3. MATERIALS AND METHODS

3.1 MILK

3.1.1 Procurement
Raw full cream cow’s milk was collected from the University of Pretoria’s experimental farm and pasteurised at 72°C for 15 s, while goat’s milk was obtained already pasteurised from the goat herd of the Medical University of South Africa (Medunsa). Since the goat’s milk could only be obtained on Friday’s, the two batches of milk were stored at 4°C over the week-end prior to cheesemaking.

3.1.2 Sampling
The batches of milk were stirred thoroughly and representative samples of each was collected into sterilised bottles. The chemical and microbiological tests were done in triplicate on each sample.

3.1.3 Fat content
The Gerber method was used to determine the fat content of the milk as outlined by the Food and Agriculture Organization (1986).

3.1.4 Protein content
The protein content of the milk was determined by the Kjeldahl method (Triebold & Aurand, 1963), using a Buchi 430 (digestion equipment), Buchi 322 (distillation unit), Buchi 343 (control unit) and dosimat (Metrohm, Herisau, Switzerland).
3.1.5 pH
The milk samples were shaken thoroughly after which the pH was measured as outlined in Kosikowski (1978) using a “Mettler DL25 titrator” pH meter (Mettler-Toledo, Switzerland).

3.1.6 Titratable acidity
The amount of titratable acidity was determined by titrating 9 ml of the milk with a 0.1M sodium hydroxide solution in presence of phenolphthalein indicator (Richardson, 1985).

3.1.7 Lactose
The lactose content was determined according to the International Dairy Federation (1974).

3.1.8 Total solids/ Moisture content
An oven drying method in which the milk was heated at 100°C until a constant weight was obtained, was used (Triebold & Aurand, 1963).

3.1.9 Total plate count
The standard plate count was carried out according to Marth (1978). The Plates were incubated at 30°C for 72 ± 3 h.

3.2 FETA CHEESE

3.2.1 Starter culture preparation
The starter culture preparation started about 7 days before cheese manufacturing. The culture used was a commercial culture CHN 22 (a mixed culture of Lactococcus lactis, Lactococcus lactis ssp. cremoris, Lactococcus lactis ssp. lactis biovar diacetylactis and Leaconostoc mesensteroides ssp. cremoris). The stock
cultures were supplied in a freeze-dried form by CHR Hansens Lab (Denmark), and were cultured in sterilized skim milk and incubated at 22°C for about 16 h (Kosikowski, 1978).

### 3.2.2 Manufacturing of the Feta cheese

Four different proportions of goat’s milk and cow’s milk were mixed as follows:-

**Treatment 1:** 100% cow’s milk and 0% goat’s milk

**Treatment 2:** 65% cow’s milk and 35% goat’s milk

**Treatment 3:** 35% cow’s milk and 65% goat’s milk

**Treatment 4:** 0% cow’s milk and 100% goat’s milk

The milks were processed to Feta cheese as shown in Figure 3.1 (modified from Prinsloo, 1997).

### 3.2.3 Sampling

Two packaged cheeses were picked randomly from each of the four treatments. The packages were opened, water drained, a sample for microbiological analysis taken from each cheese and excess water blotted from the surface of the remainder of each cheese with a paper towel. The individual cheeses, after removal of the sample for microbiological work, were then ground into paste-like form using a pestle and a mortar. The ground sample was then used for chemical analyses.

On each of the eight samples, representing four treatments, tests were done in duplicate, except for pH measurements. All the tests except sensory evaluation (see section 3.2.14) were done on weekly basis (for three weeks) beginning the second day after the milk was renneted.
Milk heated to 31°C

1% (v/v) active starter culture added, stirred and left undisturbed for 30 min

Rennet added (4 ml/100 l), stirred and left for 1 h

Firmness of the curd was checked, and allowed to stand longer if necessary

Curd cut into 1 cm³ cubes, and allowed to heel for 20 min

Curd scooped into Feta moulds and left to drain for 2 days

Curd turned and left to stand for further 5 h

Curds dry salted with 3% (m/m) NaCl and vacuum packed in polythene bags

Finally stored and allowed to ripen at 10°C

Figure 3.1: Summary of Feta cheesemaking
3.2.4 Fat content
The fat content of the cheeses was determined according to a modified Babcock method (Kosikowski, 1978).

