J. Food and Dairy Sci., Mansoura Univ., Vol. 2 (6): 271 - 281, 2011

EFFECT OF PROBIOTIC BACTERIA ON THE QUALITY AND CHOLESTEROL LEVEL OF RAS CHEESE

Shalaby, Hanan S. ; Kh. M. El-Zahar ; Madeha A. El-Shiwy and S. E. El-Nemr

Food Science Dept., Fac. Agric., Zagazig Univ., Egypt.

ABSTRACT

The aim of this work was manufacture of probiotic Ras cheese and study the chemical, microbiological, sensory characteristics and cholesterol level compared with control Ras cheese. The results showed that the moisture content significantly decreased in all Ras cheese samples. Fat and salt contents of Ras cheese were non-significantly increased, while the titrtable acidity and total nitrogen were significantly increased with progress of the ripening period. The higher level of total nitrogen was found in Ras cheese made with of *Bif. Bifidum*, then in cheese contained *Bif. Lactis*. Also, the ripening indices showed higher level (S.N./T.N. ratio, N.P.N./T.N. ratio) in probiotic Ras cheese with progress of the ripening period. T.V.F.A. content in probiotic Ras cheese containing *Bif. Bifidum* or *Bif. Lactis* had the highest significant effect as compared with control cheese. The results showed that the highest level of cholesterol concentration in control Ras cheese, while the lowest level in probiotic Ras cheese made by using *Bif. Bifidum*. The probiotic strains found viable during the ripening period and the increasing in total bacterial counts and the decreasing of Moulds and Yeasts counts. Lactic acid bacteria decreased with progress the ripening period in all samples. Ras cheese produced with *Bif. Bifidum*, The higher scores of sensory evaluation while the sample of *Bif. lactis* had the lowest scores as compared with the control cheese.

Results obtained showed that the potential advantages of using the probiotic strains to produce safe and healthy cheese.

INTRODUCTION

Probiotic food is defined as a processed product which contains viable probiotic microorganisms in a suitable matrix and in sufficient concentration (Saxelin and Mayra, 2003). This means that their viability and metabolite activity must be maintained in all the steps of the food processing operations from their manufacture up to their ingestion by the consumer and also that they must be able to survive in the gastrointestinal tract (Sanz, 2007). Some of the main beneficial effects on health related to probiotic consumption are: antimicrobial activity, prevention and treatment of diarrheas, relief in the symptoms resulting from lactose intolerance, antmutagenic and ant carcinogenic activities stimulation of the immunological system improvement of urogenital health relief of constipation and optimization of vaccine effects (Bomb *et al.*, 2002; Nagpal *et al.*, 2007; Saad, 2006 and Shah, 2007). Also, to reduce serum cholesterol (Shah, 2007).

Cheese is one of the most versatile food products available nowadays appealing to many palates and suitable for all age groups (Wikinson *at al*., 2001) as a probiotic food carrier. The ripening process of cheese is very complex and involves microbiological and biochemical changes in the curd. Resulting in the flavor and texture characteristic of a particular variety.

The biochemical changes occurring during ripening may be grouped into primary events that include the metabolism of residual lactose besides lipolysis and proteolysis (McSweeney, 2004). In study on Ras cheese manufactured with *Bif. bifidum* or *Lb. reuteri*, *Lb. rhamnosus* or *Enterococcus faecium* as a dairy starter adjunct. The investigators stated that, there were no significant difference between the probiotic and conventional cheeses were found for either salt in moisture or fat in dry matter when their ripening times were comparable. Ras cheese produced with *Bif. bifidum*, *Lb. reuteri* and *Lb. rhamnosus* had significantly lower pH than the conventional cheese throughout ripening. Numbers of *Bif. bifidum*, *Lb. reuteri* gradually decreased during ripening and both species decreased by three log cycles with in 120 days of ripening, both strains showed a comparable degree of viability loss over the first two months period, but the reduction in the viability was more pronounced during the final two months of ripening. The population at the end of ripening period was 4.0 and 5.78 log 10 cfu/g for *Bif. bifidum* and *Lb. reuteri*, respectively. Scores of organoleptic properties of Ras cheese with *Bif. bifidum* were high after two and four months of ripening (Mehanna *et al.*, 2002).

