

The chemical composition of fresh and evaporated milk of cow marketed in Ghana

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SUMMARY

The chemical composition of fresh milk and evaporated milk of cow from both local and imported sources was determined. The imported types of fresh milk and evaporated milk contained over 3% and 9% butterfat respectively; these figures agreed with the label declaration. The locally-produced fresh milk samples were found to contain mean values ranging from 2.76% to 7.50% for butterfat, 11.62% to 15.19% for total solids, 2.99% to 3.63% for protein and 0.59% to 0.62% for ash. Crossbreeds of Jersey and any of the local breeds of cattle produce milk of high chemical composition. Provisional communication. Received 2 Aug 72; revised 6 Apr 73.

Introduction

The milk marketed in Ghana comes from foreign and domestic sources. The imported milk constitutes the major supply of this commodity to the public. It is usually a standardized and processed product sold in cans or bottles.

The locally-produced milk from cow comes mostly from the Amrahia Dairy Farm, the Agricultural Research Station at Nungua and from dairy farms situated in various places on the Accra plains. Whereas a small volume of this type of milk reaches the public for direct consumption, greater portion is processed into dairy products.

This article evaluates the quality of fresh milk and evaporated milk from both local and imported sources with respect to their chemical constituents.

Materials and methods

The samples of imported fresh milk and evaporated milk analysed were brought from

RÉSUMÉ

ANKRAH, E. K.: *Composition chimique des laits de vache, frais ou en poudre, vendus au Ghana*. La composition de laits de vache, frais ou en poudre, d'origine locale ou importés, a été déterminée. Les types importés de lait frais ou en poudre contenaient respectivement plus de 3% et 9% de beurre; ces chiffres correspondaient à ceux mentionnés sur les étiquettes. Les échantillons de lait frais d'origine locale contenaient entre, 2,76 et 7,50% de beurre, 11,62 à 15,19% d'extrait sec, 2,99 à 3,63% de protéines et 0,59 à 0,62% de cendres minérales. Les croisements de la race Jersey avec n'importe quelle race locale produisent du lait de haute teneur en substances chimiques.

department stores and markets in Accra. The brand names of the samples analysed are shown in column 1 of Table 1. The samples of locally-produced fresh milk were obtained from the Amrahia Dairy Farm, the Agricultural Research Station at Nungua and from places such as Katamanso, Dahwenya, Afienea, Doryumu and Nungua located on the Accra plains. The samples were collected between April and October 1971, and were analysed for fat, total solids, protein and ash.

Fat. Fat was determined by the Roesse-Gottlieb method (FAO/WHO, 1968) on a 5 g portion of sample.

The total solids, protein and ash contents were determined by methods of the A.O.A.C. (1970) as follows:

Total solids. 5 g portion of the milk sample was mixed with sand and was first heated on water bath before drying in an oven at 105 °C to a constant

weight. The total solids were the dry substance remaining after drying.

Protein. The total nitrogen content was determined by the Kjeldhal method using macrodigestion procedure. The percentage protein was calculated as $N \times 6.38$.

Ash. 5 g portion of the sample was ashed in a muffle furnace at 550 °C for about 8 h.

Results and discussion

The composition of fresh milk and evaporated milk imported into Ghana is shown in Table 1. For the imported fresh milk, the mean values of butterfat content ranged from 3.19% for Bear Brand Swiss Milk to 3.29% for Busck's Natural Milk while the total solids content ranged from 12.11% for Nestle's Milk to 12.56% for Red and White Swiss Milk.

The butterfat content of all the evaporated milk samples with means ranging from 9.09% for Carnation Evaporated Milk to 9.16% for Peak Evaporated Milk conformed to the label declaration of 9% fat content. The total solids content of the evaporated milk samples had means ranging from 31.23% for Lorado Evaporated Milk to 31.96% for Nestle Ideal Milk. The results indicate that the evaporated milk samples analysed were well above the FAO standard of minima of 7.5% fat by weight and 25.0% of milk solids by weight (FAO/WHO, 1968).

