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THE INFLUENCE OF SOME FACTORS ON THE MANUFACTURE AND PROPERTIES OF "ZABADY"

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The present results showed that no pronounced changes were observed in titratable acidity and pH values during the manufacture of "zabady" as affected by the amount of starter added and homogenization. Heat treatments caused some effect in this respect.

The chemical composition of fresh "zabady" was slightly affected by homogenization and the heat treatments applied. Moreover, homogenization improved the physical properties of fresh and stored zabady.

Key words: Zabady, Manufacture and properties.

INTRODUCTION

"Zabady" is an Egyptian fermented dairy product characterized by a cooked flavour and firm consistency similar to that of yoghurt. The traditional method for making "zabady" was reported by El-Gendy [1]. Many attempts were made for studying the composition and quality of "zabady" as affected by adding skim milk powder [2], whey protein [3], soy extract [4] and whey protein concentrate [5] but the effect of some principal factors on the processing, composition and quality of "zabady" is scanty.

The total solids content of milk, rate of acid development, heat treatments, denaturation of serum protein, homogenization and cooling temperature were reported by Rasic and Kurmann [6] as the main factors affecting structure, consistency and composition of yoghurt. Accordingly, it should be worth while to investigate the effect of the amount of starter added, homogenization and different heat treatments on the processing and compositional properties of "zabady" and this is the aim of the present study.

MATERIALS AND METHODS

Fresh cow's milk fortified with 2 % skim milk powder was used in the present study to follow the changes in the titratable acidity and pH values during 5 hr. incubation with yoghurt culture (*S. thermophilus, L. bulgaricus,* 1:1) as affected by the amount of yoghurt culture used (2 and 3 %), homogenization (200 atm./60°) and heat treatments (80°/5 min., 80°/15 min., 90°/5 min. and 90°/15 min.).

"Zabady" was manufactured from heat-treated milk whether previously homogenized or not. The resultant "zabady" was analysed for pH, acidity, total solids, fat, total N (TN), non-casein N (NCN), non-protein N (NPN) as described by Ling [7]. Casein N (CN) and whey protein N (WPN) were calculated from the previous nitrogenous values. Total volatile fatty acids (TVFA) were determined as given by Kosikowski [8]. Acetaldehyde and diacetyl were measured as mentioned by Yaygin [9], whereas Gerber's penetrometer was used for determining curd tension. The rate of curd syneresis was measured by determining the weight of whey exuded from exactly 15 g. "zabady" after 10, 30 and 60 min. at room temperature.

RESULTS AND DISCUSSION

Fig. 1 and 2 illustrate the changes in the titratable acidity (TA) and pH values during manufacturing "zabady" as affected by the amount of the starter added, homogenization and the heat treatments applied. It is obvious that TA was slightly higher with using 3 % starter, whereas pH values were nearly the same in milk inoculated with 2 or 3 % culture. No pronounced changes were observed in the rate of acid development and pH values during incubation of homogenized and non-homogenized milk (Fig. 1). Increasing time of heating from 5 to 15 min. at 80 and 90° caused some decrease in the rate of acid development during incubation time. Thus the TA was almost lower in 80°/15 min. and 90°/15 min.-treated milk compared to the corresponding values of milk heated at 80 and 90° for 5 min. The pH values were slightly higher in milk heated for longer time. Grigorov [10] obtained more rapid coagulation when milk was heated at 85° for 20 min. and

