Comparative studies on Zabadi made from cow and goat milk with or without skim milk powder supplement.

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Summary

Zabadi (Yoghurt) was manufactured in the laboratory, from fresh milk of cow, of goat and from the same milks but supplemented with 5% and with 10% skim milk powder. The Zabadis were subjected to quantitative tests i.e. contents of total solids (T.S.), fat (BF) and protein (N).

The same products were also subjected to qualitative tests i.e. titrable acidity (buffering capacity) and organoleptic evaluation. Zabadi manufactured from cows or goats milk supplemented with skim milk powder had lower pH and higher titrable acidity compared to Zabadi from raw milk. The statistical analysis showed significant difference ($p < 0.01$) between Zabadis in total solids, fat content and pH, for cow's milk and significant difference also ($p < 0.01$) in total solids between Zabadis made from goat's milk.

The organoleptic results revealed that the addition of 5% skim milk powder greatly improved the quality of the Zabadi produced from cow's milk, while the quality of Zabadi made from goat's milk was improved when 10% skim milk powder was added.

Introduction

Zabadi is a popular, fermented dairy product in Sudan. It is usually made from cow's milk, mixed milks of cow, sheep and goat, and from skim milk powder. Like yoghurt, Zabadi is acid coagulated by culture of *Lactobacilus bulgaricus (L. bulgaricus)* and *Streptococcus thermophilus (S. thermophilus).*

Qualitative and quantitative evaluation of Zabadi manufactured from cow's and goat's milk, supplemented with skim milk powder has not been done. Therefore this work was carried out to examine some quantitative and qualitative properties of Zabadi manufactured from raw cow's milk, goat's milk and, the same milks supplemented with either 5% or 10% skim milk powder.

Materials and methods

For the purpose of this experiment fresh cow's milk, goat's milk, skim milk powder and commercial yoghurt were purchased from the local market. No attempt has been done to identify the bacterial population in the product used as a starter.

Preparation of Zabadi:

Fresh cow's and goat's milk were divided into three equal portions and treated as follows:

(A) Fresh milk.
(B) Milk supplemented with 5% skim milk powder (w/v).
(C) Milk supplemented with 10% skim milk powder (w/v).

The milks from the three treatments were heated to 85 °C for 10 minutes and then cooled to the incubation temperature of 42 °C. Commercial yoghurt culture was **then** added at the rate of 2.5% (wlv). Three replicates were made from each milk treatment.

Chemical and qualitative analysis:

Zabadi from each milk was divided into two parts. One part was used for chemical analysis. Total solids were determined gravimetrically according to A.O.A.C. (1970). Fat content was determined according to the modified Gerber method and protein contents were determined by micro-kjeldahl method. pH and titrable acidity were determined according to Ling (1963). The other part was used for subjective qualitative evaluation i.e. consistency, texture, appearance, flavour and sourness. Consistency was evaluated by gentle hand stirring. The best score for thicker consistency. Texture was evaluated by considering mouth feel or Zabadi pass through the throat plus visual observation. Taste includes flavour and sourness. The evaluation panel involved eight participants.

The results were subjected to analysis of variance (see Owan 1978).

Results and discussion

Addition of skim milk powder led to a significant increase ($p < 0.01$) in T.S. of the Zabadi, particularly between samples (A) and (C) whether made from cow or goat milk (Table 1). Protein contents followed a similar trend but it reached significance ($p < 0.05$) in case of goat's milk. On the other hand and as might be expected BF% showed a downfall and this was significant ($p < 0.01$) in case of cow's milk, particularly between samples (A) and (C). Difference between species in magnitude of change and level of significance may be attributed to differences in proximate composition of the raw milks of the two species. Initial mean values of protein and fat conten' - of cow's and goat's milk were 3.0% and 3.1%

Table 1: Chemical analysis, pH and acidity of different Zabadis

	Treatment									
	Cow's milk					Goat's milk				
Character	**(A)**	**(B)**	(C)	**SE of mean**		**(A)**	**(B)**	(C)	**SE of mean**	
Total solids %	13.6a	17.6 ab	22.8b	1.41	**	16.2a	19.2 ab	22.8b	1.13	**
Protein %	3.0a	4.4a	5.6a	0.39	NS	3.1a	5.2ab	6,5b	0.49	*
Fat %	2.2a	[1] .lab	1.2b	0.16	**	2.7a	2.1a	1.7a	0.23	NS
pH-value	4.5a	4.6ab	4.2b	0.10	**	4.5a	4.4a	4.3a	0.09	NS
Acidity % (As lactic acid)	1.2a	1.4a	1.5a	0.09	**	1.2a	1.3a	1.4a	0.11	NS

N.B. In this and the subsequent tables (A): Zabadi from fresh.milk. (B): Zabadi from fresh milk supplemented with 5% skim milk powder. (C): Zabadi from fresh milk supplemented with 10% skim milk powder.