Cheese was used as probiotic food carrier presents potential advantages and it is a valuable alternative for the dairy industry. However, development on an industrial scale requires knowledge of all technological steps involved in the traditional process, and adaptations of the existing protocol are usually necessary. As there are lots of cheese varieties available on the market, is it important to conduct preliminary tests to vents, the behavior and the performance of the culture in the cheese environment for traditional and low fat processes. Such tests must be completed with laboratorial analysis testing parameters which decisive for the marketing of the product, like organic acid profile, and typical aroma compounds of the product. Additionally, the use of sensorial techniques can help to determine the important attributes which may influence consunfers (Adriano *et al.*, 2009). Hypercholesterolemic is a major risk factor associated with coronary heart diseases and it is considered that keeping blood cholesterol at a desirable level is one of the major preventive strategies for these disease. Thus much attention has been given to the relationship between diet and blood cholesterol levels (Ibrahim *et al.*, 2005).

The present study was designed to study the following: 1) Effect of use probiotic bacteria in the manufacture of Ras cheese on the chemical composition, microbiological properties and sensory evaluation.
2) Evaluation of cholesterol concentration in Ras cheese during ripening period.

MATERIALS AND METHODS

Materials

Milk:

Fresh buffaloe's milk (5.5 % fat and 8.75 % SNF) and fresh cow's milk (3.5 % fat and 8.56 % SNF) were obtained from Faculty of Agriculture, Zagazig University, Egypt.

Rennet and Bacterial strains:

A standard rennet powder (HA-LA) was obtained from Chr. Hansen's laboratory (Horshohn, Denmark). *Bifidobacterium bifidum* Bb_{12}, *Bifidobacterium lactis* BB_{12}, *Lactobacillus acidophilus* La-5, *Lactobacillus delbreukiis* subsp. *bulgaricus* and *Streptococcus salivarus* subsp. *thermophilus* were obtained from Chr. Hansen's laboratory (Horshohn, Denmark)

Methods

Cheese making:

The experiment was conducted as described by Kebary *et al.* (1996) to study the effect of probiotic bacteria on the quality of Ras cheese. A mixture of cow's and buffaloe's milk (1:1) was heated to 75^{o}C, cooled immediately to 37^{o}C and calcium chloride was added at the rate of 0.02%. Then 1.0% of starter culture consisted of *S. thermophilus, Lb. bulgaricus and Lb. acidophilus* (1:1:1) control cheese, (T1); *Bif. bifidum, Lb. bulgaricus and Lb. acidophilus* (1:1:1) as probiotic cheese, (T2) and *Bif. lactis, Lb. bulgaricus and Lb. acidophilus* (1:1:1) as probiotic cheese, (T3) were added. The milk was ripened until acidity developed to 0.19%. Rennet was added at the rate of 30ml 100 kg-1 milk. The milk was thoroughly mixed and left to curdle. Thereafter, the curd was cut vertically and horizontally into cubes using 0.5 inch knives. The curd was stirred and heated gradually to 45°C in 15min, and held at this temperature until the whey acidity reached 0.14%. About one-third of the whey was drained off and commercial salt was added at the rate of 2%. After 15 min, the whey was completely drained off and the curd was cooled. The curd was then molded and pressed for 24 h. The cheese was turned over every day and rubbed with dry salt for one week. Then coated with paraffin wax. Cheeses were ripened for 3 months, at 75-80% and 75±80% relative humidity.

Analytical methods:

Chemical analysis:

All cheese samples were chemically analyzed for moisture and salt contents by the method of IDF (1982). Titratable acidity, fat and total nitrogen contents were measured according to standard methods (A.O.A.C., 2000). Total nitrogen (T.N.) and non-protein nitrogen (N.P.N.) contents were determined by the semi-micro Kjeldahl method described by IDF (1993), the water soluble nitrogen (W.S.N.) content in cheese was determined according to Kuchroo and Fox (1982). Total volatile fatty acids in cheese samples were determined according to the method of KosiKowski (1982).

Determination of total cholesterol content:

Total cholesterol of Ras cheese was determined as described by Pantula *et al.*, (1975)

Microbial examination:

Total viable counts, mesophilic and thermophilic lactic acid bacteria were enumerated according to Avila, *et al.*, (2005). Moulds and yeasts were cultivated on potato dextrose agar (pH 3.5) at 24 ºC for 4 days (A.P.H.A., 1992). Bifidobacterial counts were enumerated according to Dave and Shah (1997) by using modified MRS-agar (Oxoid CM 36) supplemented with 0.05%

L-cystein-Hcl, MRS-agar (Oxoid CM361) medium supplemented with 5ml NNL solution /100ml before use, incubation at 37°C for 3 days under anaerobic condition (BBL anaerobic jar containing Gas Generating Kit, BRO38B Oxoid) according to Chr. Hansen's (1995).

