

Chemical composition of some Ghanaian honey samples

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SUMMARY

Some honey samples from Ghana were analyzed for moisture, ash, sugar levels, nitrogen, and mineral contents. It was found that these samples contained 18.8 per cent moisture, 0.8 per cent ash, 57.0 per cent reducing sugars calculated as invert sugar and 3.0 per cent sucrose. The results compared favourably with those reported in the Codex Alimentarius, making the Ghanaian honey samples acceptable for domestic and international trade.

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Introduction

The production of honey is an important cottage industry in Ghana. The major uses of honey in Ghana have been described (Anon., 1973). Honey is used as a beverage for infants and adults, as a flavouring agent in bakery, and as a source of sugar in ice cream and confectionery. For pharmaceutical purposes, honey is used in honey cough syrup and in hand lotion.

In Ghana, it is possible for one to adulterate honey and present it for sale as a natural, genuine product. It is necessary, therefore, for dealers and consumers to have the means of ascertaining the quality of any honey sample being handled. For Ghanaian and international trade, information is unavailable on the quality and grading of domestic honey samples as can be found for example in the United Kingdom (Anon., 1963). The nutritional values of local honey samples are also unknown.

This study, therefore, seeks to investigate the chemical properties of domestic honey samples to provide some necessary data.

RÉSUMÉ

ANKRAH, E. K.: *La constitution chimique de quelques échantillons de miel Ghanéen.* Quelques échantillons de miel du Ghana étaient analysés pour l'humidité, la cendre, les niveaux de sucre, les contenus d'azote et de minéral. Il était découvert que ces échantillons contenaient 18.8 pour cent d'humidité, 0.8 pour cent de cendre, 57.0 pour cent des sucres réducteurs calculés et tant que sucre inverti et 3.0 pour cent de saccharose. Les résultats comparaient favorablement avec les chiffres rapportés dans le Codex Alimentarius, rendant les échantillons de miel Ghanéen convenable pour le commerce intérieur et international.

Materials and methods

Five honey samples were bought from the market in Accra for the analyses. The moisture, nitrogen, reducing sugar, sucrose, ash, calcium, and iron contents were determined.

Moisture

Moisture was determined according to the method described by Pearson (1976). About 5 g of the honey sample was weighed into sand contained in nickel dish and dried in air-oven at 105 °C to constant weight. The difference between the weights of the wet and dry samples represented the moisture content.

Nitrogen

About 5 g of the sample was used to determine the nitrogen content by the macroKjeldahl method according to Pearson (1976). The percentage nitrogen present was calculated from the relation:

$$1 \text{ ml } 0.1 \text{ N } \text{NH}_2\text{SO}_4 = 0.0014 \text{ g N}$$

Reducing sugars

The volumetric method of Lane & Eynon according to Pearson (1976) was used for determining the reducing sugars as follows: about 2.5 g of the honey sample was weighed and diluted to 250 ml. Suitable dilutions were then made for titration. About 10 ml of mixed Fehling's solution were pipetted into a conical flask. This was titrated hot against the cleared honey solution until the end-point was reached; methylene blue solution was used as the indicator. The proportion of invert sugar equivalent to 10 ml Fehling's solution was read from a table, and the percentage reducing sugars was calculated as invert sugar.

Total reducing sugars and sucrose

A portion of the cleared honey solution was inverted. After titrating against 10 ml of mixed Fehling's solution, the amount of invert sugar produced was obtained by reference to a table. The percentage total reducing sugar (as invert sugar) was calculated.

Sucrose was calculated from the relation:

$$\% \text{ sucrose} = \% \text{ invert sugars} \times 0.95$$

Ash

The ash content was determined by igniting

about 5 g sample in a muffle furnace at 550 °C according to the method described by Pearson (1976).

Calcium

For the measurement of calcium, the ash was dissolved in 10 ml 5 N HCl and made up to 50 ml with water. Calcium was precipitated as oxalate. After dissolving in 2 N-H₂SO₄, the liberate oxalic acid was titrated against 0.02 N-KMnO₄ solution according to method of AOAC (1984).

Iron

A slightly modified method of the AOAC (1984) was used in determining iron. Ascorbic acid was added to 0.5-ml portion of the ash solution to reduce the iron. Dipyrindyl solution was then added and the intensity of the colour was measured in a Coleman Model 8 Colorimeter in a 19-mm diameter cuvette. Filter 8-206 was used. The iron content was obtained from a standard curve.

Results and discussion

Table 1 shows the results for the chemical composition of some honey samples from Ghana. Their chemical constituents have been compared with data from Codex Alimentarius (1994).

TABLE 1

Chemical Composition of Some Ghanaian Honey Samples Compared with Data from Codex Alimentarius

Source of data	Moisture (percent)	Ash (percent)	Nitrogen (percent)	Reducing sugars (as invert sugar) (percent)	Total reducing sugars (as invert sugar) (percent)	Sucrose (percent)	Calcium (mg/100 g)	Iron (mg/100 g)
Ghana	18.8 (5) 13.9-22.2	0.8 (5) 0.3-1.4	0.10 (3) 0.05-0.20	57.0 (3) 50.0-63.0	64.2 (5) 53.0-70.0	3.0 (3) 3.0-4.0	58 (4) 33-148	1.4 (2) 1.0-1.8
*Codex Standard	not more than 21	not more than 0.6		not more than 65 ^{a)}		not more than 5 ^{b)}		

The figures represent mean and range values

Figures in parenthesis denote the number of samples analyzed

*Source from Codex Alimentarius (1994)

a) represents apparent reducing sugar content

b) represents apparent sucrose content

A moisture content of not more than 21 per cent has been stated by Codex Alimentarius (1994). It has been observed that when the water content of honey is above 21 per cent, rapid aerobic growth of honey-fermenting yeasts occurs (Encyclopaedia Britannica Vol. 11). The mean moisture level of 18.8 per cent obtained for Ghana honey samples is, therefore, desirable and conforms to Codex requirement.

The honey samples from Ghana were found to be high in ash, being 0.8 per cent with a range value of 0.3 to 1.4 per cent compared with a value of not more than 0.6 per cent stated in the Codex Alimentarius (1994). The honey samples from Ghana contained 3 per cent sucrose, conforming to Codex requirement of not more than 5 per cent sucrose.

However, honey samples from Ghana contained low reducing sugars (calculated as invert sugar), being 57 per cent with a range of 50.0 to 63.0 per cent compared with Codex requirement of not less than 65 per cent. This difference observed in Ghanaian honey samples is probably due to their natural property and not to the effect of adulteration. It may be attributed to the finding of Laude (1989) that significant difference in composition exists when honey samples come from different sources with respect to the honey bee species and country of origin.

The honey samples were also found to contain 0.10 per cent nitrogen, 55 mg calcium, and 1.44 mg iron per 100 g of sample.

Based on the results so far obtained, it is

concluded that the chemical composition of Ghanaian honey samples conformed to the requirement of Codex Alimentarius (1994), except for their low reducing sugar contents. The Ghana honey samples were, therefore, of good quality and were acceptable in the domestic and international trade.

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