- Each reading is the average of three replicates.
- Means bearing similar superscripts are not significantly different ($p > 0.05$).

and 2.9% and 2.7%, respectively. These findings are in agreement with those reported for yoghurt by Todoric' and Savandinovic' (1977), El-Shibiny *et al.* (1973) and Mehana and Gonic' (1988).

Table 1 indicates that pH tended to decrease with amount of skim milk powder added, and it reached significance ($p < 0.01$) in case of cow's milk, particularly between samples (A) and (C). The acidity tended to increase with the increase of level of supplenientation. Similar' results were reported for yoghurt by El-Shibiny *et al.* (1977) and Mehana and Gonic' (1988).

In case of cow's milk (see Table 2) addition of 5% skim milk powder improved the appearance, but only reached significance ($p < 0.05$) in flavour particularly between samples (A) and (C). While consistency was improved only with the addition of 10% skim milk powder.

In case of goat's milk similar improvements were observed on addition of 10% skim milk powder. However, differences were significant only in case of flavour ($p < 0.05$), this was true between samples (A) and (C).

The buffering capacity (percentage change in pH in relation to zero time) of Zabadi made from cow's milk tended to increase with addition of skim milk powder. Percentage changes after 180 minutes were 40%, 32%, and 33% in raw milk, 5% and 10% supplementation, respectively (see Table 3). The magnitude of change was marked after 30, 120 and 180 minutes incubation time, but tended to stabilize between 30 and 90 minutes incubation time (Figure 1).

Table 2: Physical and organoleptic quality of the different Zabadis

	Treatment									
	Cow's milk					Goat's milk				
Character	**(A)**	**(B)**	(C)	**SE of mean**		**(A)**	**(B)**	**(C)**	**SE of mean**	
Appearance	2.0a	1.9a	2.0a	0.08	NS	2.2a	2.0a	1.7a	0.11	NS
Texture	2.1a	1,9a	2.0a	0.06	NS	1.9a	2.0a	1.6a	0.13	NS
Flavour	2.0ab	1.8a	2.2b	0.08	*	2.3a	2.1ab	1.5b	0.15	*
Sourness	1.9a	1.6a	2.3a	0.13	NS	2.2a	2.0a	1.8a	0.10	NS
Consistency	1.9a	2.0a	1.8a	0.14	NS	2.2a	1.7a	1.7a	0.17	NS

Means bearing similar superscripts are not significantly different ($p > 0.05$).

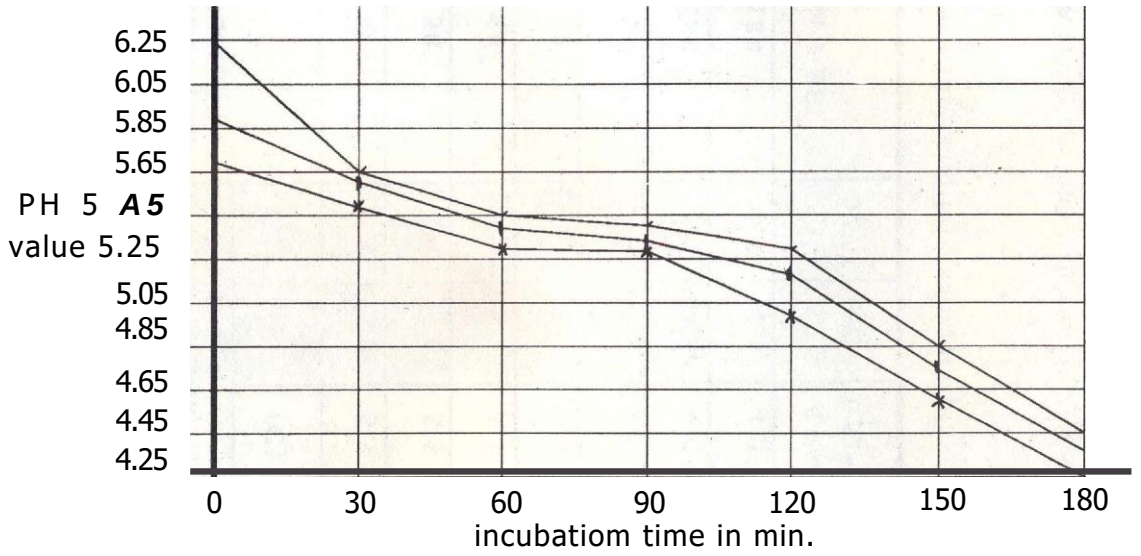
Table 3: Time change in pH of the Zabadi as affected by the addition of skim milk powder.