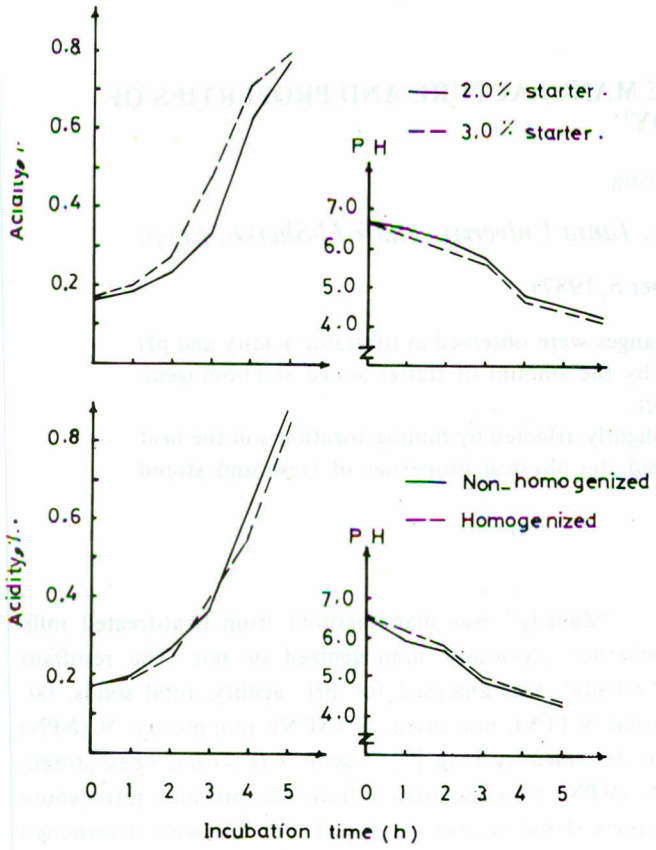

Fig. 1. Effect of amount of starter added and homogenization on the changes in the titratable acidity and pH values during manufacture of "zabady".

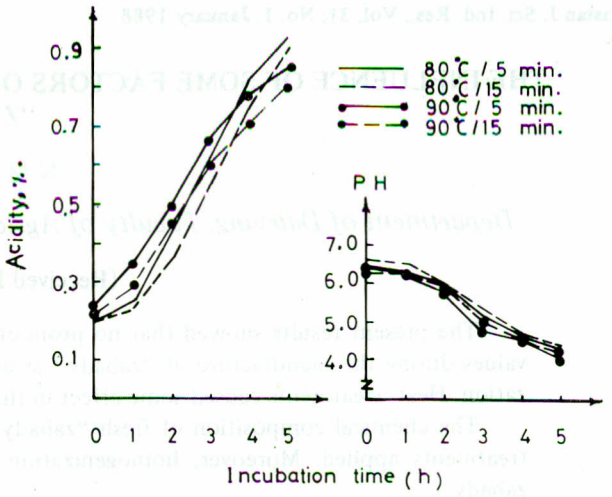

Fig. 2. Changes in the titratable acidity and pH values during manufacture of "zabady" as affected by different heat treatments used.

homogenized. In general, stimulation and inhibition of lactic culture during fermentation of milk were found to be associated with changes in oxidation-reduction potential, pH and denaturation of whey proteins [11].

Concerning the chemical composition and properties of "zabady" it obvious from Table 1 that "zabady" samples made from homogenized and non-homogenized milk of different heat treatments had nearly the same pH, acidity and total solids values. Fat content on dry matter basis

Table 1. Chemical composition and some properties of fresh zabady made from homogenized and non-homogenized milk as affected by different heat treatments.

Property		Non-homogenized				Homogenized			
		A	B	C	D	A	B	C	D†
pH		4.25	4.25	4.35	4.30	4.30	4.25	4.30	4.30
Acidity	(%)	1.10	1.10	0.98	1.07	1.05	1.05	1.07	1.07
Total solids	(%)	13.58	13.47	13.46	13.66	13.42	13.50	13.51	13.50
Fat	(%)	3.20	3.20	3.20	3.25	3.35	3.35	3.45	3.45
Fat/D M	(%)	23.56	23.76	23.77	23.79	24.96	24.81	25.54	25.56
TVFA††		6.60	6.60	6.65	6.65	7.30	7.20	7.80	7.80
TN	(%)	0.62	0.62	0.62	0.62	0.61	0.61	0.61	0.62
TN /DM	(%)	4.57	4.60	4.61	4.54	4.55	4.52	4.52	4.59
CN	(%)	0.54	0.55	0.56	0.56	0.53	0.54	0.54	0.56
CN/TN	(%)	87.10	88.71	90.32	90.32	86.89	88.52	88.52	90.32
NCN	(%)	0.08	0.07	0.06	0.06	0.08	0.07	0.07	0.06
NCN/T N ,	(%)	12.90	11.29	9.68	9.68	13.11	11.48	11.48	9.68
NPN	(%)	0.07	0.06	0.06	0.06	0.07	0.06	0.07	0.06
NPN/TN	(%)	11.29	9.68	9.68	9.68	11.48	9.84	11.48	9.68
WPN	(%)	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00

(Continued.....)

(Table 1, Continue)

WPN/TN	(%)	1.61	1.61	0.00	0.00	1.64	1.64	0.00	0.00
Acetaldehyde	(ppm)	43.50	43.00	42.00	39.00	51.50	48.00	56.00	52.00
Diacetyl,	(ppm)	0.80	0.80	0.00	0.00	1.20	1.20	0.80	0.90
Curd tension	(min.)	8.5	8.5	8.0	8.0	13.5	13.5	13.0	12.5

†A, 80°/5 min.; B, 80°/15 min.; C, 90°/5 min.; D, 90°/15 min.

