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Analysis of Magnesium Contents in *Zea mays, Beta vulgaris, Medicago sativa, Cirsium arvense* and *Agropyron repens*

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Abstract The mineral composition of food crops showed that they could be used as rich sources of essential nutrients. Magnesium is an essential macronutrient found from 0.2-0.4% dry matter and is necessary for normal plant growth. In vegetation, magnesium is the metallic ion at the center of chlorophyll, and is, thus, a common additive to fertilizers. In addition to its role in chlorophyll, Mg is the most common activator of enzymes associated with energy metabolism or energy transport, particularly those utilizing adenosine triphosphate (ATP). The purpose of this study was to monitorize the Mg accumulation in *Zea mays, Beta vulgaris, Medicago sativa, Cirsium arvense* and *Agropyron repens*, grown on a chernozem soil. The plants samples were analyzed by flame atomic absorption spectrometry (FAAS). The mean values of Mg contents in plants are: *Zea may*s grain– 485 (mg/kg dry weight), *Beta vulgaris* root- 1205 (mg/kg dry weight), *Medicago sativa* leaf- 724 (mg/kg dry weight), Cirsium arvense leaf- 249 (mg/kg dry weight) and *Agropyron repens* leaf- 960(mg/kg dry weight).The trend of Mg accumulation in the edible parts of plants was the following: *Beta vulgaris* root > *Agropyron repens* leaf > *Medicago sativa* leaf > *Zea mays* grain > *Cirsium arvense* leaf. Our results show that that animals consuming these plants ingest significant amounts of Mg.

Key words

Magnesium, *Zea mays, Beta vulgaris, Medicago sativa, Cirsium arvense* and *Agropyron repens*

Eleven elements are named essential nutrients. Six of them are used in large quantities (magnesium, phosphorus, potassium, calcium, nitrogen and sulphur) and are named macro-elements, and five elements are used in small quantities (boron, copper, iron, manganese and zinc) and named trace-elements. They are transferred from soil to plant and are receiving major attention [1].

The mineral composition of food crops showed that they could be rich sources of macro-nutrients.

Magnesium is an essential macronutrient found from 0.2-0.4% dry matter and is necessary for normal plant growth.

In vegetation, magnesium is the metallic ion at the center of chlorophyll, and is, thus, a common additive to fertilizers.In addition to its role in chlorophyll, Mg is the most common activator of enzymes associated with energy metabolism or energy transport, particularly those utilizing adenosine triphosphate (ATP) [2].

Magnesium deficiency is a detrimental plant disorder that occurs most often in strongly acidic, light, sandy soils, where magnesium can be easily leached away. Without magnesium, chlorophyll cannot capture sun energy that is needed for photosynthesis to occur. Due to magnesium's mobile nature, the plant will first break down chlorophyll in older leaves and transport the Mg to younger leaves which have greater photosynthetic needs. Therefore, the first sign of magnesium deficiency is the chlorosis of old leaves which progresses to the young leaves as the deficiency continues)[5].

In short, magnesium is required to give leaves their green color. Magnesium in plants is located in the enzymes, in the heart of the chlorophyll molecule. Magnesium is also used by plants for the metabolism of carbohydrates and in the cell membrane stabilization[6].

In animals organism, magnesium has the following rolls: bone formation, cell replication, hormone regulation , nerve impulse transmission (stress) and muscle contraction, fertility and resistance to infection (immune system, vitamin E).

Magnesium participates in the body's main functions. Problems linked to magnesium deficiencies are: rickets (due to mobilisation of skeletal Mg^{2+}), grass tetany or staggers (spasms caused by a decrease in the Mg^{2+} concentration in the blood) and thrombosis (clot formation in a blood vessel) [7].

Magnesium ions are sour to the taste, and in low concentrations they help to impart a natural tartness to fresh mineral waters [8].

The purpose of this study was to monitorize the difference between Mg accumulation in *Zea mays, Beta vulgaris, Medicago sativa, Cirsium arvense* and *Agropyron repens* edible parts, grown on a gleyed chernozem.

Material and Methods

All the collected samples of various plants were washed with double distilled water to remove airborne and soil pollutants. After washing, plants samples were oven dried at 80°C to constant weight. The dried samples were ground, passed through a 2 mm sieve and stored at room temperature before analysis.