Sensory Evaluation of cheese:

The organoleptic properties of Ras cheese samples were assessed by a regular taste panel of the staff members of the Food Science Department, Faculty of Agriculture, Zagazig University according to Hofi *et al.*, (1991).

Statistical analysis:

The obtained data throughout the present study were analyzed statistically by using One Way ANOVA, LSD significant level (0.01) Murry (1975).

RESULTS AND DISCUSSION

Chemical composition of Ras cheese:

Chemical composition (moisture, fat, salt, titratable acidity and total nitrogen) content of Ras cheese is shown in table (1). The moisture content significantly decreased in Ras cheese during the ripening period. The moisture content of Ras cheese containing Bifidobacteria was decreased during the ripening period (Hofi *et al.*, 1991 and Shehata *et al.*, 2004). Fat content of Ras cheese was non-significantly increased. These results are agreement with those obtained by Osman and Abbas (2001) who showed that the fat content of traditional Ras cheese and cheese samples containing Bifidobacteria gradually increased with extending the ripening period. These results due to the decrease of moisture content of all cheese samples (Hassanein, 2003). There is a gradual increase in salt content during the ripening period. Decreasing the moisture content and increasing the salt level during ripening of Ras cheese were also reported in others studies (Awad, 2003). Increasing salt content in cheeses was due to the decrease in moisture content along the ripening period. These obtained results are agreement with Shehata *et al.* (2004). The aged cheese was within the reported limits for salt, moisture, fat, and protein in market Ras cheese (Abou-Donia, 2002 and Awad *et al.*, 2003). Titratable acidity content significantly increased in all samples during ripening. The results are agreement with Osman & Abbas (2001), El-Zayat & Osman (2001) and Shehata *et al.* (2004). In different types of cheese containing Bifidobacteria. Also, lowering the fat content caused a significant decrease in titratable acidity which may have been due to the lower moisture content and higher salt content (lower water activity) which subsequently could suppress the bacterial growth (Adriano, *et al.*, 2009).

Also, the total nitrogen content of Ras cheese was significantly increased in all cheeses samples with the progress of the ripening period. These results agreement with the previous finding reported by Osman & Abbas (2001) and Shehata *et al.* (2004). Probiotic Ras cheese contained higher total nitrogen and protein break down in probiotic Ras cheese was higher than in traditional Ras cheese (Nadia and Kmal, 2007).

Table (1): The changes in chemical composition content (Moisture, Fat, Salt, Titratable acidity and Total nitrogen) of Ras cheese during the ripening period.

Components %	Ripening period (months)	Treatments			L. S. D
		T_1 (Control)	T2	T3	
Moisture	Fresh	39.46^{a}	39.94^{a}	39.34^{a}	0.66
	1	38.70^{ab}	38.90^{a}	38.11^{b}	0.73
	2	37.44^{a}	36.11^{b}	37.43^{a}	0.84
	3	36.84^{a}	35.58^{b}	36.92^{a}	0.48
Fat	Fresh	33^{a}	33^{a}	33^{a}	1.14
	1	34^{a}	34.5^{a}	34^{a}	1.27
	2	35^{a}	35.5^{a}	34.5^{a}	1.52
	3	36^{a}	36.5^{a}	35.5^{a}	2.27
Salt	Fresh	1.97^{a}	1.97^{a}	1.99^{a}	0.027
	1	2.06^{a}	2.03^{a}	2.04^{a}	0.46
	2	2.07^{a}	2.06^{a}	2.08^{a}	0.08
	3	2.12^{a}	2.10^{a}	2.13^{a}	0.73
Titratable acidity	Fresh	2.22^{a}	1.98^{b}	1.73^{c}	0.069
	1	2.57^{a}	2.22^{b}	1.98^{c}	0.087
	2	2.72^{a}	2.62^{b}	2.73^{a}	0.052
	3	2.97^{a}	2.77^{b}	2.48^{c}	0.10
Total nitrogen	Fresh	3.45^{b}	4.08^{a}	3.76^{b}	0.23
	1	4.08^{c}	4.94^{a}	4.55^{b}	0.075
	2	4.70^{c}	5.64^{a}	5.17^{b}	0.11
	3	5.48^{c}	6.27^{a}	5.96^{b}	0.097

