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HEALTHY MODIFIED ZABADY

[45]

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ABSTRACT

Buffaloe's milk was used for the manufacture of Zabady. Control, Zabady made by using 3% of the regular starter. 1.5% of the regular Zabady starter was added to the other three parts, then 1.5% of *Bifidobacterium bifidium*, ABT or autolyzed *S. thermophilus* were added to the other three parts respectively. The result showed an increase in acidity of control zabady, while bifidobacterium decreased the acidity and curd tension, and increased pH value, coagulation time and synersis. Organoleptic properties showed an improve in the flavour of zabady by using bifidobacterium in the end of storage compared to the other treatments.

Keywords: Zabady, Probiotic, Bifidobacterium , Acidophilus , Autolyzed *S. thermophilus*

INTRODUCTION

Zabady is the most popular fermented dairy products in Egypt. The importance of zabady in human diet is determined by its nutritive and caloric values and health effects **(El-Atawy *et al* 2001).**

Recent epidemiological evidences support to protective effects of dairy foods and probiotic bacteria against some cancer diseases. Zabady is manufactured with *Streptococcus thermophilus* and *Lactobacilus delbeuckii* subsp *bulgaricus*. These bacteria nither inhibit the human and animal intestinal tract nor survive in large numbers during passage through the digestive tract.

Recently, there was an increase interest in the incorporation of *L. acidophilus* and Bifidobacterium species into fermented milk products (**Klaver et al 1993 and Tawfik 1993**). These probiotic effects are generally related to inhibition of pathogenic species, treatment of diarrhea, reducing the risk of colon cancer, increasing the immune response system and decreasing concentration of cholesterol in blood plasma **(Havenaar and Huis 1992 & Tawfik, 1993)**.

Also autolyzed starter culture was added to the normal starter in the manufacture of cheese **(Nasr, 1983).**

The present study aimed to manufacture healthy zabady by mixing the regular zabady starter with Bifidobacterium, ABT and autolyzed *S. thermophilus* to enhance the nutritive values of zabady.

MATERIAL AND METHODS

Milk.

Fresh buffaloe's milk was obtained from the herd of Animal Production Research Institute, Egypt.

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Starters

Steptococcus thermophilus, Lactobacillus delbreukii subsp *bulgaricus, Bifidobacterium befidium,L. acidophilus* and ABT were obtained from Ch. Hanson's Lab., Copenhagen, Denmark.

Preparation of autolyzed culture of *S. thermophilus*

Old culture of *S.themophilus* was prepared as autolyzed starter according to (**Dyachenko *et al* 1970)**. The pure strain was inoculated to sterilized skim milk under aseptic condition. Incubation was carried out at 38^{o}C for 7 days.

Manufacture of Zabady

Zabady was manufactured from buffalo's milk heat treated at (85^{o}C /15min). The milk was divided to four portion. The first was served as control of zabady by using 3% of the regular starter. The other three portion were inoculated with 1.5% of the regular zabady starter then 1.5% of *Bifidibacterium bifidium*, ABT and autolyzed S. thermophilus were added to the other three portions respectively.

Methods of analysis

Total solid, Total protein and titratable acidity percent were determined according to the methods described by **(IDF 1986)**. pH value was measured by using laboratory microprocessor pH meter model. Hanna HI 852. Curd tension was determined according to **El-Shabrawy (1973)** using modified westphal balance. Synersis was determined by the methods described by **Mehanna and Mehanna (1989)**.

Lactic acid bacterial count was conducted according to **Lee *et al* (1974).** Yeast& moulds were determined according to **Blanchette *et al* (1996)** using modified MRS agar (Oxoid)

Bifidobacterium befidium was enumerated according to **Dave and Shah (1996)** using modified MRS agar supplemented with 0.05% L. cystein. HCl .