Table 2 shows the chemical composition of fresh milk from local sources. The samples from the Agricultural Research Station (Nungua) were found to contain the highest amount of butterfat and total solids with mean values of 7.50% and 15.19% respectively, while those from Amrahia Dairy Farm were lowest in butterfat (2.76%) and

TABLE 1
Composition of Imported Fresh and Evaporated Milk

| Brand name | Type of milk sample | Number of samples analysed | Total solids (%) | Fat (%) | Protein ($N \times 6.38$) (%) | Ash (%) |
|--------------------------------|---------------------|----------------------------|------------------------|---------------------|---------------------------------|---------------------|
| Busck's Natural Milk .. | Fresh | 6 | 12.42 (12.26-12.53) | 3.29 (3.03-3.87) | 3.46 (3.44-3.53) | 0.65 (0.53-0.81) |
| Nestle's Milk | Fresh | 9 | 12.11 (11.60-13.48) | 3.24 (3.02-3.62) | 3.33 (2.83-3.54) | 0.71 (0.51-0.81) |
| Bear Brand Swiss Milk | Fresh | 10 | 12.22 (11.75-12.59) | 3.19 (3.06-3.54) | 3.18 (2.97-3.35) | 0.66 (0.51-0.73) |
| Red and White Swiss Milk | Fresh | 7 | 12.56 (12.36-12.75) | 3.25 (3.07-3.69) | 3.25 (3.08-3.44) | 0.68 (0.51-0.76) |
| Lorado Evaporated Milk | Evaporated | 8 | 31.23 (30.29-32.59) | 9.11 (8.88-9.28) | 7.73 (7.59-7.94) | 1.94 (1.60-2.44) |
| Carnation Evaporated Milk .. | Evaporated | 8 | 31.64 (30.91-32.16) | 9.09 (9.01-9.19) | 7.87 (7.57-8.01) | 2.10 (1.83-2.56) |
| Nestle Ideal Milk .. | Evaporated | 9 | 31.96 (30.95-33.44) | 9.06 (8.98-9.14) | 7.68 (7.43-7.95) | 2.18 (1.70-2.56) |
| Peak Evaporated Milk | Evaporated | 6 | 31.77 (31.33-32.55) | 9.16 (9.10-9.27) | 7.95 (7.74-8.19) | 1.92 (1.76-2.44) |

The figures represent mean values.

The figures in parentheses are the range values.

TABLE 2
Composition of Locally Produced Fresh Milk

| Source | Breed of cattle from which milk samples were collected | Number of samples analysed | Total solids (%) | Fat (%) | Protein (N × 6.38) (%) | Ash (%) |
|--|--|----------------------------|------------------------|---------------------|------------------------|---------------------|
| Amrahia Dairy Farm | Friesian | 8 | 11.62 (10.44-12.48) | 2.76 (2.17-3.71) | 2.99 (2.48-3.46) | 0.59 (0.44-0.69) |
| Agricultural Research Station (Nungua) | Herd of off-spring of Jersey crossed with any of the local breeds* | 11 | 15.19 (13.65-17.17) | 7.50 (6.66-8.84) | 3.54 (3.31-3.82) | 0.57 (0.54-0.57) |
| Accra plains | Herd of White Fulani, West African Shorthorn and Sangas | 16 | 14.28 (10.88-16.86) | 4.56 (3.65-5.76) | 3.63 (3.38-3.99) | 0.62 (0.53-0.79) |

The figures represent mean values.

The figures in parentheses are the range values.

* The local breeds are the West African Shorthorn, N'dama and Sokoto Gudali.

total solids (11.62%). If the local fresh milk samples are to be sold to the public for direct consumption then the butterfat must be standardized to the 3% level. This requires the establishment of a standardization plant.

The results show that a factor influencing the quality of the locally-produced fresh milk samples analysed is the type of breed of cattle. Compared with herd comprising of the West African Shorthorn, the White Fulani and the Sangas, Friesian cows produced milk with smaller protein and butterfat contents. This finding is in agreement with the observation of Oyenuga (1967) that milk of White Fulani cattle in Nigeria is richer in fat than the milk of breeds from temperate countries. Milk from crossbreeds of Jersey stud bull and any of the local breeds, i.e. the West African Shorthorn, N'dama and Sokoto Gudali gave the highest chemical constituents.

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