

## Chemical Composition of Boza

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**Abstract:** Boza is non-alcoholic beverage that is produced with traditional methods in Turkey. In this study, certain chemical properties were determined for bozas which were supplied from different markets and producers in Izmir. Average of dry matter 19.49%, total sugar 19.09%, ash 0.07%dm., total acidity 0.34%, volatile acidity 0.017%, pH 3.5, ethanol 0.13% and methanol  $7.10^{-3}$  were found for the samples.

**Key words:** Boza, chemical composition and traditional foods

### Introduction

Fermentation, occurring in foods due to activity of microorganisms or their enzymes, is a desirable process for the production of certain products. Fermented foods are produced from various raw materials of which are converted into stable and delicious products, under certain environmental conditions. They are very important resources for human nutrition in various part of the world. Boza is a fermented, cereal based beverage consumed under varying names in different countries. It has been known and produced in Asia, Mesopotamia, Africa and Anatolia for 8000-9000 years (Topal and Yazicioglu, 1986). Boza is usually consumed in winter and served with cinnamon and roasted chick peas in Turkey (Basaran, 1999). Similar fermented beverages are Kenyan Busaa (Sanni, 1992), South African kaffir beer (Beuchat, 1995), Nigerian Ogi (Beuchat, 1995), pito (Steinkraus, 1996), sehete (Sanni, 1992 and Adegoke *et al.*, 1995), Egyptian Boza (Sanni, 1992), Turkmenistan and Krim busa (Pederson, 1979). Although, there are lots of differences between beer and boza, boza is believed to be one of the oldest type of beer (Pamir, 1961).

Boza production consists of several steps milling of various cereals such as corn, maize, wheat, rice, oat or barley, cooking the raw ingredients with water, sugar addition and yeast and lactic acid fermentation. Boza production steps are illustrated in Fig. 1.

White corn is generally preferred for boza production in Turkey, because of desired light boza colour; however, yellow corn semolina addition may be required to adjust the colour (Köse and Durak, 1998). At the end of the process, a viscous beverage with sour or sweet taste is obtained. The taste of the boza depends on the ingredients and method of preparation (Hayta *et al.*, 2001). Fermentation products, lactic acid and CO<sub>2</sub> gives boza a desirable aroma and freshness.

Several studies were conducted on boza focusing

rhological properties (Genç *et al.*, 2002; Hayta *et al.*, 2001; Sopade and Filibus, 1995), microflora identification (Gotcheva *et al.*, 2000) and protein solubility (Hayta *et al.*, 2001) of boza. In this work, chemical composition of boza supplied from local markets in İzmir were determined. Since boza is produced using various raw materials, the properties of end product will also be different. Therefore, boza obtained from different producers or shops will vary in chemical composition. In this study, the differences in terms of various chemical properties of samples were evaluated and general composition of boza was determined. In addition, boza samples were evaluated for their pertinence to country's boza standard.

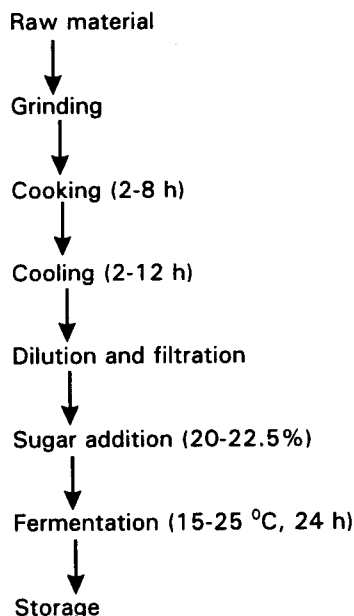


Fig. 1: Flowsheet of bozamaking

Table 1: The chemical composition of boza samples<sup>a</sup>

	Range	Mean	SD
Dry matter(%) <sup>b</sup>	17.26-22.32	19.49	1.727
T.sugar(%) <sup>b</sup>	16.11-22.59	19.09	2.388
Ash(%) <sup>bc</sup>	0.02-0.17	0.07	0.060
T.acidity(%) <sup>bd</sup>	0.15-0.50	0.34	0.109
V.acidity(%) <sup>be</sup>	0.006-0.032	0.017	0.007
pH	3.2-3.8	3.5	0.005
Ethanol(%H)	0.03-0.39	0.13	0.137
Methanol(%H)	0.001-0.014	0.007	0.005

