

## ORANGE AND LEMON PEEL POWDERS AS A BIOELEMENT SOURCE

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### Abstract

The purpose of this paper was to evaluate the concentration of some bioelements from citrus peel powder. Peels powder was obtained by drying and grinding citrus peels as a by-product resulting after the preparation of some natural juices. The results obtained by atomic absorption spectrometry of Na, K, Ca, Mg, Fe, Mn, Zn and Cu, shows that the powders taken into the study contain important amounts of essential mineral elements, especially Ca and K (159-182 mg/100g, respectively 211-218 mg/100g) and also appreciable contents of Mg (15.3-23.4 mg/100g), Fe (18.1-34.1 mg/100g), Zn (9.34-11.8 mg/100g), Na (8.75-12.8 mg/100g), Cu (1.27-3.71 mg/100g) and Mn (1.32-2.03 mg/100g).

The concentration of the analyzed mineral bioelements shows, in general, the following decreasing trend: K > Ca > Fe > Mg > Zn > Na > Cu > Mn.

**Keywords:** orange peel powder, lemon peel powder, bioelement sources.

### Introduction

The peel of oranges and lemons, resulted as a by-product when obtaining natural juices, still contains important quantities of nutritionally and biologically active compounds, among which are also mineral substances, which could be used as additives to improve the nutritional parameters of many foods: bakery, beverage, chocolate, desserts, ice cream, smoothies, toppings, yoghurts, etc. [1,2,3,4]. These peels may provide a health benefit, beyond the traditional nutrients they contain, as well as prevent diet-related diseases, e.g.: metabolic syndrome, type II diabetes, coronary heart disease, obesity, hypertension, certain types of cancer, gastrointestinal diseases and osteoporosis [5].

Literature data shows that orange and lemon peels are rich in phenolic compounds, vitamins, minerals and dietary fiber with antioxidant properties [2,6,7,8].

The purpose of this study was to obtain powder from orange and lemon peels, as a by-product from the preparation of natural juices in order to evaluate their bioelement contents. Bioelements Na, K, Ca, K, Mg, Fe Mn, Zn and Cu from orange and lemon powders peel prepared under laboratory conditions were analyzed.

## Materials and methods

Fruits were acquired in bulk from the fruit local markets in Timisoara. (Romania). Oranges and lemons were washed thoroughly, peeled and the fruit peels were cut into small pieces and oven dried (at 40-50 °C, until the constant mass).

The bioelements from oranges and lemon peels were carried out according to the method recommended [9]. The determination consists in calcining the powder peels at 550 °C, followed by solubilizing the ash in HNO<sub>3</sub> 0.5 N and measuring the concentrations of mineral elements using the FS Varian 280 Spectrometer.

## Results and discussions

The results obtained from the analysis, by of Na, K, Ca, Mg, Fe, Mn, Zn and Cu from orange and lemon peel powders shows that the samples contains important amounts of macro and essential elements (table 1).

**Table 1. Mineral composition (mean values) of orange and lemon peel powders**

| Peel powder | Mineral content, mg/100g |      |      |       |       |       |       |       |
|-------------|--------------------------|------|------|-------|-------|-------|-------|-------|
|             | Na                       | K    | Ca   | Mg    | Fe    | Mn    | Zn    | Cu    |
| Orange      | 12.8±                    | 218± | 182± | 23.4± | 34.1± | 2.03± | 11.8± | 3.71± |
|             | 0.93                     | 9.03 | 8.06 | 2.53  | 1.83  | 0.52  | 1.03  | 0.43  |
| Lemon       | 8.75±                    | 211± | 159± | 15.3± | 18.1± | 1.32± | 9.34± | 1.26± |
|             | 0.76                     | 8.65 | 8.18 | 1.03  | 1.11  | 0.24  | 0.66  | 0.25  |

The distribution of bioelements analyzed in orange and lemon peel powder is uneven, depending on the fruit from which they come (orange or lemon) and the analyzed bioelement: 12.8 mg/100g Na, 218 mg/100g K, 182 mg/100g Ca, 23.4 mg/ 100g Mg, 34.1 mg/100g Fe, 2.03 mg/100g Mn, 11.8 mg/100g Zn, 3.71 mg/100g Cu - in orange peel powder and 8.75 mg/100g Na, 211mg/100g K, 159 mg/100g Ca, 15.3 mg/100g Mg, 18.1mg/100g Fe, 1.32 mg/100g Mn, 9.34 mg/100g Zn, 1.26 mg/100g Cu - in lemon peel powder.

From all the analyzed elements, potassium and calcium are the best represented. Compared to these, magnesium and iron were determined in much lower concentrations, but much higher levels compared to Na, Zn, Cu and Mn. Comparing the mineral concentrations of the two citrus fruit peel powders, it can be seen that the orange peel powder has a significantly higher content of bioelements.

The obtained results show that the powders from the analyzed fruit peels could be used to improve the mineral content of foods.

## Conclusion

Orange and lemon peel powders, obtained under the conditions of this experiment, contain important amounts of essential mineral elements, especially Ca and K, but also appreciable contents of Mg Fe, Zn, Na, Cu and Mn. In general, the concentration of the analyzed mineral bioelements shows the following decreasing trend: K> Ca> Fe> Mg> Zn> Na> Cu> Mn.

Orange peel powder is significantly richer in bioelements, comparable to lemon peel powder. Orange and lemon peel powders obtained in this experiment can be recommended to be used to improve the mineral content of foods. In addition, due to the increased content of dietary fibers, antioxidants, vitamins, etc. presents a series of benefits regarding the health of the body. The development of orange and lemon powders, rich in nutritional and biologically active compounds, can be a method of superior valorization of the orange and lemon peels resulting as by-products when obtaining natural juices.

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