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THE USE OF CAMEL'S MILK IN MAKING YOGHURT DRINK

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ABSTRACT

Camel's milk was used for preparing yoghurt drink .Yoghurt was prepared from camel milk and then diluted (1: 1) with water or permeate and then pasteurized or kept without pasturization as plain or flavured with mint extract. The freshly prepared drinks were analyzed for chemical composition and sensory properties after 5days of storage in the refrigerator.

The use of permeate for the preparation of yoghurt drink increased the total solids (TS), non protein nitrogen (NPN) and total volatile fatty acids (TVFA), as compared to dilution with water. Also, the use of permeate and mint extract improved quality of the product. The drink made with permeate and mint extract gained the highest scores as compared to other treatments. Acidity, TS, NPN and TVFA of yoghurt drinks from different treatments increased, while the pH decreased after storage. Also, the score points of stored drinks were slightly less than that of the fresh samples.

Keywords: Camel milk, yoghurt d 0rink, permeates pasteurization.

INTRODUCTION

Camel milk still plays an important role in the human diet in many semi-arid countries. Camel's have the ability to give more milk than other herbivores under the same environmental conditions (Farah et al., 1990). According to FAO statistics (2001), there are about 19 million camels in the world, of which 15 million are found in Africa and 4 million in Asia. In Egypt there are approximately 120000 camel populations.

Camel's milk is less affected by storage and transportation than cow's milk. It has been reported that the acidity increases slowly at 30 ^{o}C with little or no change in the taste (Knoess, 1982). Moreover, it contains low cholesterol, low sugar, high minerals (sodium, potassium, copper, zinc and magnesium), high vitamin C, low protein and large concentrations of insulin. There are no allergens, and it can be consumed by lactase deficient persons and those with weak immune systems. The milk is considered as having medicinal properties.

It is mainly consumed raw, boiling of the milk is not common as it decrease. The high ambient temperature and the lack of refrigeration facilities in many arid areas are the main reasons for hygienic problems (Radwan *et al.*, 1992; Semereab & Molla, 2001). However, in some countries like Egypt, the United Arab Emirates, Saudi Arabia, camel dairies exist and camel milk and milk products (Abeiderrahmane, 1997 and Wernery *et al*., 2002).

The use of camel milk in the manufacture of some dairy products was reported in the literature (Yagil, 1987; Abu-Lehia *et al.,* 1989; Farah *et al*., 1989, 1990 and Mehaia, 1993a, b).Concerning fermented milk, it was reported (Abu-Tarboush 1994) that the apparent increase in photolytic

activities of L. acidophilus in raw camel milk compared with the raw cow milk could be attributed to the present of peptides in camel milk that can be easily attacked by starter cultures.

The objective of the present work was to evaluate the possibility of using camel milk in the manufacture of yoghurt drink. In this respect, a comparison was done on the use of water or permeates as diluent with or without adding mint extract as a flavouring agent.

MATERIALS AND METHODS

Fresh camel milk samples used in the present study were collected from the herd of Marsa matrouh Animal Production Research Station, Animal production Research Institute and kept under cooling until the preparation of yought, which made as indicated in Fig.1:

Figure (1): Manufacturing of yoghurt drink

Few drops of the mint oil extract (commercial) was added to give a flavour for yoghurt drink(only few drops).

All samples were analyzed when fresh and after 5 days of storage in refrigerator for pH, acidity, TS, fat, TN and NPN as described by A.O.A.C. (1984), whereas, total volatile fatty acids content (TVFA expressed as ml.0.1N NaOH / 10g) was done according to Kosikowiski (1982).The organolyptic evaluation was carried out as recommended by Nelson and Trout (1981).The collected data were statistically analyzed using General Linear Model's procedure as given by SPSS (2004).

RESULTS AND DISCUSSION

Table (1) shows the chemical analysis of four treatments of fresh yoghurt drink made from camel's milk of A,B,C,D treatments. The highest and significant acidity value (0.48%) was found in B and C treatments. Acidity of drink from A', B', C' and D' were insignificantly different, whereas A' had the lowest acidity (0.33%). An opposite trend of changes was obtained for pH values being the highest figures in case of treatments A' and D (4.97) and the lowest values in A' (4.57) and B (4.50) treatments. These significant differences in acidity and pH might be due to differences in the diluents used and pasteurization, as permeate is an acidic diluents, which contains lactose and lactic acid. In this respect,Abd el-salam et al.(1991)reported that the UF permeate had 6.64%TS,5.87%lactose, 0.037%TN, 0.09% acidity and 6.51 for pH value.