<sup>a</sup>Results are the average of nine trials <sup>b</sup>g/g <sup>c</sup>dissolved in 10% HCL <sup>d</sup>based on lactic acid <sup>e</sup>based on acetic acid

## Materials and Methods

Boza samples were obtained from local markets and producers in Ýzmir, Turkey. They were in their original package of 1 kg and kept in refrigerator until analysis of samples.

Dry matter, total sugar, ash content, total and volatile acid contents were determined using methods described by TS 9778 boza standard of Turkish Standard Institute (Anonymous, 1992). pH measurement was performed using a digital pH meter (WTW Microprocessor pH meter, Germany). Ethanol and methanol contents of boza were determined by gas chromatography (Pye unicom; model 204; Pye Unicam Ltd., Cambridge, UK). Chromatography conditions: Inert gas was N<sub>2</sub>, detector temperature was 250 °C, column temperature was 150 °C and column block temperature was set at 180 °C. Samples were run in gas chromatography according to the following heating program. First, samples were held at 150 °C for 10 min, then heated to 200 °C with 32 °Cmin<sup>-1</sup> and held at that temperature for 5 min.

Before injecting the samples to the GC, 5 ml of boza was mixed with 2 ml acetone then centrifuged at 500 rpm for 5 minutes. 2 ml liquid from the top of tube was taken up to microsyringe and injected to the column.

## Results and Discussion

The chemical composition of boza samples was shown in Table 1. The total dry matter of samples were between 17.26-22.32% and the average was determined as 19.49%. Birer (1987) worked on properties of boza samples and determined that the average of total dry matter was 26.3%.

Total sugar content based on sucrose was between 16.11-26.55% while the average of nine samples was 19.09%. Birer (1987) also reported that average sugar content of various boza samples produced in Turkey was 15.1%. The starch is not converted to fermentable sugar by addition of malt containing amylase in the boza making technique in Turkey. Therefore sucrose is needed to be added to boza after fermentation.

The ash content of samples was between 0.01-0.17%. Total acidity boza samples was in the range of 0.15-0.50%. Topal and Yazicioglu (1986) determined that total acidity was 0.3-0.5%. Yoghurt or sourdough are

used as starters in boza making in the case of not adding previous batch boza to formulation. Therefore, boza produced in this way become more acidic. Boza could be classified according to the acidity, namely sweet boza and sour boza. Boza obtained from the technique explained before is generally the sweet one. In this case, boza is held for sometime after fermentation to produce sour boza.

pH value of unfermented boza is between 4.1-6.7 and it goes down pH 4 or below at the end of fermentation. The pH values of samples analysed were 3.22-3.82. There are several factors affecting the pH of boza including microorganismal activity and waiting period of boza after fermentation.

Volatile acid content of samples was in the range of 0.006-0.032%, with the average of 0.017%. Topal and Yazicioglu (1986) stated that boza samples in their study had volatile acidity of 0.04-0.13%.

While alcohol content of boza produced on other countries is 1-6%, it is around 1% for boza produced in Turkey. Topal and Yazicioglu (1986) reported alcohol content of various boza samples was negligible amount.

If chemical composition of boza samples are to evaluate according to Turkish Boza Standard, it could be concluded that from 9 boza samples, 3 of them were pertinent to the standard in terms of dry matter while others not. All samples were in the range of the standard in terms of other chemical properties. Boza produced in Turkey is considered as sweet boza according to the standard.

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