Organoleptic properties were evaluated by panelists according to the scoring sheet outlined by **Nelson and Trout (1956)**

All the treatments analysed when fresh and after storage period for 4, 8 and 12 day at 5^{o}C±2^{o}C. Only microbiological analysis were analysed after 4,8,12 and 16 days.

RESULTS AND DISCUSSION

Chemical composition of fresh zabady is shown in **Table (1).** It is cleared from the results that TS%, Fat% and total protein content did not affect with the type of starter cultures used in all treatments compared with control zabady.

Table1. Effect of different starter cultures on Chemical composition of fresh zabady

Treatments	T.S%	Fat%	T.P%
Control	17.34	4.40	4.79
T1	17.67	4.46	4.70
T2	17.70	4.44	4.80
T3	17.67	4.36	4.87

T1: zabady with *Bifidobacterium bifidium*
T2: zabady with ABT culture
T3: zabady with *S. thermophilus* autolyzed

This may be due to the same chemical composition in the initial milk used in the manufacture of zabady.

Table (2) shows the effect of using different types of starter culture on titratable acidity% and pH value when fresh and during storage period at 5°C±2°C for 12 days. The data indicated that acidity increased and pH values decreased with increasing storage period in all treatments. These results are in agreement with the finding **Mehanna and Gonc(1988)** and **El-Shibiny et al (2005)** who mentioned that yoghurt acidity and pH changes on fresh yoghurt and during storage.

Also, the data showed that the rate of developing both acidity and pH value during storage were less in case of zabady made with bifidob acterium. These results are in accordance with the finding of **El-Shibiny *et al* (2005).**

Table 2. Effect of different starter cultures on titratable acidity and corresponding pH during the storage period of zabady

Treatments	T.A				pH			
	fresh	4 days	8 days	12 days	fresh	4 days	8 days	12 days
Control	0.79	0.84	0.89	0.98	4.86	4.77	4.71	4.59
T1	0.75	0.77	0.83	0.89	4.96	4.87	4.80	4.71
T2	0.78	0.80	0.85	0.92	4.90	4.84	4.78	4.67
T3	0.77	0.78	0.85	0.88	4.93	4.82	4.79	4.64

Table (3) shows the effect of using different types of starter cultures on some rheiological properties of zabady

It is cleared from the data that, the coagulation time of zabady affected with starter culture type. The longest coagulation time recorded when befidobacterium used (T1) while, the shortest recorded when autolyzed *S. thermophilus* used (T3) compared to control and the other treatment (T2). This may be related to the development of acidity during the incubation period. These results are in agreement with those reported by **Marshall (1982) and Peri *et al* (1995).**

Also, the same **Table (3)** showed that the curd tension of zabady when fresh affected with type of starter culture. Curd tension of zabady made by using Bifidobacterium recorded the lowest while curd tension of zabady made with autolyzed *S. thermophilus* recorded the lowest may be due to the ability of the different starter culture to produce lactic acid and the capability to coagulate the milk **El-Garawany (2004).**

The effect of using different starter culture on the synersis of zabady when fresh and during storage period at 5°C±2°C for 12 days are shown in the same **Table (3)**.

It is obvioued from the data that the synersis of all the treatments decreased with storage period may be due to increasing the water binding capacity of protein when stored at 5°C±2°C which led to decrease in synersis. These results are in accordance with the finding of **Lorenzen *et al* (2002) and Abou El-Nour *et al* (2004)**.

Table 3. Effect of different starter cultures on rheiological properties of zabady

Treatments	Coagulation time	Curd tension	Synersis Storage period (days)			
			0	**4**	**8**	**12**
Control	180	79.79	20	16	14	11
T1	195	67.53	24	23	19	15
T2	185	82.31	22	20	18	17
T3	170	83.05	18	17	16	13

The variation in fatty acids content between the different treatments of zabady as affected by using different types of starter cultures when fresh and after 12 days of storage are shown in **Table (4)**. In general one could say that almost saturated fatty acids increased and unsaturated fatty acids decreased during storage. The rate of changes showed the lowest when bifidobacterium used due to the lowest rate of acidity development . It was clear that the short chain saturated fatty acids Caprillic (C_8) and the long chain saturated fatty acids Stearic (C_{18}) which represented the higher percent of the estimated saturated fatty acids showed the same trend as they decreased by using bifidobacterium and increased by advancing storage.

