THE MINERAL CONTENT OF THE POTATO

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Abstract. *Minerals are the basic elements of metabolism and have a structural and indispensable role for the realization of metabolic functions in the human and plant organism. Most of the world's potato production is used for fresh consumption, however, in industrialized nations there has been a decline in fresh potato consumption in recent years. The potato is a particularly important plant for human nutrition, animal feed and industrial processing. The potato provides the body with minerals such as magnesium, phosphorus, potassium, calcium or zinc. Potassium is an essential mineral because it helps the body function properly. The experiment was done for 2 years, 2022-2023, on the Carerra potato variety, and the potato crop was sown mechanized, the maintenance work was also done mechanized, the land was fertilized with manure and complex fertilizers, in the locality Cralovăț, Timiș county. This study aimed to monitor the content of Ca, K, Mg, Mn, Cu and Zn minerals and evaluate some quality parameters in Solanum tuberosum tubers. These determinations were made by atomic absorption spectrophotometry in a research laboratory. This two-year study was conducted to investigate the influence of fertilization and variety on potato tuber quality. The results were within the limits provided in the specialized literature.*

Keywords: *potato, variety, fertilization, spectrophotometry*

INTRODUCTION

Potatoes are a versatile and affordable staple food that plays a significant role in global food security, and their mild flavor and diverse culinary applications make them popular worldwide. (RAIGOND P.; JAYANTY S.S.; PARMAR V., DUTT S.; CHANGAN S.S.; KUMAR LUTHRA S.; SINGH B., 2023)

Potatoes are rich in minerals like potassium and magnesium, accompanied by phenols and anthocyanins that act as antioxidants (RAIGOND P.; JAYANTY S.S.; PARMAR V.; DUTT, S.; CHANGAN S.S.; KUMAR LUTHRA S.; SINGH B., 2023)

In addition, potatoes boast an amount of dietary fiber, promoting digestive health and general well-being. (RAIGOND, P.; JAYANTY, S.S.; PARMAR, V.; DUTT, S.; CHANGAN, S.S.; KUMAR LUTHRA, S.; SINGH, B., 2023)

Most of the world's potato production is used for fresh consumption, however, in industrialized nations there has been a decline in fresh potato consumption in recent years. (CAMIRE ET AL. 2009; LANGE ET AL. 2014).

In industry, the potato is a valuable raw material, especially for the manufacture of spirit, starch, dextrin and glucose. One ton of tubers yields 95 liters of alcohol or 140 kg. dry starch or 100 kg. dextrin, or 15-17 kg. synthetic rubber. (Simona NITA, 2004)

Macroelements - They are the nutrients that plants need in the greatest quantity. During the vegetation period, plants need several kg of active substance for the development of their own organic matter. From the point of view of the quantity and quality of the harvest, not only the amount of nutrients is important, but also their ratio. When applying, it is recommended to respect the ratio of 1/2 of N/K.

The potato is a plant with a high need for potassium, and without potassium supplementation, potato cultivation is impossible. Potassium improves the efficiency of water use, being indispensable in order to obtain a high yield.

Calcium is an element of vital importance for the potato, and the lack of calcium manifests itself in the quantity and quality of the harvest. A regular intake of calcium is indispensable to ensure the unimpeded growth of the leaves.

Magnesium is important in the growth stage of the potato, especially during the formation of tubers.

It also has an important role in increasing the appropriate quality of the tuber.

Micronutrients - Despite the fact that they are needed in small amounts, a proper balance is indispensable for growing quality plants.

The potato is not characterized by a lack of copper. Manganese participates as an activator in the metabolic process of plants. Zinc plays an important role in nitrogen assimilation and metabolism, and contributes to the formation of starch.

MATERIALS AND METHODS

Research within the stated theme was carried out in an experimental field in Timiș County, Cralovăț locality, and then in the research laboratories of the Agrochemistry discipline within the Faculty of Agriculture in Timisoara.

The experiment was carried out on a potato crop of the Carrera variety, for two years, 2022-2023. The culture was fertilized with manure (20t/ha) and with complex fertilizer N100P80K0 (500kg/ha).

For the experiment was used both whole, skinned potato tubers and peeled potato tubers.