T_1 (control):- ***Streptococcus thermophilus + Lactobacillus bulgaricus+Lactobacillus acidophilus***
T_2: - ***Bifidobacterium bifidium+ Lactobacillus bulgaricus+ Lactobacillus acidophilus***
T_3: ***Bifidobacterium lactis+ Lactobacillus acidophilus+ Lactobacillus bulgaricus***

Ripening indices:

Cheese ripening was assessed by determination of soluble nitrogen compounds (S.N./ T.N. and N.P.N./ T.N.) and total volatile fatty acids (T.V.F.A.) content during the ripening period of 4 months is shown in Table (2). Probiotic Ras cheese showed higher S.N./ T.N. ratio compared to control Ras cheese samples through 3 months periods. The results may be due to the differences in total viable bacterial and Bifidobacteria counts, as well as the differences in the activities of the starter's enzymes. These results are agreement with data reported by several investigators, (Shehata *et al.,* 2001; Osman & Abbas, 2001 and Nadia & Kamal, 2007) who mentioned that addition of both lactobacilli and Bifidobacteria led to increase the levels of proteolysis in the different cheeses.

Probiotic Ras cheese samples containing Bifidobacteria had higher significant levels of N.P.N. compared with control Ras cheese throughout ripening period. These results may be due to the protein break down occurred through the growth of microflora and or the proteolysis with proteolytic enzyme. These results are in harmony with those obtained by El-Zawahry (2003) and Shehata *et al.* (2004).

Generally TVFA content in Ras cheese samples containing *Bif. bifidum* or *Bif. lactis* had the highest significant effect as compared with control Ras cheese during the ripening period. However, T.V.F.A. content was increased in all cheese samples during the ripening period. These results may be account for lipolytic activity in Ras cheese which means that factors affecting the proteolysis (Kebary *et al.*, 1996). Table (2) showed the higher significantly levels of S.N./T.N., N.P.N./T.N. and T.V.F.A. during the ripening period observed Bifidobacteria compared to traditional cheese. The increase in the nitrogen fractions or T.V.F.A. may be due to activity proteinases and lipases have the same effect lipolysis activity.

Table 2. The changes in ripening indices (SN/TN, NPN/TN and TVFA) of Ras cheese during the ripening period.

Components	Ripening period (months)	Bacterial Strains			L. S. D
		T_1(control)	T_2	T_3	
SN/TN %	Fresh	0.78^b	1.2^a	0.84^b	0.31
	1	1.09^c	1.57^a	1.37^b	0.043
	2	1.45^c	2.35^b	2.12^a	0.53
	3	2.39^c	3.14^a	2.67^b	0.11
NPN/TN %	Fresh	0.63^c	0.82^a	0.71^b	0.038
	1	0.78^c	1.17^a	0.98^b	0.046
	2	0.94^c	1.53^a	1.10^b	0.06
	3	1.29^c	1.96^a	1.53^b	0.15
TVFA (0.1 N NaOH/100g)	Fresh	20^c	28^a	24^b	0.79
	1	32^c	48^a	40^b	0.79
	2	40^c	60^a	52^b	0.79
	3	52^c	68^a	60^b	0.79

T_1 (control):- ***Streptococcus thermophilus + Lactobacillus bulgaricus+Lactobacillus acidophilus***

T_2: - ***Bifidobacterium bifidium+ Lactobacillus bulgaricus+ Lactobacillus acidophilus***

T_3: ***Bifidobacterium lactis+ Lactobacillus acidophilus+ Lactobacillus bulgaricus***

Cholesterol Determinations:

The cholesterol contents (mg cholesterol/ 100 g cheese fat) of Ras cheese during the ripening period are shown in table (3). The results were showed that the cholesterol content of traditional Ras cheese (control) was significantly lower than those of Ras cheese samples when fresh and during the ripening period. These results are reported that different Bifidobacteria strains assimilate or precipitate cholesterol Tahri *et al.*, (1995 and 1996).

Microbiological Examination:

Counts of different microbial groups in cheese during ripening are illustrated in tables (4, 5 and 6). The obtained results in table 4 showed that, increasing counts of *Bif. bifidium* compared to *Bif. Lactis,* although decreased counts in all samples during the ripening period. Dinakar & Mistry (1994); Gomes *et al.*, (1998) and Osman & Abbas (2001), Who found that Bifidobacteria survive well in Cheddar, Gouda, Bifidus, Karish and Ras cheeses. The present results showed that the final numbers of viable cells of

Bifidobacteria were still above the levels suggested to produce their claimed health benefits.