Concerning the unsaturated fatty acids, it was obvious that Oleic acid ($C_{18:1}$) which had the highest ratio compared to the other obtained unsaturated fatty acids markedly decreased during storage. The rate of decreasing was the lowest when bifidobacterium used. These results are in agreement with those reported by **Alm(1982) and Shalaby *et al* (1992)** who mentioned that, some fatty acid were increased whereas others decreased according to manufacturing methods. Also, they revealed that fatty acids profile changed during fermentation .They reported that the relative amount of fatty acids increased, whereas quantities of Oleic, Linoleic and Palmitolic acids decreased.

Effect of using different starter culture on the organoleptic properties of zabady when fresh and during storage period at $5^oC \pm 2^oC$ for 12 days are shown in **Table (5)**. The obtained data showed that flavour of all the treatments affected by the type of starter culture used.

Flavour of control zabady and zabady made with ABT starter culture gained the highest score when fresh compared with the other treatments while zabady made with bifidobacterium had the lowest falvour score .Flovour of all treatments decreased with storage except that made with Bifidobacterium which had constant flavour score with storage to be the highest score after 12days of storage.

Body &texture of control zabady and T3 were the highest when fresh. Body & texture of all treatments decreased with increasing storage period.

Table 4. Effect of different starter cultures on fatty acids of zabady when fresh and at the end of storage.

Fatty acids	Control		T1		T2		T3	
	Fresh	12days	Fresh	12days	Fresh	12days	Fresh	12days
C4	-	1.916	-	0.901	-	1.171	-	1.240
C6	-	1.808	-	0.861	-	0.936	-	1.062
C8	-	0.604	0.658	1.360	-	-	0.482	0.634
C10	-	1.696	1.514	1.834	-	-	1.277	1.545
C12	2.484	2.662	2.152	2.359	2.11	2.615	2.300	2.579
C14 iso	-	0.259	-	0.286	1.470	-	-	0.295
C14	12.255	12.445	11.812	12.087	12.419	12.119	12.750	12.921
C14:1	1.972	1.341	1.198	1.031	1.264	0.907	1.553	1.036
C15	1.498	1.663	1.648	1.685	1.679	1.715	1.768	1.821
C16 iso	2.134	2.561	1.655	2.120	2.326	2.554	2.031	2.194
C16	33.912	34.291	35.397	36.065	34.935	36.905	31.940	32.243
C16:1	2.948	1.563	-	1.196	1.268	0.967	-	0.367
C17	-	0.796	-	0.803	0.757	0.837	-	0.783
C18	16.806	17.312	16.944	17.412	15.143	16.357	14.976	15.863
C18:1	25.828	19.354	27.152	20.254	25.957	24.305	31.641	25.788

Table 5. Effect of different starter cultures on organoleptic properties of zabady

Treatments	Age	Flavour	Body&Tex.	App.	Total
		50	40	10	100
Control	Fresh	48	39	9	96
T1		46	35	9	90
T2		48	38	10	96
T3		46	39	9	94
Control	4	47	38	9	94
T1		46	36	9	91
T2		47	38	9	94
T3		45	39	9	93
Control	8	43	36	9	88
T1		46	34	8	88
T2		45	36	9	90
T3		43	36	8	87
Control	12	41	35	8	84
T1		46	31	7	84
T2		44	33	8	85
T3		39	33	8	80

Highest appearance score recorded when ABT starter culture used in the manufacture of zabady when fresh. Appearance tended to decrease with storage. Total score of zabady made from ABT was closed with traditional zabady when fresh. Total score of all the treatments decreased with increasing storage period.