The Carrere variety has early maturity, oval shape, the color of the skin is yellow and the color of the core is light yellow. In the potato tuber, the dry matter content is low, it has a superficial to average eye depth. The variety has high productivity and the shape of the potato tuber is also large.

Minerals Ca, K, Mg, Mn, Cu and Zn were determined by atomic absorption spectrophotometry.

The method is based on measuring the intensity emitted by atoms, excited in an air-acetylene flame, the intensity of the spectral line being proportional to the concentration of the mineral in the analyzed solution.

Determination of the content of potassium, calcium and magnesium in the ash - weigh 0.5-1 g of grated plant material in a porcelain capsule and insert it into the calcination furnace heated to 550 degrees Celsius. where it is left for 5 hours. After calcination, dissolve the ash in 2 ml. 2N HCl stirring well. After 10-15 minutes, it is introduced into a 50 ml volumetric flask and brought to the mark with distilled water. Stir for 30 min. after which to filter. From the filtrate, the concentration of potassium, calcium and magnesium is read by emission, with an atomic absorption spectrophotometer, at a wavelength of 766.5 nm. for potassium, 422.7 nm. for calcium and 285.2 nm for magnesium.

Determination of the content of copper, zinc and manganese in the ash - weigh 1 g of grated plant material and place it in a porcelain crucible. It is left to calcine for five hours, at a temperature of 550 degrees Celsius. After calcination and the sample is cooled, add 2-3 drops of 50% HCl. And 10 ml of 0.5N HCl, stir with a rod and then filter into a 25 ml volumetric flask. Bring to volume with 0.5N HCl. Read on an atomic absorption spectrophotometer at 324.8 nm the copper content, 213.9 nm the zinc content and 279.5 nm the manganese content.

From the experiments in the field, plant samples were collected for laboratory analysis in order to diagnose the changes that appeared as a result of the applied treatments.

RESULTS AND DISCUSSIONS

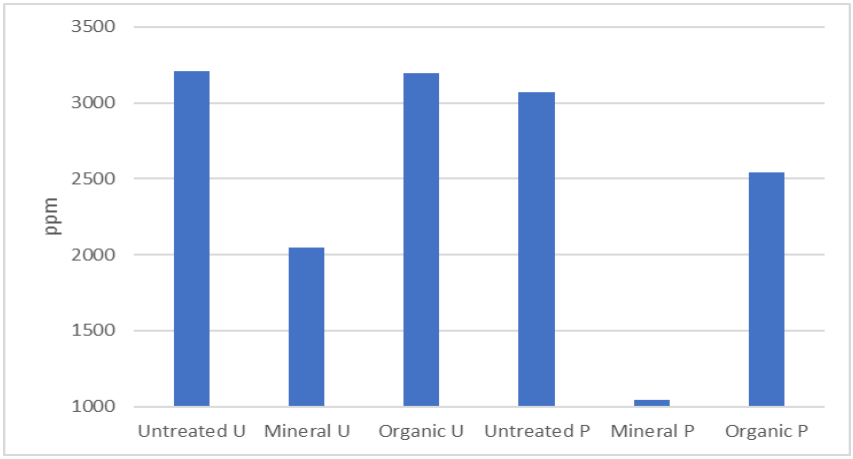

Figure 1. Potassium content in potato tubers (U – unpeeled, P – peeled)

The potassium content in potato tubers was between 1044 and 3210 ppm, the higher content being determined in unpeeled tubers. The highest potassium content was determined in the non-fertilized version, > 3000 ppm, and the lowest content in the version fertilized with mineral fertilizer. Organic fertilization led to the accumulation of a high amount of potassium in unpeeled tubers, namely 3068 ppm, while in peeled tubers the value determined was 2540 ppm.

The applied organic fertilizer provides an input of approximately 120 kg K/ha, which explains the higher content in this macroelement compared to mineral fertilization.

