85	85	82	80	77
T_2	41	41	40	40	39	26	25	25	24	24	13	12	11	11	10	9	9	8	8	7	89	87	84	83	80
T_3	42	42	41	40	39	27	27	26	25	24	13	13	12	12	11	9	9	8	8	7	91	91	87	85	81
T_4	41	41	41	39	38	26	26	25	24	23	12	12	11	11	10	8	9	8	8	7	87	88	85	82	78
C_3	39	38	38	37	35	23	23	22	21	20	10	10	9	8	8	7	7	6	6	6	79	78	75	72	69
T_5	40	40	39	39	36	24	24	23	22	20	11	10	9	8	8	8	7	7	6	6	83	81	78	75	70
T_6	42	42	41	40	38	25	25	24	23	22	11	11	10	10	10	8	8	8	7	6	86	86	83	80	76
T_7	41	41	40	40	37	26	26	25	24	24	12	12	11	10	10	9	9	8	7	7	88	88	84	81	78
T_8	41	41	40	38	36	25	25	25	24	22	11	11	10	10	9	8	8	8	7	7	85	85	83	79	74

* See Table (1).

Table (5): Statistical analysis of yoghurt properties.

Properties of yoghurt	Mean squares	Effect of treatments						Mean square						Effect of storage (days)				
		Multiple comparisons•												Multiple comparisons•				
		C_1 ¦	C_2	T_1	T_2	T_3	T_4	C_3	T_5	T_6	T_7	T_8		1	3	6	9	12
T.S. (%)	16.425*	A	B	B	B	B	B	C	C	C	C	C	12.131*	B				A
Protein (%)	3.125*	A	B	B	B	B	B	C	C	C	C	C	3.424*	A				B
Fat (%)	6.431	A	A	A	A	A	A	A	A	A	A	A	1.021*	A				A
Ash (%)	3.025*	A	B	B	B	B	B	C	C	C	C	C	5.467*	B				A
Lactose (%)	0.942*	A	B	B	B	B	B	C	C	C	C	C	9.321*	A				B
Acetaldehyde (ppm)	59.312*	A	C	AB	AB	A	A	D	C	C	AB	AB	113.231*	C	A	B	D	E
pH value	35.118	C	AB	B	CD	CD	D	A	AB	AB	C	C	0.932*	A	B	C	D	E
Titratabel acidity (%)	36.121*	AB	BC	BC	AB	AB	A	CD	CD	BC	AB	AB	1.239*	E	D	C	B	A
Syneresis after 2h (%)	53.463*	D	B	C	CD	CD	D	A	A	AB	B	C	76.432*	A	C	D	C	B
Organoleptic properties:																		
Flavour	69.12*	A	B	B	AB	A	AB	C	AB	A	AB	AB	93.126*	A	A	AB	B	C
Body and texture	23.809*	A	C	C	AB	A	B	E	D	C	AB	C	36.241*	A	A	AB	B	C
Appearance	9.427*	A	C	B	A	A	B	D	C	C	AB	C	58.432	A	A	AB	B	C
Acidity	7.362*	A	B	B	A	A	B	C	B	B	B	B	26.782	A	A	AB	B	C
Total score	296.321	A	D	D	AB	A	C	E	D	C	AB	D	934.635	A	A	AB	B	C

• Each different letters (in the same row) means that the multiple comparisons are different from each other, letter A is the highest mean followed by B, C, ... etc.

* Significant at 0.05 level.

¦ See legend Table (1).

Protein content of all yoghurt treatments decreased slightly ($p \leq 0.05$) during storage period. Similar results were reported by El-Nagar and Brennan (2001).

Concerning fat content, all yoghurt treatments were not significantly ($p>0.05$) different from each other, which means neither the rate of fortification with non-fat dry milk nor the rate of fortification of cow's milk with gelatin affected significantly ($p > 0.05$) the fat content of the yoghurt treatments (Tables 1, 5) (Mehanna and Mehanna, 1989). The fat content of yoghurt treatments did not change during storage period (Mehanna & Mehanna, 1989 and Kebary & Hussein, 1999).

