Food Chemistry **33** (1989) 187–191

Chemical Studies on *Sekete* Beer

A. I. Sanni

Department of Botany and Microbiology,
University of Ibadan, Ibadan, Nigeria

(Received 8 July 1988; revised version received and accepted 11 October 1988)

ABSTRACT

The chemical composition of sekete *beer and the maize used in its preparation are reported. Apart from calcium, decreases in the values of phosphorus, magnesium, potassium and sodium were observed in the beer. Riboflavin and niacin contents increased at the end of fermentation while thiamine decreased slightly. An increase in the moisture, nitrogen and protein contents is reported. The ash and crude fibre contents, however, decreased.*

INTRODUCTION

Fermented alcoholic beverages are important to many ethnic groups of Nigeria. They utilize diverse agricultural products in preparing these beverages which are mostly for nutritional, ceremonial, stimulating and medicinal purposes.

The microbiological and nutritional quality of some of these beverages are well documented (Bassir, 1962; 1968; Faparusi, 1966; Ekundayo, 1969; Faparusi *et al.* 1973; Okafor, 1978; Sanni & Oso, 1988).

There is, however, a dearth of information on *sekete* beer. The ethnological and microbiological studies on the beverage have been reported earlier (Sanni, in press). The beer is produced by the fermentation of maize kernels and it is important to the Yoruba ethnic group of south-western Nigeria. The associated microorganisms are yeasts, bacteria and moulds, while the fermentation process is by chance inoculation.

Since most of the raw materials employed in preparing the beverages are starchy and low in protein and vitamins, their constant consumption has been the source of malnutritional diseases such as *kwashiokor* and *beriberi.* Therefore, fermentation of these carbohydrate-rich materials is encouraged to improve upon their nutritional status—a process described by Platt (1964) as 'Biological Ennoblement'.

Considering the importance of alcoholic beverages to the diet of thousands of people who are in the low-income group, this paper examines some of the chemical composition of *sekete* and the maize kernels used in its preparation.

MATERIALS AND METHODS

Preparation of *sekete*

The beverage was prepared as described by Sanni (in press). A quantity of maize grains are soaked in water for 2 days after which they are malted for 3 days in baskets lined with moistured banana leaves, or on banana leaves alone. The grains are then rinsed with water and malted for another 3–4 days.

The malted grains are ground and put in earthenware pots. Water is added to cover the ground grains usually in the ratio 1:2.

The pots are then covered and fermentation allowed for 2–3 days. The resulting wort is filtered and then boiled for at least 60 min to concentrate. Filtration is done again using the substrate residue (pomace) as sieve. The final filtrate is boiled again for the same duration and allowed to cool. The final product is a dark-brown liquid.

Chemical analysis

Two grams of finely ground sample of the maize kernels and 10 ml of *sekete* beer were used for the analysis.

Methods of the AOAC (1980) were used in determining the moisture, crude fibre and ash contents. Nitrogen and protein contents were assayed by the macro-Kjeldhal method (AOAC, 1980). The determination of riboflavin, thiamine was by the fluorimetric method, while niacin was measured colorimetrically (AOAC, 1980).

Mineral elements were determined by the AOAC methods (1980): sodium and potassium were measured on the 'EEL' flame photometer while phosphorus content was measured using a Technicon-Auto Analyzer. Calcium and magnesium were analyzed by atomic absorption spectrophotometry.

Percentage increase or decrease in the values of the constituents of the beer compared with its ingredient was calculated thus:

$$\frac{sekete - \text{maize}}{sekete} \times 100$$

Assays and analyses were carried out on duplicate fermentations and, for each sample, three determinations were made.

RESULTS AND DISCUSSION

There were decreases in the values of ash and crude fibre of the beverage at the end of the fermentation period while the moisture content increased significantly (Table 1). Increase in the moisture content of the beer can be related to the amount of water available for fermentation and rates of physiological activities of the associated microorganisms. The increase in the crude fibre content was as a result of the fermentation activity of the microflora, leading to eventual release of the fibre content of the maize kernels and the addition of the biomass of the microorganisms.

The slight decrease in the ash content of the beer may be a result of the substrate residue that was discarded after fermentation. This agrees with the report of other workers on fermented beverages (Cravioto *et al.*, 1955).

TABLE 1
Chemical Analysis of *Sekete* and the Maize used in its Preparation.

