Mineral contents of traditional breads enriched with floral honey

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Received 16 March 2015, revised 06 April 2015

The micro- and macro-element contents of bread with honey were determined by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES). Molibden (Mo), cadmium (Cd), chromium (Cr) and nickel (Ni) contents of breads were found that 1 mg/Kg. B contents of breads was determined between 2.54 mg/Kg to 3.83 mg/Kg. It was found partly high according to control group. Is, contents of breads ranged from 6.89 to 9.29 mg/Kg. Calcium (Ca), iron (Fe), potassium (K), magnesium (Mg) and sulphur (S) in breads were established as the macro-element. Ca contents of breads changed between 247 to 366 mg/Kg. The highest Ca content was found at bread with honey 15%. Fe (except 15%), K (except 15%), Mg, Mn, phosphours (P) and S contents of breads were generally decreased with increasing of honey concentrations. While K contents of breads with honey change between 1402 mg/Kg to 1570 mg/Kg, P contents of samples ranged from 835 to 1203 mg/Kg.

Keywords: Bread, Honey, Minerals, ICP-AES

IPC Int. Cl.: A47G 19/32, A47J 47/01, A23L 21/25, G01J 3/00

Bread is a bakery product priced for its taste, aroma and texture. It is staple food prepared by baking dough of flour and water. Bread is an important source of minerals, especially phosphorus and copper. The exceptional role of breadstuff in human nutrition results from three basic factors: its high share of starch. Moreover, bread is an excellent source of numerous vitamins and minerals whose abundance depends on the degree of grinding. The popularity of bakery products has contributed to increased demand for ready to eat, convenience food products, such as bread, biscuits and other pastry products. Polish bread may be enriched with substances which are supposed to improve its flavor and/or nutritional value, such as fiber additives, dried vegetables, grain bran or different types of seeds. Some authors claim that enriching bread with mineral elements has a beneficial effect on its quality. Bioavailability is a general term that refers to how well a nutrient can be absorbed and used by the body. Minerals, classified as micronutrients are needed by our body in small amounts. Honey is an extremely complex mixture of carbohydrates that is found naturally with almost 70-80% sugars, 10-20% water and other minor constituents such as organic acids, mineral salts, vitamins, proteins, phenolic compounds, lipids and free amino acids. Honey maturity, the manner of production, processing and storage climatic conditions of the region of production and the nectar source have a substantial influence on the quality, composition and biochemical properties of honey. The benefits of honey are many and it has been long used both as a source of nutrients and also as a medicine. Honey has a diverse application in the bakery, cereal and confectionary industry. It is assumed that the advantages of adding honey to a product include moisture retention, good texture, improved baking, flavor and sensory properties. In recent years, the consumption of wheat bread has risen in many developing rations. With the progressive increase in the consumption of bread and other baked products, formulations increasing to the nutritional value of bread were provided. However, specialist literature contains little information regarding the mineral composition of bread. Thus, the objective of current study is to evaluate the mineral contents of wheat-bread added honey at the different concentrations.

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Materials and methods

Materials
Honey (flower) was provided from Bee Program, Hadim Vocational College in Konya (Hadim) province in Turkey. Its moisture content is 16.2%. It was kept in glass jar till using.

Methods
Flour at the rates of 5%, 10%, 15%, 20% and 25% on the basis of 50 gm flour was added to honey sample. 30 ml water and 1% salt were used for 50 gm flour. Each obtained dough sample from mixture was baked in the oven at 220 °C in 20 min. As to control samples honey sample was not the only material used in control samples. The parameters of the bread making procedure with honey are presented in Table 1.

Determination of Mineral contents
Bread samples were dried at 70 °C in a drying cabinet with air-circulation until they reached constant weight. Later, about 0.5 gm dried and ground sample was digested by using 5 ml of 65% HNO₃ and 2 ml of 35% H₂O₂ in a closed microwave system (Cem-MARS Xpress) at 200°C. The volumes of the digested samples were completed to 20 ml with ultradeionized water and mineral concentrations were determined by inductively coupled plasma-optical emission spectroscopy (ICP AES; Varian -Vista, Australia). Measurement of mineral concentrations was checked using the certified values of the related minerals in the reference samples received from the National Institute of Standards and Technology (NIST; Gaithersburg, MD, USA). Distilled deionized water and ultrahigh-purity commercial acids were used to prepare all reagents, standards, and samples. After digestion treatment, samples were filtrated through Whatman No 42. The filtrates were collected in 50 ml flasks and analysed by ICP-AES. The heavy metal contents of the samples were quantified against standard solutions of known concentrations which were analysed concurrently.