Lactose content of yoghurt treatments decreased significantly ($p \leq 0.05$) by decreasing the rate of fortification of cow's milk with non-fat dry milk. Treatmen C_1 contained the highest lactose content followed by treatments C_2, T_1, T_2, T_3 and T_4 then treatments C_3, T_5, T_6, T_7 and T_8, which might be due to the lactose content of added non-fat dry milk. Either treatments C_2, T_1, T_2, T_3 and T_4 or treatments C_1, T_5, T_6, T_7 and T_8 were not significantly ($p > 0.05$) different from each other in lactose content, which means that the rate of adding gelatin did not affect significantly ($p > 0.05$) the lactose content of yoghurt treatments (Tables 1, 5). Lactose content of yoghurt treatments decreased ($p \leq 0.05$) throughout storage period, which might be due to the consumption of lactose by lactic acid bacteria (El-Nagar and Brennan, 2001).

Ash content of yoghurt decreased ($p \leq 0.05$) by decreasing the amount added of non-fat dry milk, which might be due to the ash content of non-fat dry milk (Tables 1, 5). Supplementation of cow's milk with gelatin did not affect significantly ($p > 0.05$) the ash content of yoghurt. Ash content of all yoghurt treatments increased slightly during storage (El-Nagar and Brennan, 2001).

Slight differences were noticed among yoghurt treatments in titratable acidity of yoghurt (Tables 2, 5) (Mehanna and Mehanna, 1989). On the other hand, titratable acidity of all yoghurt treatments increased significantly ($p \leq 0.05$) as storage period progressed (Tables 2, 5). These results are in agreement with those reported by Mehanna & Mehanna (1989); Abd El-Salam *et al.* (1996); Kebary & Hussein (1999); Harby & El-Sabie (2001) and Zedan *et al.* (2001).

pH values as affected by the rate of fortification with non-fat dry milk or gelatin and storage period followed opposite trends of those of titratable acidity (Tables 2, 5). Similar results are reported by Badawi & El-Sonbaty (1997); Hassan *et al.* (1999); Harby & El-Sabie (2001) and Zedan *et al.* (2001).

Acetaldehyde content of yoghurt decreased ($p \leq 0.05$) by decreasing the rate of fortification with non-fat dry milk (Tables 3, 5), while increased slightly by increasing the rate of adding gelatin (Tables 3, 5). Acetaldehyde content of all yoghurt treatments increased up to the 3rd day of storage, then decreased up to the end of storage period. Similar results were reported by Salama (2001).

The changes of total, lactobacilli and streptococci bacterial counts are illustrated in Figs. (3, 4, and 5). These bacteria followed almost similar trends. The count of total, lactobacilli and streptococci bacteria decreased by decreasing the rate of adding non-fat dry milk, while they increased slightly by adding gelatin. Total lactobacilli and streptococci bacterial counts increased as storage period progressed up to the third day, then decreased up to the end of storage period. These results are in agreement with those reported by Kebary *et al.* (1996); Hussein & Kebary (1999) and Harby & El-Sabie (2001).

Scores of sensory evaluation of yoghurt are presented in Table (4). Scores of organoleptic properties (flavour, body and texture, appearance, acidity and total scores) followed similar trends. Scores of sensory evaluation decreased by decreasing the rate of fortification of cow's milk with non-fat dry milk. Scores of organoleptic properties increased by adding gelatin and this increase was proportional to the rate of adding gelatin (Tables 4, 5). Yoghurt treatment that made with adding 1.5 and 0.4% of non-fat dry milk and gelatin, respectively was not significantly ($p > 0.05$) different from control yoghurt that made with adding 3.0% non-fat dry milk and T_7 which made from unfortified milk and adding 0.55% gelatin (Tables 4, 5). Scores of organoleptic properties of all yoghurt treatments did not change during storage period up to the sixth day, then decreased as storage period proceeded up to the end of storage period (Tables 4, 5).