The Mg contents in plants were carried out in HNO_3 solution resulted by plants ash digestion [4].

Each sample solution was made up with dilute HNO_3 (0.5N) to a final volume of 50 mL

Solutions of varying concentrations were prepared by diluting the standards

The concentrations of Mg in the filtrate were determined by using flame atomic absorption spectrophotometer with high resolution continuum source (Model ContrAA 300, Analytik Jena, Germany),

Necessary dilutions were made.

All the analyses were made in triplicate and the mean values were calculated.

Results and Discussions

In Figure 1 are presented the results regarding the Mg contents in plants .

The results regarding the mean values of Mg contents in plants show that *Beta vulgaris* root registered the highest value of this parameter (1205 mg/kg dry weight), followed by *Agropyron repens* leaf (960 mg/kg dry weight) and *Medicago sativa* leaf (724 mg/kg dry weight).

Zea mays content in magnesium was 485 (mg/kg dry weight) and Cirsium arvense leaf 249 (mg/kg dry weight).

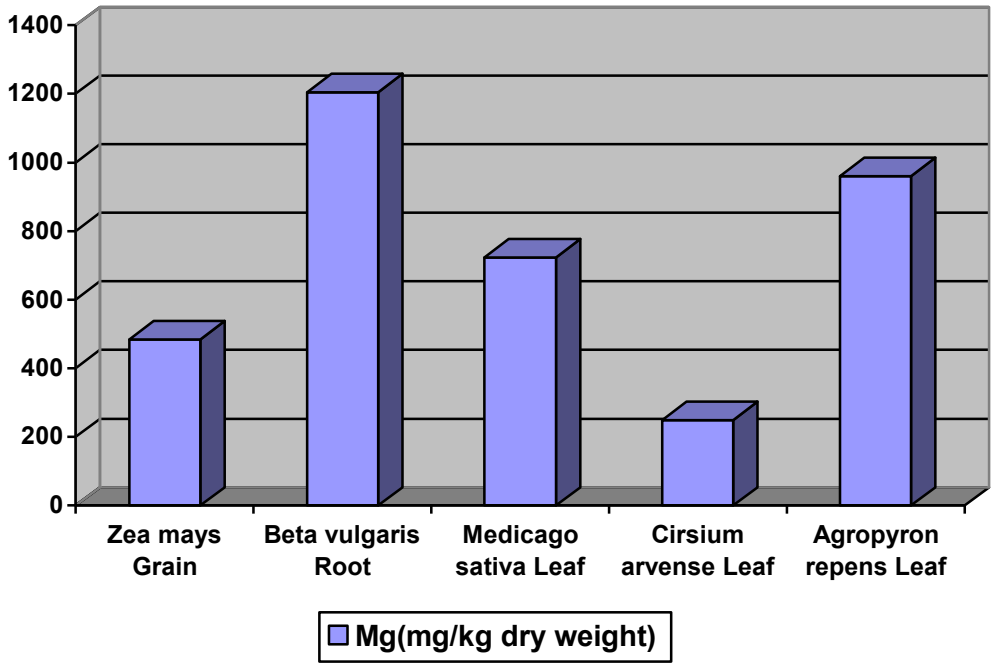

Fig. 1. Mg mg/kg dry weight) contents in plants

The order of Mg contents (mg/kg dry weight) in edible parts of plants were the following: *Beta vulgaris* root > *Agropyron repens* leaf > *Medicago sativa* leaf > *Zea mays* grain > *Cirsium arvense* leaf.

Conclusions

Magnesium is an essential macronutrient and is necessary for normal plant growth. In addition to its role in chlorophyll, Mg is the most common activator of enzymes associated with energy metabolism or energy transport. Without magnesium, chlorophyll

cannot capture sun energy that is needed for photosynthesis to occur. In short, magnesium is required to give leaves their green color.

The mean values of Mg contents in plants are: *Zea may*s grain- 485 (mg/kg dry weight), *Beta vulgaris* root-1205 (mg/kg dry weight), *Medicago sativa* leaf- 724 (mg/kg dry weight), Cirsium arvense leaf- 249 (mg/kg dry weight) and *Agropyron repens* leaf – 960 (mg/kg dry weight).

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The present study highlights that animals consuming *Beta vulgaris* root, *Agropyron repens* and *Medicago sativa* ingest significant amounts of Mg.

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