Such impact of permeate was noticed with respect to total solids content, since treatments C,C`,D and D` had higher significant TS content than these in treatments A, A`, B and B` which made by using water as diluents. Using mint oil extract had no effect in this respect since the differences in TS between A, B and A`, B` or between C, D and C`, D` were almost insignificant (Table 1).

In all cases, fat content had the values of 2% or slightly higher. This might be due to water or permeate were nearly fat- free. Also, flavouring agent had no effect in this respect.

TN content was the highest in D` (0.39%) and D (0.37%) treatments, whereas the lowest significant values were in treatment B (0.33%) and treatments A, A`, B`, C and C`. Such differences in TN might be due to the recorded NPN content since C, D` treatments had the highest NPN values. However, it is well known that permeate contains some soluble components like NPN- containing materials.

Data of TVFA in fresh yoghurt drink were significantly higher values in case of using permeate and mint oil extract (C` and D` treatments). The lowest significant value (1.7ml) was given for A treatment suggesting that using water as diluent had no increasing effect on TVFA of fresh yoghurt drink.

The foregoing results suggest that the chemical composition of the yoghurt drink was affected by the diluent used. This was expected since chemical composition of the diluents should be taken into consideration.

Regarding, permeate; its chemical composition when prepared by UF from whole milk was as follows: TS, 5.4%; nitrogen, 0.05%; lactose, 4.6% and ash, 0.5%.

The corresponding figures when skim milk was used were 3.3, 0.03, 3.1 and 0.3% respectively (Tamime and Deeth, 1980).

Table (2) shows chemical analysis of the stored yoghurt drink. It seems that all the acidity values (expect D`treatments) increased during storage with different rates. Treatment B and C had the highest significant values being 0.54%, whereas the lowest significant value of 0.36% was given for treatment A`, followed by 0.40% value for treatment B`. The corresponding decrease in pH was expected since during storage even in the refrigerator lactic acid bacteria consume lactose and produce lactic acid and other components which affected the acidity and pH of the product. However, such slight increase in acidity during storage might be due to the nature of camel milk, since it was reported in the literature that camel milk soured in 8h when kept at 30^0C, compared with cow's milk which soured within 3h at the same temperature (Ohri &Joshi, 1961). Also, Yagil et al. (1984) reported that cow's milk turned sour after 48h at 30^0C, while camel milk did not sour before 7days.In this respect, Mehaia et al. (1994) attributed such differences to the differences in hygiene of the actual milking and in the total microbial count and its activity in milk.

The change the TS, fat and TN in all treatments as affected by storage were not clear enough to give conclusion, thus some values slightly increased - on storage - and some others slightly decreased when values Tables 1 and 2 were compared in this respect.

In general, Table (2) shows an increase in NPN content than those given in Table (1) suggesting that storage had an increasing effect in this respect, but the impact of the applied treatments showed that treatment B had the highest value (0.18%) whereas the lowest figure (0.15%) was given for treatments A` and B`.

TVFA content was significantly higher in treatments C to D` than those of treatments A to B`. Permeate was used as a diluent whereas in the second group water was used suggesting the significant impact of permeate in this respect. The effect of storage was also more pronounced in the first group. In general, the changes given during storage are in agreement with the trends reported in the literature. Degradation of protein and fat during manufacture and storage of yoghurt are responsible for the recorded values of NPN and TVFA. Proteolysis and lipolysis effects of yoghurt starter were given in the literature (Tamime and Deeth, 1980), whereas Abu-Tarboush (1996) found that growth of four strains of *Streptococcus thermophilus* and three strains of *Lactobacillus delbrukii ssp. bulgaricus* was higher in cow milk than in camel milk.

Table (3) reveals the sensory evaluation of the fresh yoghurt drink as affected by the applied treatments, whereas Table (4) shows the same but for the stored product. In most cases application of pasteurization and adding mint extract improved flavour of the fresh product (Table 3). This was not true with respect to the stored product, and might be due to impact of the storage conditions (Table 4).

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The use of permeate as diluent improved flavour of the product even when fresh or after storage. These treatments from C to D` ranked higher scoring points than the corresponding treatments from A to B` (Table 3 and 4). Impact of using permeate was also recorded with respect to body and texture. Thus, the values given for the fresh and stored yoghurt drinks were higher in case of using permeate (Table 3 and 4). Such trend of results was also noticed for the acidity property.

