Effect of Storage period on the chemical composition and sensory characteristics of soy milk — made Yoghurt.

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SUMMARY

This study was carried out to investigate the effect of storage period on the chemical composition and sensory characteristics of Yoghurt made from milk partially substituted with soymilk.

Yoghurt was made from cow's milk substituted with 5, 10 and 20% (v/v) soymilk plus the control sample (whole cow's milk). The starter culture was added at the rate of 3% (v/v) (1:1 combination of *Streptococcus thermophilus* and *Lactobacillus bulgaricus)* and stored for 7 days at 4 °C.

Chemical composition of milk as well as the final product was determined (fat, protein, total solids, solids-non-fat, ash and acidity) at 0, 3 and 7 day intervals. Sensory evaluation (colour, flavour, consistency, taste and overall' acceptability) was carried out using untrained panelists at 0, 3 and 7 day intervals.

The storage period affected the chemical composition of yoghurt, indicating that yoghurt analyzed at day zero (immediately after manufacture) had higher fat ($P<0.05$), protein ($P<0.05$), total solids ($P<0.01$) and ash ($P<0.05$) contents, followed-by day 3 and the least values were obtained at day 7. the storage period did not affect ($P>0.05$) the solids-non-fat content of yoghurt. The acidity increased with time ($P<0.01$).

The period of storage did not significantly affect ($P>0.05$) the colour, consistency, taste and overall acceptability of yoghurt, while there was significant variation ($P<0.05$) between the periods of storage in flavour.

INTRODUCTION

In Sudan, yoghurt (which is locally know as zabadi) is made from cow's milk or skim-milk powder. After boiling and cooling, milk is inoculated with a previous batch of yoghurt and incubated in a warm place in the house or kitchen (Dirar 1993).

Yoghurt has been widely recognized to be effective in the prevention and treatment of illness. It has been most effective against gastrointestinal disorders such as diarrhoea and has antibacterial effects on pathogens resistant to standard antibiotics (Deeth and Tamime 1981; Dirar 1993).

The shelf-life of any food commodity should combine the two considerations of safety and organoleptic property of the product. It is the latter that requires emphasis by the dairy industry before attempts are made to prolong the shelf-life of plain liquid yoghurt beyond five days (Salji *et al.* 1987).

This study was designed to study the effect of storage period of yoghurt made from soymilk on its chemical composition and sensory characteristics.

MATERIALS AND METHODS

Source of milk, starter culture and yoghurt cups: '

Cow's milk was obtained from the University of Khartoum Farm. The starter culture *(S. thermophilus* and *L. bulgaricus* at a ratio of 1:1) as bulk culture was kindly supplied by Khartoum Dairy Products Company Ltd. **(1(1)PC).** Plastic cups (100 ml size) were purchased from the local market.

Preparation of soymilk:

Soymilk was prepared according to Johnson and Synder (1978) as follows: beans (200 gm) were soaked in one liter boiling water, kept in a refrigerator overnight and homogenized in 1.4 liter boiling water. The resultant slurry was filtered to obtain soymilk. The soymilk used in this experiment contained 2.76% protein, 7.86% total solids and 0.48% ash. Four samples of milk were prepared for yoghurt manufacture: whole cow's milk and cow's milk substituted with 5%, 10% and 20% soymilk.

Manufacture of yoghurt:

Yoghurt was prepared as described by Kosikowski (1982). Milk was heated to 85-90°C for 30 min, cooled to 45°C then the starter culture was added. The mixture was poured into clean dry plastic cups (100 ml), which were covered and then placed into an incubator at 42-45°C until milk was completely coagulated (about 3-4 hrs). the cups were removed from the incubator and placed in a refrigerator at 4°C and the chemical composition and sensory evaluation were carried out at 0, 3 and 7 day intervals.

Chemical analysis and sensory evaluation:

Both milk and yoghurt were analyzed for fat, protein, total solids, solids-non-fat, ash contents and acidity. Fat content was analyzed by Gerber method (Bradley *et* a 1992). Protein content (by, Kjeldahl method), total solids (TS) content, ash content and the titratable acidity of yoghurt were determined according to AOAC (1990). Solids-non-fat content was determined by subtracting fat content from total solids content.

Yoghurt samples were subjected to sensory evaluation using 10 untrained panelists at 0, 3 and 7 day intervals. The scoring for colour, taste and overall acceptability ranged from 1.—unacceptable to 5=acceptable, while for flavour it ranged from 1=extremely intense to 4=bland, and for consistency it ranged from 1=-tough to 4=soft. The test was done in triplicate.

Statistical analysis:

Statistical analyses were performed using the Statistical Analysis Systems (SAS). General Linear Models (GLM) were used to determine the effects of storage period (0, 3 and 7 days) on fat, protein, TS, solids-non-fat, ash and titratable acidity as, well as sensory characteristics (colour, flavour, taste, consistency and overall acceptability). Means were separated using Least Significant Difference (LSD) with an a *s* 0.05 (ASA1988).

RESULTS

Effect of storage period on the chemical composition of yoghurt:

The data in Table (1) represent the mean value of all soymilk concentrations at each storage period. The maximum fat ($P<0.05$), protein ($P<0.05$) and total solids ($P<0.01$) contents were obtained when yoghurt was analyzed at day zero, while the minimum contents

were obtained when yoghurt was analyzed after 7 days of **storage at 4°C.** However, the solids-non-fat content did not show any significant difference (P>0.05). the maximum ash content was **obtained when** analysis was carried out at day zero and the lowest was in the **7th day** (P<0.05). the acidity steadily increased reaching a maximum value in the 7th day (P<0.01).

Table 1. Effect of storage period on the chemical 'composition of Yoghurt.