Table 3. Changes in cholesterol determinations of Ras cheese during the ripening period.

Components	Ripening period (months)	Bacterial Strains			L.S.D
		T_1 (control)	T_2	T_3	
Mg cholesterol/100g	Fresh	48.80^{a}	28.00^{c}	40.39^{b}	4.95
	1	108.8^{a}	66.40^{c}	87.28^{b}	5.64
	2	123.20^{a}	88.80^{c}	98.79^{b}	6.02
	3	136.08^{a}	100.52^{c}	114.64^{b}	8.02

T_1 (control):- ***Streptococcus thermophilus + Lactobacillus bulgaricus+Lactobacillus acidophilus***
T_2: - ***Bifidobacterium bifidium+ Lactobacillus bulgaricus+ Lactobacillus acidophilus***
T_3: ***Bifidobacterium lactis+ Lactobacillus acidophilus+ Lactobacillus bulgaricus***

Table 4. The changes in Bifidobacterium (cfu/g. cheese) of Ras cheese during the ripening period.

Ripening period (months)	T_1 (control)	T_2	T_3	T-test
Fresh	Nil	50×10^{7a}	41×10^{7b}	6.971**
1	Nil	9.7×10^{7a}	50×10^{7b}	19.744**
2	Nil	30×10^{6a}	20×10^{6b}	7.746**
3	Nil	5×10^{6a}	4×10^{6a}	$1.25^{N.S}$

T_1 (control):- ***Streptococcus thermophilus + Lactobacillus bulgaricus+Lactobacillus acidophilus***
T_2: - ***Bifidobacterium bifidium+ Lactobacillus bulgaricus+ Lactobacillus acidophilus***
T_3: ***Bifidobacterium lactis+ Lactobacillus acidophilus+ Lactobacillus bulgaricus***

Table 5. The changes in total bacterial counts bacteria (cfu/g cheese) of Ras cheese during the ripening period.

Ripening period (months)	T_1 (control)	T_2	T_3	L.S.D
Fresh	5.2×10^{8c}	24×10^{8a}	20×10^{8b}	1.30
1	0.7×10^{8a}	5×10^{8b}	1×10^{8c}	1.31
2	0.55×10^{8c}	1.2×10^{8b}	1.8×10^{8a}	0.4
3	0.35×10^{8a}	0.68×10^{8a}	0.44×10^{8a}	2.74

T_1 (control):- ***Streptococcus thermophilus + Lactobacillus bulgaricus+Lactobacillus acidophilus***
T_2: - ***Bifidobacterium bifidium+ Lactobacillus bulgaricus+ Lactobacillus acidophilus***
T_3: ***Bifidobacterium lactis+ Lactobacillus acidophilus+ Lactobacillus bulgaricus***

Table (5) showed increasing in the total bacteria counts (TBC) during the ripening period in probiotic Ras cheese compared with traditional Ras cheese. There were significant differences in viable T.B.C. between samples when fresh, while the 1- 2- 3 months during the ripening period were non significant. Lactic acid bacteria counts in probiotic cheese (Table 6) showed a slight increase on the first month of ripening then declined throughout the ripening period, these two bifidobacteria samples were higher than the control cheese.

Table (6): The changes in lactic acid bacteria (cfu/g cheese) of Ras cheese during the ripening period.

Ripening period (months)	T_1 (control)	T_2	T_3	L.S.D
Fresh	40×10^{8c}	80×10^{8a}	70×10^{8b}	6.13
1	1×10^{7a}	30×10^{7a}	20×10^{7a}	2.74
2	33×10^{6a}	62×10^{6a}	55×10^{6a}	3.77
3	20×10^{6a}	36×10^{6a}	35×10^{6a}	3.99

T_1 (control):- ***Streptococcus thermophilus + Lactobacillus bulgaricus+Lactobacillus acidophilus***

T_2: - ***Bifidobacterium bifidium+ Lactobacillus bulgaricus+ Lactobacillus acidophilus***

T_3: ***Bifidobacterium lactis+ Lactobacillus acidophilus+ Lactobacillus bulgaricus***

Probiotic Ras cheese had the lowest viable undesirable yeast and moulds counts during the ripening period (Table 7). Lactic acid bacteria in soft cheese were slightly increased during storage but moulds and yeast were not detected in all probiotic cheese (Mehanna *et al.*, 2002). The results obtained showed that significant difference in Ras cheese samples during the ripening periods. Mould and Yeast disappeared after 15 days and the cheeses were free from yeasts in Ras cheese during the ripening period (Nadia and Kamal, 2007).