††Expressed as ml 0.05 N NaOH/100 g. "zabady."

Table 2. Changes in titratable acidity and pH values of zabady during cold storage as affected by different heat treatments.

Heat treatment	Non-homogenized			Homogenized		
	Fresh	5 days	10 days	Fresh	5 days	10 days
Titratable acidity						
80°/5 min.	1.10	1.14	1.35	1.05	1.12	1.28
80°/15 min.	1.10	1.14	1.32	1.07	1.14	1.32
90°/5 min.	0.96	1.10	1.19	1.02	1.19	1.37
90°/15 min.	1.07	1.16	1.35	1.07	1.16	1.26
pH value						
80°/5 min.	4.20	4.10	4.05	4.25	4.12	4.10
80°/15 min.	4.20	4.10	4.05	4.20	4.10	4.10
90°/5 min.	4.30	4.20	4.15	4.20	4.05	4.05
90°/15 min.	4.20	4.10	4.05	4.20	4.10	4.10

as well as total volatile fatty acids (TVFA) were slightly higher in "zabady" from homogenized milk. The highest values for TVFA were recorded in homogenized milk zabady made from milk heated at 90°. This may be due to the fact that the extent of lipolysis in homogenized milk is much greater than in unhomogenized milk [12]. Casein N(Table 1) slightly increased in "zabady" by increasing the time of heating. This may be attributed to the effect of heat treatments on the whey proteins, and so the denaturated whey proteins co-precipitated with the casein when the latter was removed. Non-casein N, non-protein N and whey protein N all were slightly decreased by increasing the time of heating. This influence of heat treatments was reported for milk by Stephen and Ganguli [13]. Acetaldehyde content (Table 1) does not seem to be affected by the heat treatment applied, whereas homogenized milk zabady had higher acetaldehyde values compared to

Table 3. Rate of curd syneresis† of "zabady" made from homogenized and non-homogenized milk as affected by heat treatment and storage time.

Storage time	Heat treatment	Non-homogenized			Homogenized		
		10 min.	30 min.	60 min.	10 min.	30 min.	60 min.
Fresh	80°/5 min.	3.78	5.20	6.30	2.92	3.42	4.25
	80°/15 min.	3.72	5.21	6.12	2.24	3.14	3.98
	90°/5 min.	2.90	4.98	5.18	2.05	3.00	4.29
	90°/15 min.	1.85	4.90	5.18	2.00	3.38	4.15
5 days	80°/5 min.	2.62	4.82	5.93	1.83	2.75	3.30
	80°/15 min.	2.62	4.49	5.29	1.87	3.14	3.81
	90°/5 min.	1.72	4.10	4.66	1.10	2.94	3.51
	90°/15 min.	1.75	3.47	4.15	1.91	3.42	3.90
10 days	80°/5 min.	2.05	3.90	4.83	1.15	1.48	2.28
	80°/15 min.	2.40	3.25	4.36	1.05	1.72	2.66
	90°/5 min.	1.26	2.92	4.22	0.85	1.45	2.91
	90°/15 min.	1.14	2.89	3.50	0.98	1.99	2.47

† Expressed as gm why exuded from 15 gm curd after 10, 30 and 60 min. at room temperature.

"zabady" from non-homogenized milk. In this respect, Gorner *et al.* [14] mentioned that certain heat treatments of basic mixture can increase the acetaldehyde content of yoghurt. Diacetyl was detected in very small amounts in the present study. Curd tension of "zabady" from milk of different heat treatments had nearly the same values, whereas that from homogenized milk was much higher compared to non-homogenized milk "zabady". The importance of homogenization to improve firmness and texture of yoghurt was demonstrated by Pette [15] and Tamime and Robinson [12].

It is apparent from Table 2 that titratable acidity gradually increased in "zabady" made from milk of different heat treatments, whereas pH values decreased at nearly the same rate. These results suggest that different heat treatments and homogenization had no pronounced effect on acid development and pH values during storage of zabady.

The rate of curd syneresis was affected by the heat treatments used (Table 3). Thus the amount of whey exuded was always higher in "zabady" from milk heated at 80° for 5 or 15 min. than the corresponding values with using 90° for 5 or 15 min. On the other hand, the rate of curd syneresis gradually decreased with advancing storage, whereas homogenization greatly improved the water holding capacity of "zabady". Rasic and Kurmann [6] reported that homogenization improved the stability of coagulum against whey separation.

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