As expected, using water as diluent decreased salty taste and the scoring points given for this property were always higher in the fresh and stored products when water was used (Tables 3 and 4).

Appearance was significantly affected by the applied treatments. Using permeate improved the appearance and the points given in its treatments were higher in the fresh and stored products (Tables 3 and 4).

In general, the total scoring points were always higher in case of using permeate than water and storage conditions had an adverse impact on all the organoleptic properties of the final product. This suggests possibility of using camel's milk for the manufacture of yoghurt drink. Using permeate as diluent and mint extract for flvouring were preferable.

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استخدام لبن النوق في صناعة مشروب اليوغورت

حامد السيد حاتم ، منال على نعيم ، هناء سيدأحمد صقر و الهام حسن أبوالعينين
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اهتمت الدراسة بتصنيع مشروب اليوغورت من لبن الجما ل حيث تم تصنيع اليوغورت بالطريقة التقليدية ثم أجرى تخفيف المنتج إما بالماء المعاملات (A,A,` B, B`)أو برا شح اللبن المعاملات (D, D`, C, C`)مع عدم إضافة مستخلص النعناع المعاملات (C, C`,A, A`)أو إضافة مستخلص النعناع المعاملات (B` D, D`, B)و إجراء بسترة للمنتج قبل التخزين المعاملات (D`, C`, B`, A`)أو عدم إجراء البسترة المعاملات (D,C,B,A)مكتفيا بالمعاملة الحرارية للبن ذاتة .و تم تحليل المنتج الطازج و بعد التخزين لمدة خمسة أيام في الثلاجة للتركيب الكيماوي و الخواص الحسية.

أوضحت النتائج المتحصل عليها من تحليل المنتج الطازج أن حموضة منتج المعاملات (C), (B) كانت الأعلى(٠,٤٨%)في حين كانت أقل القيم(٠,٣٣%)للمعاملة (A) ..و أدى استخدام راشح اللبن إلى زيادة الجوامد الكلية ، النتروجين غير البروتينى و الأحماض الدهنية الكلية الطيارة ....كما خفضت البسترة الحموضة و الأحماض الدهنية الكلية الطيارة ورفعت الرقم الهيدروجيني للمنتج .في حين أن استخدام راشح اللبن و مستخلص النعناع حسن نكهة المنتج و رفع من درجات التحكيم الحسي .كما زادت قيم الحموضة ، الجوامد الكلية، النيتروجين غير البروتينى و الأحماض الدهنية الكلية الطيارة نتيجة تخزين كل العينات في حين انخفضت أرقام الأس الهيدروجيني و درجات التحكيم الحسي لمعظم الخواص الحسية للمنتج .

Table (1): Chemical analysis of fresh yoghurt drink from camel milk as affected by some treatments (average of three replicates).

Treatment	Acidity%	pH	TS%	Fat%	TN%	NPN%	TVFA**
A	0.46±0.001a	4.57±0.03c	5.97±0.04c	2.03±0.03	0.34±0.003bc	0.13±0.003dc	1.70±0.03d
A`	0.33±0.001c	4.97±0.03a	6.41±0.03c	2.00±0.00	0.034±0.008bc	0.12±0.003d	2.00±0.09c
B	0.48±.0.01a	4.50±0.005c	5.97±0.03c	2.06±0.03	0.33±0.007c	0.13±0.003bcd	1.80±0.05d
B`	0.36±0.01b	4.93±0.06a	6.16±0.02c	2.00±0.00	0.34±0.003bc	0.13±0.00bcd	2.00±0.03c
C	0.48±0.001a	4.73±0.07b	7.23±0.15b	2.00±0.00	0.34±0.007bc	0.14±0.003abc	2.00± 0.003bc
C`	0.38±0.01b	4.90±0.06a	7.45±0.05ab	2.00±0.00	0.34±0.00bc	0.14±0.00ab	2.30±0.03a
D	0.45±0.002a	4.97±.03a	7.37±0.009b	2.00±0.00	0.37±0.002ab	0.14±0.003ab	2.16±0.03b
D`	0.40±0.001b	4.40±0.03b	7.68±0.16a	2.00±0.00	0.39±0.007a	0.14±0.006a	2.23±0.03a

*** See Fig.(1) for details.**

****Expressed as ml 0.1N NaOH/10g yoghurt drink.**

a, b.....d: Values in the same column with different superscripts differ significantly at 5%level.

