

Influence of catch crops and the application of microelements on the content of Zn, Cu, Mn and Fe in tuberos of the potato

Oddziaływanie międzyplonów i aplikacji mikroelementów na zawartość Zn, Cu, Mn oraz Fe w bulwach ziemniaka

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The content of microelements in plant products intended for consumption or for feed is an essential criterion of the yield quality assessment. Microelements control many enzymatic processes, thus affecting the plant chemical composition, including the quality of potato tubers. Of fertilizers applied in plant production, apart from microelement fertilizers, farmyard manure constitutes their basic source, covering the demand in approx 75%. In connection with a deficit of the most valuable natural fertilizer – farmyard manure, more frequent research is undertaken concerning other methods for supplementing the deficit of organic matter, including microelements, in soil, such as straw fertilization or catch crops growing. Thanks to a wide significance of catch crops, they are the element of crop rotations which largely limits the effects of an improper plant succession, often increasing their yields and determining their quality. At the deficit of farmyard manure, catch crop growing may, among other things, keep the current level of organic substance in soil, and have an effect on the content of microelements. Thus their deficit may be considered as a factor which prevents plants from obtaining the state of nutrition balance, and consequently, results in reduction in yield and its quality. Therefore, a study was undertaken aimed at the assessment of the effect of farmyard manure, stubble catch crop growing, in comparison with mineral fertilization and microelement application, in the aspect of quantity of yield and the content of Fe, Mn, Cu and Zn in potato tubers cultivar 'Bila'.

The experiment was carried out at the Research Station of UTP located in Wierzychucinek, over 2010-2012. The experiment was established as two-factorial, the 1st factor was the following variants (n = 5): NPK – control treatment, farmyard manure, catch crop of white mustard, field pea, tansy phacelia, the 2nd factor was fertilization with microelements (n = 2): without fertilization with microelements (M_0), after application of microelements as – Symfonia Mikro PLUS (M). After harvesting, the contents of: copper, zinc, manganese and iron were determined in representative samples of plant material using the atomic absorption spectrometer VARIAN NA 240 FS.

It was found that significantly highest yields were obtained from treatments where farmyard manure was applied or catch crop of field pea was grown combined with microelements. The contents of studied microelements in potato tubers in individual years of the study were significantly determined by all studied factors. It was observed that growing catch crops, the use of farmyard manure and the application of microelements have a significantly effect on reduction in Fe content in potato tubers as compared with their concentration after the use of mineral fertilization. Highest mean contents of Cu, Mn and Zn, except for the content of iron, were obtained on treatments where farmyard manure was applied. Consequence of decreasing contents of Fe and Mn in tubers was narrowing or widening of values of the Fe:Mn ratio, which was 7.3:1 in tubers harvested from treatments with farmyard manure, whereas on treatment where only mineral fertilization was applied, it amounted to 10.7:1, which indicates a low content of manganese in tubers on this treatment. It also should be emphasized that the application of fertilizer Symfonia Mikro PLUS affected an increase in contents of copper, zinc, manganese and iron in the potato tuber dry weight. It was also proved that the effect of studied factors led to differentiation of

the yield quantity and the content of studied microelements in potato tubers. This is indicated by the calculated correlation coefficients. We found significant positive correlations only between the yield quantity and the contents of: Zn ($r = 0.91$), Cu ($r = 0.88$) and Mn ($r = 0.84$). The course of weather conditions during the growing season in successive years of the study also determined then concentration of studied microelements in tubers.