3.2.5 Free fatty acids
Free fatty acids were extracted into a neutralised mixture of benzene-ethanol and titrated with 0.1N sodium hydroxide solution in presence of an indicator (Triebold & Aurand, 1963).

3.2.6 Total Proteins
The Kjeldahl method (Triebold & Aurand, 1963; Kosikowki 1978) was used to determine the protein content of the cheese using the Buchi apparatus (subsection 3.1.4).

3.2.7 Soluble proteins
Soluble proteins were extracted with hot water and subjected to digestion, distillation and titration in a similar manner to total protein in milk and cheese (Kosikowski, 1978).

3.2.8 pH
pH of the cheese samples was measured introducing the pH meter electrode directly into the ground, undiluted cheese samples (Kosikowski, 1978), using a “Mettler DL25 titrator” (Mettler -Toledo, Switzerland).

3.2.9 Moisture content and total solids
The determination of total solids was done by oven drying at 100°C (Kosikowski, 1978).
3.2.10 Salt
Salt (sodium chloride) was extracted into hot water, then titrated with standard solution of 0.171 N silver nitrate according to the Australian Society of Dairy Technology (1966).

3.2.11 Lactose
The lactose in the cheeses was determined according to the International Dairy Federation (1967).

3.2.12 Total Plate Count
The primary dilutions \(10^{10}\) were made by mixing cheese with sterilised peptone water and macerating in stomacher bags (Art Medical Equipment, Johannesburg). Further dilutions were prepared and plated using the pour plate method (Marth, 1978; International Dairy Federation, 1987).

3.2.13 Texture Analysis
Two representative samples were picked randomly from each of the four cheese treatments and cut into 2 x 2 x 1.5 cm pieces for analysis. An automatic texture analyzer TA-XT2 (Stable Microsystems, England), fitted with a conical probe was used. The machine was programmed to operate using the following settings:-

**Mode:** Measure force in compression

**Option:** Return to start

**Pre-test speed:** 2.0 mm/s

**Test speed:** 1.0 mm/s

**Distance:** 10 mm

**Trigger type:** auto (3 g)

**Accessory:** P/45 conical probe
3.2.14 Sensory Evaluation
The acceptability of the cheeses was evaluated by 62 panelists 21 days after cheese manufacturing. A Nine-point Hedonic scale evaluation sheet (Figure 3.2) was used to rate the preference of the panelists (Piggott, 1988).

**SENSORY EVALUATION OF FETA CHEESE**

Date..........................................................

Name..........................................................

Please taste and evaluate 4 samples from left to right, and make a mark (x) in the block that best describes how much you like the specific sample. Drink water between samples.

<table>
<thead>
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<th>Degree of Liking</th>
<th>Codes</th>
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<tbody>
<tr>
<td>Like extremely</td>
<td></td>
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<tr>
<td>Like very much</td>
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<tr>
<td>Like moderately</td>
<td></td>
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<tr>
<td>Like slightly</td>
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<td>Neither like nor dislike</td>
<td></td>
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<tr>
<td>Dislike slightly</td>
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<td>Dislike moderately</td>
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<tr>
<td>Dislike very much</td>
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<td>Dislike extremely</td>
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Comments

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**Figure 3.2:** Evaluation sheet used for sensory evaluation
3.3 STATISTICAL ANALYSIS
The whole experiment was repeated three times with batch 1 processed in June, batch 2 in September and batch 3 in November 1998. The results were analysed statistically using Statistica version 5.0 (Statsoft, United States of America) and evaluations were based on a 5% significance level.