Composition	Storage period (days)		
	0	3	7
Fat	3.89a	3.87a	3.78[b]
Protein	3.46[a]	3.36''	3.29[b]
Total solids	**14.03a**	**14.02a**	**13.71[b]**
Solids-non-fat	10.15'	10.16'	9.97a
Ash	0.67'	0.66°	0.64[b]
Acidity	1.02[b]	1.04[b]	1.11[a]

Means within the row bearing the same superscripts **are not significantly different (P>0.05).**

Effect of storage period on the sensory characteristics of yoghurt:

The storage period did significantly (P>0.05) affect the colour, consistency, taste and overall acceptability, the flavour scored highest when analysis was carried out after 7 days of storage, while the lowest score was obtained when yoghurt was organoleptically analyzed at day zero (P<0.05) (Table 2).

As reflected in Table ,(2) the colour of the product scored highest at day 0 then minimally decreased with no significant **variation when tested after 3 and 7 days. Similarly, the yoghurt flavour increased gradually with time. The taste, consistency and overall acceptability showed best results in the 3rd day.**

Table 2. Effect of storage period on the sensory composition of Yoghurt.

Sensory attribute	Storage period (days)		
	0	3	7
Colour	3.63a	3.60[a]	3.60'
Flavor	2.50[1]	2.73'[1]	3.05'
Consistency	2.60'	2.73'	2.60'
Taste	3.18'	3.40a	3.05'
Overall acceptability	3.23a	3.30'	2.95 [b]

Means within the row bearing the same superscripts are not significantly different **(P>0.05).**

DISCUSSION

Table (1) shows the chemical composition of yoghurt at 0, 3 and 7 day storage. It is evident that the fat, protein, total solids, solids-nonfat and ash contents were higher when yoghurt was analyzed at the beginning of storage period (day zero). With progressing storage period, the values decreased. This is largely attributable to the microbial action on the components of yoghurt (fat, protein, lactose) (Shanely, 1973). Some of the lactose is slowly converted to lactic acid. However, most of the lactose is substantially fermented to lactic acid during manufacture of yoghurt (Shanely, 1973). The production of flavor components such as acetaldehyde can arise from fat, protein or lactose (Tamime and Deeth, 1980), but the bulk of acetaldehyde comes from the microbial fermentation of lactose. A subordinate factor for total solids content depression is the on-going deposition of soluble non-protein nitrogen, which is generated from the protein breakdown (Breslaw and Kleyn, 1973). Tamime and Deeth (1980) found that the doubling of solids-non-fat content resultedin a similar

effect of titratable acidity. In addition, decreasing the total solids content may also be attributed to the interaction of basic amino groups with lactose (Humphreys and Plunkett, 1969). Our results in common are in conformity with those obtained by El-Shibiny *et al.* (1979 a, b) who propoSed that total solids content decreased proportionally during the storage period with increase in glucose plus galactose, acetaldehyde, non-protein nitrogen and free amino acids content. From Abrahamsen's (1978) survey, it is obvious that acidity progressively increases during storage of yoghurt.

As reflected in Table (2) the color of the product scored highest at day 0 then minimally decreased with no significant variation when tested after 3 and 7 days. Similarly, the yoghurt flavor increased gradually with time. The taste, consistency and overall acceptability showed best results at day 3. the increasing flavor content with time may be due to development of acetaldehyde produced by microbial action on lactose, breakdown of proteins to flavor compounds and breakdown of fat to volatile fatty acids (El — Shibiny *et al.* , 1979a, b; Tamime and Deeth, 1980; Breslaw and Kleyn, 1973). Moreover, the improvement of the beany flavor of soymilk yoghurt was obtained by fermentation (Mital and Steinkraus, 1979).

In conclusion, this investigation focuses on the manufacture of yoghurt from milk partially substituted with soymilk (5, 10 and 20% soymilk), and determination of the effect of storage period on the chemical composition and sensory characteristics. Fat, protein, total solids and ash contents decreased with time, while acidity increased. Solids-non-fat content increased till 3"[1] day and then decreased. The colour was best at the beginning of storage period, taste and overall acceptability at 3[1.]" day and flavour was best at 7th day of storage.

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تاثير فترة التخزين علي المكونات والصفات الحسية للزبادي

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ملخص البحث

تم إجراء هذا البحث لدراسة تأثير فترة التخزين علي المكونات والصفات الحسية للزيادي المصنع من لين بقر كامل الدسم تم استبداله جزئيا بلبن الصويا (بنسبة 5 % و 10 % و 15 % بالإضافة إلى العينة الضابطة) ، أضيف اليادية بنسبة 3 % وتم حفظ الزبادي علي درجة حرارة 4 م لمدة 7 أيام .

تم تحليل نسبة الدهون ، البروتينات ، الجو لمد الكلية الجر لمد غير الدهنية + الرماد والحموضة في اليوم الأول للتصنيع (صفر) وبعد 3 ايام و 7 ايام . كما تم إجراء التقويم الحسي (اللون ، النكهة ، القوام ، المذاق و القبول العام في نص الفترة المذكورة أعلاه باستخدام مشاركين غير مدربين

لوحظ وجود تأثير لفترة التخزين علي مكونات الزبادي ، حيث أن نسبة الدهن ، البروتينات ، الحوامد الكلية والرماد كانت عالية في اليوم الأول للتصنيع (صفر) ، ومن ثم تناقصت النسبة حتي اليوم السابع ، بينما لم تؤثر فترة التخزين على الحوامد عر الدهنية اثرت فترة التخزين علي الحموضة حيث زادت الحموضة مع تقدم فترة التخزين

فترة التخزين لم تؤثر على الصفات الحسية (اللون ، النكهة ، القوام ، المذاق والقبول العام) ، بينما أثرت تاثيرا طفيفا علي النكهة