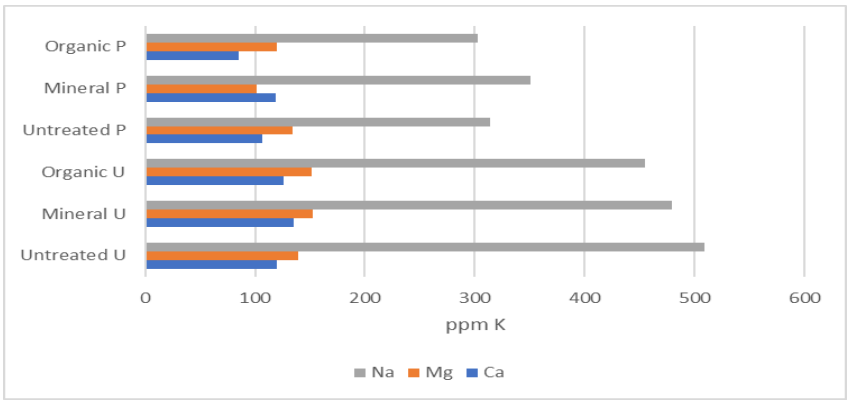

Figure 2. Sodium, magnesium and calcium content in potato tubers (U – unpeeled, P – peeled)

The magnesium content in potato tubers is between 101 and 152 ppm, amounts above 150 ppm being determined in unpeeled tubers in the version fertilized with mineral or organic fertilizer. The highest amount of magnesium in the peeled tubers was determined in the unfertilized version.

The calcium content had values between 85 and 135 ppm, mineral fertilization leading to the highest values both in unpeeled and peeled tubers.

The applied manure, being a complex fertilizer, brings an intake of Ca and Mg, a fact also determined in the laboratory; the content in these macroelements being higher in samples fertilized with organic fertilizers compared to those fertilized with mineral fertilizers.

Sodium was identified in the largest amount, with values between 300 and 510 ppm. As in the case of potassium, the highest amount was determined in the unfertilized version, in unpeeled tubers.

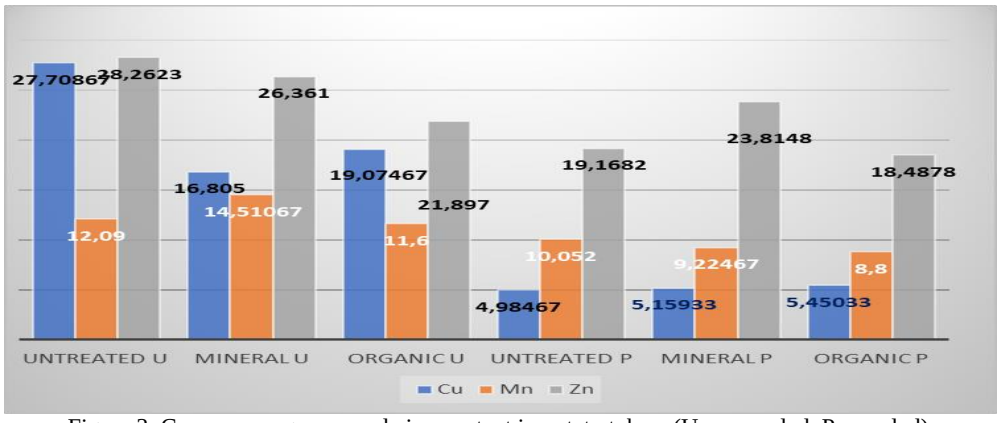

Figure 3. Copper, manganese and zinc content in potato tubers (U – unpeeled, P – peeled).

The copper content of potato tubers is between 4.98 and 27.20 ppm. The lowest amount was observed in the unfertilized version in the peeled tuber and the highest amount was observed in the unfertilized version, in the unpeeled tuber.

The manganese content is between 8.8 ppm. in the organically fertilized variant in the peeled tuber and 14.5 ppm. in the mineral fertilized version in the unpeeled tuber.

The zinc content is between 18.48 ppm. in the organically fertilized variant in the peeled tuber and 28.26 ppm. in the unfertilized version in the unpeeled tuber.

CONCLUSIONS

The study was carried out for two years and was carried out to investigate the influence of organic and chemical fertilization on the potato tuber. Using the atomic absorption spectrophotometry method, we determined the content of Ca, K, Mg, Mn, Cu and Zn in peeled or unpeeled potato tubers.

We noticed that the highest amount of K and Mg in the potato tubers was obtained in the organically fertilized version, in the unpeeled tubers.

Mineral fertilization resulted in obtaining the highest values of Ca, both in unpeeled and peeled tubers.

Sodium (Na) had the highest value in the unfertilized version from unpeeled tubers.

I also noticed that the results fell within the normal values in the specialized literature.

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