Table 7. The changes in Moulds and Yeasts of Ras cheese during the ripening period.

Ripening period (months)	T_1 (control)	T_2	T_3	L.S.D
Fresh	Nil	Nil	Nil	-
1	Nil	Nil	Nil	-
2	$1\times10^{4\ a}$	1×10^{4a}	1×10^{4a}	0.40
3	2×10^{4a}	1×10^{4b}	1×10^{4b}	0.27

T_1 (control):- ***Streptococcus thermophilus + Lactobacillus bulgaricus+Lactobacillus acidophilus***

T_2: - ***Bifidobacterium bifidium+ Lactobacillus bulgaricus+ Lactobacillus acidophilus***

T_3: ***Bifidobacterium lactis+ Lactobacillus acidophilus+ Lactobacillus bulgaricus***

6. Sensory Evaluation of Ras Cheese:

The *Bif. bifidum* Ras cheese sample showed better flavor intensity and body characteristics than others samples (Table, 8). The gained score points for flavor and body characteristics of all cheese significant increased with the increase of the ripening period and the highest scores were recorded at the end of the ripening period. Also, Nadia and Kamal, (2007) who showed the probiotic Ras cheese with 100% replacement of probiotic strains could accelerate the ripening process, improved flavor and cheese quality and the microbiological quality of Ras cheese. The results (Table, 5) showed that, the increasing good Ras cheeses were considered acceptable and the flavour of probiotic Ras cheeses developed earlier than the control. Statically analysis showed that differences in total scores of probiotic Ras cheese, this could be attributed to the higher levels of soluble nitrogen and total volatile fatty acids which are considered to essential contributor for flavour development.

Table (8): Sensory Evaluation of Ras cheese during the ripening period

Ripening period (months)	Flavour (60)				Body and Texture (40)				Total (100)			
	T_1 (control)	T_2	T_3	L.S.D	T_1 (control)	T_2	T_3	L.S.D	T_1 (control)	T_2	T_3	L.S.D
1	47^b	49^c	48^a	2.74	28^b	35^c	31^a	2.72	75^b	82^c	79^a	1.58
2	50^b	53^c	52^a	1.58	33^b	37^c	35^a	1.49	83^b	90^c	87^a	1.46
3	51^b	56^c	54^a	1.55	36^b	38^c	37^a	1.53	87^b	94^c	91^a	1.51

T_1 (control):- ***Streptococcus thermophilus + Lactobacillus bulgaricus+Lactobacillus acidophilus***

T_2: - ***Bifidobacterium bifidium+ Lactobacillus bulgaricus+ Lactobacillus acidophilus***

T_3: ***Bifidobacterium lactis+ Lactobacillus acidophilus+ Lactobacillus bulgaricus***

REFERENCES

Abou-Donia, S.A. (2002). Recent development in Ras cheese research. A review. Egyptian J. Dairy Sci., 30: 155-166.

Adriano, G. C.; C. A. B. Flavia; H. B. S. Cinthia; A. F. F. Joso and M. I. S. Susana. (2009). Probiotic cheese health benefits, Technological and stability aspects. Trends in Food Science and Technology, 20: 344-354.

American Public Health Association(APHA) (1992). Method for the examination of dairy products. Inc. 16th (ed) New york, USA.

AOAC. (2000). Official methods of analysis, Association of official analytical chemists, International Artington, VA.

Avila, M.; Garde, S., Gaya, P., Medina, M., and Nuñez, M. (2005). Influence of a bacteriocin producing lactic culture on proteolysis and texture of Hispánico cheese. Inter. Dairy J., 15 : 145-153.

Awad, S.; A. El-Attar; A. H. Ayad and M. El-soda. (2003). Characterization of Egyptian Ras cheese. 1 sensory evaluation rheological, physico-chemical, properties and microbiological and analysis. Egyptian J. Dairy Sci., 31: 289-303.

Bomba, A.; R. Nemcova; D. Mudronova and P. Guba. (2002). The possibilities of potentiality the efficacy of probaiotics. Trends in Food Science and Technology, 13(4): 121-126.

Chr. Hansen´s. (1995). Nu-trish cultures. Methods of analysis for the identification of Lactobacillus acidophilus and Bifidobacteria. Seminar, Cairo, Egypt, pp. 27-28 January 18th.