Table (2): Chemical analysis of stored yoghurt drinks (average of three replicates)

Treatment	Acidity%	pH	TS%	Fat%	TN%	NPN%	TVFA**
A	0.50±0.00b	4.23±0.03d	5.97±0.04d	2.03±0.03	0.34±0.008c	0.17±0.007ab	2.00±0.00b
A`	0.36±0.01c	4.79±0.09a	6.37±0.06d	2.00±0.00	0.35±0.006c	0.15±0.006b	2.00±0.00b
B	0.54±0.003a	4.17±0.03c	6.31±0.15d	2.07±0.03	0.35±0.01c	0.18±0.005a	2.00±0.00b
B`	0.40±0.008d	4.66±0.12ab	6.57±0.05d	2.03±0.03	0.35±0.05c	0.15±0.005b	2.00±0.00b
C	0.54±0.009a	4.40±0.05b	7.47±0.17c	2.03±0.03	0.35±0.006c	0.17±0.03ab	2.50±0.05a
C`	0.42±0.003c	4.63±0.14ab	7.91±0.05ab	2.00±0.00	0.36±0.00bc	0.16±0.01ab	2.50±0.06a
D	0.53±0.008a	4.46±0.03b	7.68±0.17b	2.06±0.03	0.38±0.01b	0.17±0.01ab	2.40±0.02a
D`	0.39±0.06d	4.83±0.03a	8.23±0.14a	2.00±0.00	0.42±0.01a	0.16±0.008ab	2.43±0.03a

***See legend to Table (1) for details.**

Table (3): Organoleptic properties of fresh yoghurt drink (average of ten panelists)

Treatment	Flavour (50)	Body& Texture(30)	Acidity(10)	Saltiness (5)	Appearance (5)	
A	45.40±1.46b	23.20±1.85d	8.80±0.37ab	4.00±0.31a	4.00±0.06b	85.40±1.50c
A`	45.60±1.54ab	19.80±0.80c	7.10±0.05c	4.20±1.65a	2.00±0.37c	79.80±1.65d
B	46.40±0.81ab	22.80±0.48d	9.20±0.20ab	3.60±0.24ab	4.00±0.00b	86.00±0.89c
B`	46.60±1.46ab	21.20±0.48c	8.20±0.37c	3.60±0.24ab	3.40±0.24c	84.40±1.60c
C	48.00±0.00ab	25.20±0.48c	9.40±0.24a	3.60±0.24ab	4.60±0.24ab	90.8±0.66b
C`	46.40±0.00ab	26.20±0.48bc	9.00±0.00ab	3.60±0.24ab	5.00±0.00a	90.20±0.73b
D	47.00±0.54ab	28.00±0.32ab	9.60±0.24a	3.20±0.20b	5.00±0.00a	92.60±0.40a
D`	48.60±0.24a	25.60±0.24ab	9.60±0.24a	3.00±0.00b	4.80±0.20a	91.60±0.40a

***see legend to Table (1) for details**

Table (4): Organoleptic properties of stored yoghurt drink (average of ten panelists).

Treatment	Flavour (50)	Body& Texture(30)	Acidity(10)	Saltiness (5)	Appearance(5)	Total (100)
A	41.80±1.11b	19.80±0.20d	8.00±0.54c	3.60±0.24a	4.00±0.00b	78.00±1.40c
A`	38.40±1.43c	17.60±1.07d	5.40±0.50d	3.80±0.37a	2.60±0.24c	67.80±2.59d
B	46.20±0.80a	20.80±0.48c	9.40±0.29a	3.60±0.24a	4.00±0.31b	79.20±1.00c
B`	43.80±0.37ab	20.40±0.40c	7.80±0.37d	3.40±0.29b	3.40±0.24bc	79.00±1.14c
C	44.60±0.67a	24.60±1.16b	8.00±0.31c	3.20±0.29b	4.60±0.24ab	84.00±0.89ab
C`	45.60±0.40	26.20±0.27ab	9.20±0.37ab	3.60±0.20a	4.60±0.24ab	85.00±1.80ab
D	46.20±0.37a	28.00±0.44a	9.00±0.32ab	3.20±0.20b	5.00±0.00a	87.80±0.73a
D`	46.40±0.60a	23.60±0.67b	9.60±0.24a	3.20±0.20b	5.00±0.00a	89.40±1.16a

***see legend to Table (1) for details**