Working conditions of ICP-AES:
Instrument : ICP-AES (Varian-Vista)
RF Power : 0.7-1.5 kw (1.2-1.3 kw for Axial)
Plasma gas flow rate (Ar) : 10.5-15 L/min. (radial) 15 ° (axial)
Auxiliary gas flow rate (Ar) :1.5”
Viewing height : 5-12 mm
Copy and reading time :1-5 s (max.60 s)
Copy time : 3 s (max. 100 s)

Statistical analyses
Results of the research were analysed for statistical significance by analysis of variance.

Results and discussion
Micro-element contents of wheat flour bread added at different concentrations (5, 10, 15, 20 and 25%) are shown in Table 2. Generally, microelement contents of bread with 5% honey were found lower compared with other concentrations. Molibden (Mo), cadmium (Cd), crom (Cr) and nickel (Ni) contents of breads were found that 1 mg/Kg. B contents of breads was determined between 2.54 mg/Kg to 3.83 mg/Kg. It was found partly high according to control group. Copper (Cu) contents of breads ranged from 2.39 mg/Kg to 3.34 mg/Kg. Ni contents of bread with 5% and 25% honey (flour bases) were found low compared with control group (0.916 mg/Kg). Manganese (Mn) contents (7.4 to 10.4 mg/Kg) of breads with all honey concentrations were found low
than that of control values (10.8 mg/Kg). Zinc (Zn) contents of breads ranged from 6.89 to 9.29 mg/Kg. Ca, Fe, K, Mg and S in breads were established as the macroelement (Table 3). Calcium (Ca) contents of breads changed between 247 to 366 mg/Kg. The highest calcium (Ca) content was found in bread containing 15% honey. Iron (Fe) (except 15%), potassium (K) (except 15%), magnesium (Mg), Mn, P and S contents of breads were generally decreased with increasing of honey concentrations. While K contents of breads with honey change between 1402 mg/Kg and 1570 mg/Kg, phosphorus (P) contents of samples ranged from 835 to 1203 mg/Kg. In addition, sulphur (S) contents were found between 914 to 1281 mg/Kg. White bread contained 10.3% Ca, 15.0% Mg, 426.2% Na, 48.3% K, 219.6% P, 2.07% mg/100gm Fe, 0.53 mg/100gm Zn, 0.38 mg/100gm Cu and 0.44 mg/100gm Mn. Honey coated cereals contained 1.46 mg/100gm Fe, 0.42 mg/100gm Zn and 138.88 mg/100gm Ca. The effects of substituting honey for sucrose in bread making were investigated. Honey and sucrore were mixed in the proportions of 0:100, 25:75, 50:50, 75:25 and 100:0 respectively and used to produce 5 samples of bread. The results showed that honey contained 16.63% moisture, 30.85% dextrose, 38.33% fructose, 0.07% ash, 0.2% total acids; the pH, specific gravity and free acidity gave values of 4.35, 1.403 and 21.75 meq/Kg, respectively. The composition of the wheat flour was as follows: 11.75% moisture, 0.45% ash, 10.5% protein and 69.0% carbohydrates. The results showed that honey contained 16:63% moisture, 30.85% dextrose, 38.33% fructose, 0.07% ash, 0.2% total acids; the pH, specific gravity and free acidity gave values of 4.35, 1.403 and 21.75 meq/kg, respectively. The composition of the wheat flour was as follows: 11.75% moisture, 0.45% ash, 10.5% protein and 69.0% carbohydrates. Bread which is an important source of our diet can be effectively fortified for minerals using honey. It is important to increase consumption of this nutritional and beneficial pğroduct as an alternative appetizer.

### Traditional significance of the study

The content of mineral elements in bread depended on its recipe’s composition and their higher share was noted in honey and mixed-flour bread. Apart from the aroma and homey feeling, there are actually many active compounds for human nutrition in bread with honey.

### Conclusion

Bread is an important source of minerals, especially calcium, potassium and phosphorus. The sensory evaluation of the bread samples revealed that addition of honey increased its aroma in bread. It is evident from present work that acceptable bread could be made using honey in the proportion of 15-25%. It appears that breads with honey could serve as good source of some nutrients. The obtained results show the existence of low micronutrient content in bread with honey and the necessity for its fortification to provide a really wholesome diet.

### Acknowledgement

The authors would like to extend their sincere appreciation to the Deanship of Scientific Research at King Saud University for its funding this Research group No (RG-1435-049)

### References