Dave, R. I. and N. P. Shah. (1997). Viability of yoghurt and probiotic bacteria in yoghurt made from commercial starter culture. Inter. Dairy J., 7: 31-41.

Dinakar, P. and V. V. Mistry. (1994). Growth and viability of Bifidobacterium bifidum in Cheddar cheese. J. Dairy Sci., 77(10): 2845-2864.

El-Zawahry, A. A. R. (2003). Improving the quality of Goats Milk cheese. Ph. D. thesis, Faculty of Agric. Zagazig Univ. Egypt.

El-Zayat, A. I. and M. M. Osman. (2001). The use of probiotics in Tallage cheese. Egyptian J. Dairy Sci., 29: 99-106.

Gomes, A. M. P.; M. M. Vieira and F. X. Malcate. (1998). Survival probiotic microbial strain in cheese matrix during ripening: stimulation of rates of salt diffusion and microorganism survival. J. Food Engineering, 36: 281-301.

Hassanien, A. M. H. (2003). Study on use of soya been in manufacturing of yoghurt and cheese. Ph. D. Thesis, Fac. Agric. Suez Canal Univ. Egypt.

Hofi, A. A.; L. B. Abdel-Hamid; N. S. Ahmed and H. M. Abbas. (1991). Acceleration of Ras cheese ripening by relevant slurry. Egyptian J. Dairy Sci., 19(12): 337- 346.

Ibrahim, A. A.; E. M. El-Sayed; S. A. Hafez and F. A. Saleh. (2005). The hypocholesterolaemic effect of milk yoghurt and soy-yoghurt containing bifidobacteria in rats fed on a cholesterol-enriched diet. Inter. Dairy J., 15: 37-44.

IDF 1982. Milk and milk products-determination of the total solids content, standard Nº 12 B-International Dariry Federation, Brussels.

IDF 1993. Milk and milk products-determination of nitrogen content (Kjelahl method) and calculation of curd protein content standard Nº 12 B-International Dairy Federation, Brussels.

Kebary, K. M. K; A. E. Khader; A. N. Zedan and S. F. Mahmoud. (1996). Acceleration ripening of low fat Ras cheese by attenuated *lactobacillus* cells. Food Res. Inter., 29 (8): 705- 713.

Kosikowski, F. V. 1982. Cheese and fermented milk foods 3rd ed. Brooktondate NY: F. V. Kosikowki and Assoc.

Kuchroo, C. C. and P. F. Fox. 1982. Soluble nitrogen in Cheddar cheese: Comparison of extraction procedure. Milchwissenschaft, 37: 331-336.

McSweeney, P. l. H. (2004). Biochemistry of cheese ripening. Inter. J. Dairy Techn., 57(2-3): 127-144.

Mehanna, N. S.; B. A. Effat; N. M. A. Dabiza; N. F. Tawfik and O. M. Sharaf. (2002). In corporation and viablility of some probiotic bacteria in function dairy foods. Minufiya J. Agric. Res., 27(2): 225-241.

Murry, R. Spiegel. (1975). Problems of probability and statistics, New york, 315.

Nadia, P. and El-Kmal. (2007). Biochemical evaluation and microbial quality of Ras cheese supplemented with probiotic strains. Pol. J. Food Nutr. Sci., 57(3): 295-300.

Nagpal, R.; H. Yadav; A. K. Puniya; K. Singh; S. Tain and F. Marotta. (2007). Potential of probiotic and prebiotics for symbiotic functional dairy foods. International Journal of probiotics and prebiotics, 2(2-3): 75-84.

Osman, M. M. and F. M. Abbas. (2001). Fate of *lactobacillus acidophilus* la-5 and *Bifidobacterium lactis* Bb-12 in probiotic Ras cheese, Proc. 8th Egyptian Conf. Dairy Sci. and Techn., 623-664. Cairo, Egypt.

Pantula, P. C.; M. B. Rao; S. D. Rao and Anantakrishnan (1975). Application of Liebermann-Burchard reaction to the unsaponifiable portion of milk and milk products. Milchwissenchaft, 30: 735.

Saad, S. M. I. (2006). Probiotics and prebiotics the state of the art. Brazilian Journal of pharmaceutical Sciences, 42(1): 1-16.

Sanz, Y. (2007). Ecological and functional implications of the acid adaptation ability of *Bifidobacterium*: away of selecting improved probiotic strains. Inter. Dairy J., 17(11): 1284-1289.