It could be concluded that it is possible to make a good quality yoghurt from cow's milk by using non-fat dry milk and gelatin and saving about 50% of the non-fat dry milk used in making the control yoghurt.

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تأثير استبدال اللبن الفرز المجفف بواسطة الجيلاتين علـــى صفـات اليوجـورت المصنع من اللبن البقرى

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فى هذا البحث تم تصنيع عشرة معاملات من اليوجورت من اللبن البقرى المدعم أو الغير مدعم بلبن فرز مجفف مع إضافة نسب مختلفة من الجيلاتين بالإضافة إلى العينة القياسـيـة التـى صنعت من اللبن البقرى المدعم بإضافة ٣% من اللبن الفرز المجفف (تصبح إجمالى المعـاملات إحدى عشر معاملة) ، أما الخمس معاملات الأولى فقد تم تصنيعها من لبن بقرى مدعم بـ ١.٥% لبن فرز مجفف وأضيف إلى كل منها الجيلاتين بنسب صفـر ، ٠,٣٠ ، ٠,٣٥ ، ٠,٤٠ ، ٠,٤٥% ، أما المعاملات الخمس الأخرى فقد تم تصنيعها من لبن بقرى بدون إضافة لبـن فـرز مجفـف وأضيف إلى كل منها الجيلاتين بنسب صفر ، ٠,٤٥ ، ٠,٥٠ ، ٠,٥٥ ، ٠,٦٠% . وقد تـم أخـذ عينات من كل المعاملات فى الأيام ١ ، ٣ ، ٦ ، ٩ ، ١٢ من التخزين بالثلاجة وذلـك لإجـراء التحليلات الريولوجية والكيماوية والحسية .

ولقد أوضحت النتائج المتحصل عليها بعد تحليلها إحصائياً ما يلى :

- أدى خفض تدعيم اللبن البقرى باللبن الفرز المجفف إلى خفض نسب الجوامد الكلية، البروتين الكلى ، الرماد ، اللاكتوز والأسيتالدهيد كما أدى إلى خفض درجات التقييم الحسى لليوجـورت بينما لم تؤثر على نسبة الدهن فى اليوجورت .
- أدى إضافة الجيلاتين إلى اللبن المصنع منه اليوجورت إلى تحسين الخواص الحسية وكـانت أحسن المعاملات هى تلك المعاملة من لبن مدعم بـ ١,٥% لبن فرز مجفف وإضافـة ٠,٤% جيلاتين وكانت غير مختلفة معنوياً عن المعاملة المصنعة من لبن بقرى فقط والمضـاف لـه ٠,٥٥% جيلاتين وكذلك المعاملة القياسية المصنعة بإضافة ٣% من اللبن الفـرز المجفـف وكذلك أدى إضافة الجيلاتين إلى زيادة نسبة الأسيتالدهيد والحموضة بينما أدى إلى إنخفـاض قيم الـ pH لليوجورت فى حين لم يؤثر إضافة الجيلاتين معنوياً على نسب الجوامـد الكليـة والبروتين الكلى والدهن والرماد واللاكتوز .
- ازدادت نسب الجوامد الكلية والرماد والحموضة بتقدم فترة التخزين بينما انخفضـت نسـب البروتين الكلى واللاكتوز وقيم الـ pH .
- لم تتغير درجات التقييم الحسى أثناء الستة أيام الأولى من التخزين بينمـا انخفضـت بتقـدم التخزين بعد ذلك
- انخفض انفصال الشرش بتقدم فترة التخزين حتى اليوم السادس ثم ازداد بزيادة فترة التخزيـن .
- زادت أعداد البكتريا الكلية والـ Streptococci والـ Lactobacilli حتى اليوم الثالث مـن التخزين ثم إنخفضت أعدادها بتقدم فترة التخزين .