Similar trends were reported by **Kebary and Hussein (1999); Hassan *et al* (1999) and El-Garawany (2004).**

Data present in **Table (6)** shows that lactic acid bacteria count (L.A.B) were increased gradually until reach 8 days, then decreased after 12 and 16 days. These results are in agreement with the finding of **Badawi *et al* (2004)** and **El-Atawy *et al* (2001).** In the same it could be seen that table mould and yeast did not detect in all treatments when fresh and during storage except control which detected after 12 and 16 days and in all treatments after 16 days. These may be due to the contamination which occurred during storage.

Table 6. Growth of lactic acid bacteria, moulds & yeasts and Bifidobacterium in zabady from different starter cultures during storage period

Treatment	Storage periods (days)								
	Fresh			4			8		
	L.A.B	M&Y	Bif.	L.A.B	M&Y	Bif.	L.A.B	M&Y	Bif.
Control	4	N.D	10.5	10.5	N.D	18.6	18.4	N.D	14.7
T1	6.2	N.D	15.0	15.0	N.D	20.1	20.1	N.D	18.2
T2	8.6	N.D	17.3	17.3	N.D	21.9	21.9	N.D	19.5
T3	4.7	N.D	11.3	11.3	N.D	19.1	19.1	N.D	15.3
	12			16					
	L.A.B	M&Y	Bif.	L.A.B	M&Y	Bif.			
Control	14.7	N.D	-	-	6.21	-			
T1	18.2	N.D	22.7	-	4.37	22.7			
T2	19.5	N.D	18.2	-	5.10	18.2			
T3	15.3	N.D	-	-	4.00	-			

L.A.B : lactic acid bacteria cfu 10^7 /g M&Y : moulds and yeasts cfu 10^2 /g
Bif : Bifidobacterium cfu 10^6 /g

The count of Bifidobacterium was higher in T1 than T2 this due to the type of starter which used for T1 and T2. Also count of Bifidobacterium increased during the storage period until 8 days then decreased at 12 and 16 days.

These results are in agreement with those reported by **Abou Dawood (2002**) who reported that Bifidobacterium maintained their viability in Kareish cheese ($>10^6$ cfu/g) till the end of storage period (10days).

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زبادى صحى معدل

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تم تصنيع الزبادى من لبن جاموسى حيث قسم اللبن الى اربع اقسام استخدم فى القسم الاول بادىء الزبادى المعتاد بنسبة 3% اما الاجزاء الثلاثة الاخرى تم اضافة بادىء الزبادى بنسبة 1.5% لكل منها ثم اضافة 1.5% من Bifidobacterium (T1) و ABT(T2) والبادىء المتحلل من autolyzed S. themophilus (T3) على التوالى للاقسام الثلاثة0

أظهرت النتائج ثبات البروتين والدهن والجوامد الصلبة فى كل العينات مع ارتفاع حموضة عينة الكنترول بينما انخفضت الحموضة والتوتر الخثرى وارتفع زمن التجبن والـ pH والتشريش للعينات المستخدم فيها ال Bifidobacterium (T1) وقل زمن التجبن فى العينة (T3) فكانت اقل تشريش 0 كما وضح عدم ظهور الاحماض الدهنية قصيرة السلسة فى العينات الطازجة وظهرت فى نهاية التخزين وانخفضت نسبة الاحماض الدهنية الغير مشبعة وفى نهاية فترة التخزين ترتفع الاحماض الدهنية المشبعة والعكس فى العينات الطازجة.

أظهرت الاختبارات الحسية تحسن فى نكهة الزبادى المصنع باستخدم الـ

Bifidobacterium (T1) فى نهاية فترة التخزين مقارنة بالمعاملات الاخرى ، كما حصلت عينات الزبادى المصنع باستخدتم الـ ABT (T2) على أعلى درجات.

لذا يوصى بتصنيع الزبادى صحى باستخدام بادى ABT أو الـ Bifidobacterium مع الزبادى المعتاد.

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