Saxelin, M. K. and M. A. Mayra. (2003). Introduction classifying functional dairy products. InT. Mattila-sandholm and M. Saarkla (Eds.), Functional dairy products pp. 1- 16. Boca. Raton, LA. USA: CRC press.

Shah, N. P. (2007). Functional cultures and health benefits. Inter. Dairy J., 17(11): 1262-1277.

Shehata, A. E.; H. A. El-Nawawy, Y. M. El-Kenewy and I. E. Aumara. (2001). Production of soft cheese with health benefits. Proc. 8th Egyptian Conf. Dairy Sci., & Techn. Cairo, Egypt. 635-651.

Shehata, A. E.; H. A. El-Nawawy, Y. M. El-Kenewy and I. E. Aumara. (2004). Use of bifidobacteria in Ras cheese production. I. chemical and organoleptic properties. Proc. 9th Egypt. Conf. Dairy Sci. Techn. Cairo, Oct., 533-548.

Tahri, K.; J. Crociani; J. Ballongue and F. Schneider. (1995). Effects of three strains of bifidobacteria on cholesterol letters in App. Microbiology, 21(2): 149-151.

Tahri, K.; J. P. Grilland and F. Schneider. (1996). *Bifidobacteria* strains behavior toward cholesterol: co-precipitation with bile salts and assimilation. Current Microbiol., 33(3): 187-193.

Wilkinson, M.G.; H. Meehan; C. Stanton and C. Cowan. (2001). Marketing cheese with a nutrient message. Bulletin IDF, 363: 39-45.

تأثير البكتريا الحيوية علي جودة ومستوي الكوليستيرول في الجبن الراس

حنـان سـعيد شـلبي ، خالـد مغـاوري الزهـار ، مديحـة عبـد الجـواد الشـيوي و شريف عيد النمر

قسم علوم الاغذية - كلية الزراعة – جامعة الزقازيق

يهـدف البحـث إلـي إنتـاج جـبن راس داعمـة للحيويـة ودراسـة خواصـها الكيماويـة والميكروبيولوجية والحسية وقياس معدل الكوليسترول ومقارنتها بالجبن الراس التقليدية حيث لوحظ إنخفاض في نسب الرطوبة في جميع عينات الجبن مع وجود فروق معنوية بينما لوحظ زيادة في نسبتى الدهن والملح مع عدم وجود فروق معنوية وزيادة نسب الحموضة والنيتروجين الكلي بتقدم فترات التسوية حتي ثلاث شهور بالرغم من وجود فروق معنوية مع ملاحظة أعلي نسب للنيتروجين الكلي في العينات التي تحتوي علي *Bif. Bifidium* ثم *Bif. lactis* بالإضافة إلي إزدياد دلائل التسوية (النيتروجين الذائب والنيتروجين غير البروتيني) في جميع عينات الجبن بزيادة فترة التسوية وكانت أعلي قيم هذه الدلائل في عينات الـ *Bif. bifidium* و *Bif. lactis* كما لوحظت زيادة الأحماض الدهنية الكلية الطيارة بالعينات التي تحتوي *Bif.* بالمقارنة بالكنترول مع الحصول علي أعلي قيم للمعنوية.

* أوضحت النتائج أن أعلي مستوي للكوليسترول بعينة الجبن الراس الكنترول وأقل مستوي لعينة جبن الراس المضاف لها *Bif. bifidium*.
* كما أظهرت النتائج المتحصل عليها أن جميع السلالات من البكتريا الحيوية بقيت حية خلال فترة التسوية (10^7 cfu/g) وزيادة أعداد البكتريا الكلية مع إنخفاض عدد الفطريات والخمائر خلال فترةالتسوية في الثلاث شهور علي الرغم من ملاحظة إنخفاض أعداد بكتريا حمض اللاكتيك.
* أعلي درجات التحكيم الحسي كانت مع عينات الجبن الراس المضاف لها *Bif. bifidum* بينما حصلت *Bif. lactis* علي أقل درجات مقارنة بالعينة الكنترول.
* وفي النهاية اتضح أن الجبن المضاف الية المدعمات الحيوية مصدر جيد للدعم الحيوي وتقليل الكوليسترول.

قام بتحكيم البحث

أ.د / محمد شلبى جمعه	**كلية الزراعة – جامعة المنصورة**
أ.د / محمد السيد على	**كلية الزراعة – جامعة الزقازيق**