Constituents	*Maize* (*g/100 g*)	Sekete (*g/100 g*)	*Difference in % between maize and* sekete
Moisture	10·96	58·20	+81·17
Ash	1·54	1·50	−2·76
Nitrogen	1·62	2·57	+37·0
Protein	10·3	16·1	+36·0
Crude fibre	2·48	1·50	−65·3
	(*mg/100 g*)	(*mg/100 g*)	
Riboflavin	0·13	0·68	+80·9
Niacin	2·56	8·14	+68·6
Thiamine	0·41	0·36	−13·9
Calcium	21	199	+89
Phosphorus	385	91	−322
Magnesium	210	160	−31
Potassium	436	242	−80·2
Sodium	54	23·8	−127

An increase in the nitrogen and protein contents of the beer was observed at the end of fermentation (Table 1). This trend was also reported in palmwine (Visser & Bassir, 1969; Okafor, 1978). It could be attributed to the synthesis of enzymes and other proteins by the microorganisms during fermentation.

There was an increase in the values of riboflavin and niacin of the beverage after fermentation, while thiamine content decreased slightly. The reduction in value of the thiamine content may be due to heating that took place during preparation of *sekete*, since the vitamin is heat-labile. This view was also expressed by Ulloa (1981).

There was a decrease in mineral elements except calcium (Table 1). Utilization of these elements by the microflora of *sekete* for the synthesis of cell protoplasm and absorbance of the mineral into the fermenting vessel are possible reasons for the decrease. For instance, potassium and magnesium are necessary for yeast growth (Myerhof & Kaplan, 1951).

The increase in calcium could be related to its being readily leached from the fermenting vessel. It has also been reported that calcium is not necessary for growth of yeast cells, although it stimulates fermentation (Myerhof & Kaplan, 1951).

The percentage increase in some of the constituents of the beer compared to the maize further supports the suggestion of Platt (1964).

The purpose of this study is to obtain knowledge of the chemical composition of the beer so as to understand nutritional implications for consumers. For instance, the complex microflora of the fermentation process can be considered beneficial; however, some species of microorganisms that are potentially pathogenic are occasionally encountered.

Since the beverage is consumed together with the microorganisms, there could be a contribution of substances accruing from their metabolic activities that may cause slight or severe physiological disturbances. This study will also serve as a basis for the approach to new studies that will lead to a biotechnologically produced *sekete* beer.

ACKNOWLEDGEMENT

The author is grateful to the International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria, for the use of their laboratory facilities.

REFERENCES

Association of Official Agricultural Chemists (1980). *Official Methods of Analysis.* AOAC, Washington, DC. (12th edn).

Bassir, O. (1962). Observations on fermentation of palmwine. *West Afr. Jour. Biol. Appl. Chem.*, **6**, 20–6.

Bassir, O. (1968). Some Nigerian wines. *West Afr. Jour. Biol. Appl. Chem.*, **10**, 42–5.

Cravioto, R. C., Cravioto, Y. O., Massieu, G. H. & Guzman, J.-G. (1955). Quoted by M. Ulloa, In *Global Impact of Applied Microbiology* ed. Emejuaiwe, S. O., Ogunbi, O. & Sanni, S. O., Academic Press, London and New York, 1981, pp. 46–59.

Ekundayo, J. A. (1969). The production of pito, a Nigerian fermented beverage. *J. Fd. Techn.*, **4**, 217–25.

Faparusi, S. I. (1966). A biochemical study of palmwine from different varieties of *Elaeis guineensis*. PhD Thesis, University of Ibadan, Ibadan, Nigeria.

Faparusi, S. I., Olofinboba, M. O. & Ekundayo, J. A. (1973). The microbiology of burukutu beer. *Zeitschrift fur Allg. Microbiologie*, **13**, 563–8.

Myerhof, R. M. & Kaplan, S. C. (1951). In *The Yeasts* Vol. 2 ed. Rose, A. H. & Harrison, J. S., Academic Press, London, pp. 3–74.

Okafor, N. (1978). Microbiology and biochemistry of oil palmwine. *Advances in Applied Microbiology*, **24**, 237–56.

Platt, B. S. (1964). Biological ennoblement: Improvement of the nutritive value of foods and dietary regimens by biological agencies. *Food Techn.*, **68**, 662–70.

Sanni, A. I. (in press). The microbiology and amino acid composition of 'sekete'—A Nigerian fermented beverage.

Sanni, A. I. & Oso, B. A. (1988). The production of 'Agadagidi'—A Nigerian fermented beverage. *Die Nahrung*, **32**, 4, 319–26.

Ulloa. M. (1981). Indigenous fermented beverages of Mexico. *Proceedings of Global Impact of Appl. Microbiology. 6th Inter. Conf.*, Lagos, Nigeria, ed. Emejuaiwe, S. O., Ogunbi, O. & Sanni, S. O., pp. 46–59.

Visser, S. A. & Bassir, O. (1969). Factors affecting the quality of palmwine 1: Period of tapping a palm tree. *West Afric. Jour. of Biol. Appl. Chem.*, **15**, 17–23.