Incubation time (minutes)	Treatment					
	Cow's milk			Goat's milk		
	(A)	(B)	(C)	(A)	(B)	(C)
0	6.3	5.8	5.7	6.7	6.7	6.5
30	5.6	5.6	5.5	6.7	6.6	6.3
60	5.5	5.4	5.3	6.3	6.2	6.1
90	5.4	5.4	5.3	5.8	5.7	5.5
120	5.3	5.2	5.0	5.6	5.4	5.2
150	4.9	4.8	4.6	5.1	5.0	4.9
180	4.5	4.4	4.3	4.8	4.6	4.4
Mean :.F.. SE	5.3± 0.57 a	5.2± 0.52 a	5.1 ± 0.52a	5.8± 0.77 a	5.8±- - 0.79 a	5.6± 0.78 a

Means bearing similar superscripts are not significantly different ($p < 0.05$).

On the other hand the buffering capacity of goat's milk followed a different trend. Percentage change in pH tended to increase with skim milk powder supplementation and the trend of change was continuous throughout the incubation time (Figure 2).

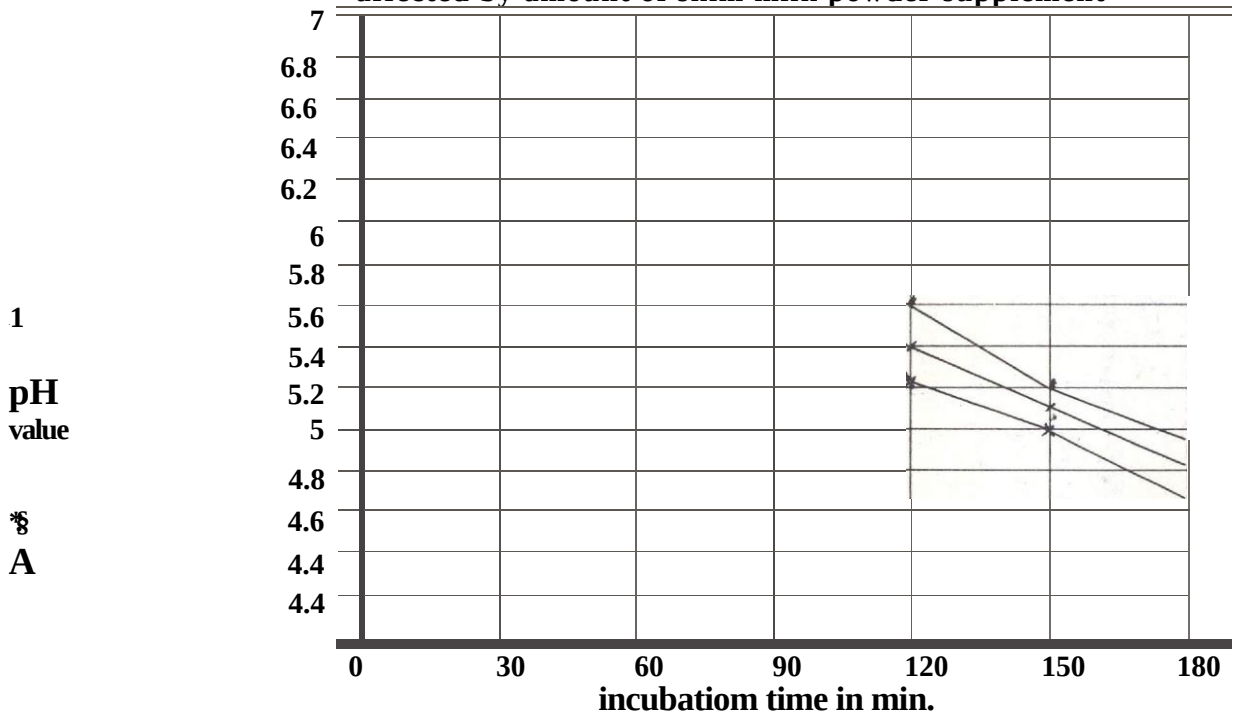
Figure 1: Change in pH value during incubation of Zabadi made from cow milk as affected by amount of skim milk powder supplement



-#- fresh milk
fresh milk + 10% SMP

-+- fresh milk + 5% SMP

Figure 2: Change in pH value during incubation of Zabadi made from goat milk as affected by amount of skim milk powder supplement



Though difference in pH and acidity with the skim milk powder supplementation at any one incubation time could be attributed to lactose content (Mehana and Gonic', 1988), it is difficult to explain the difference between the two species in buffering capacity. This needs further investigation.

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