Effect of foliar application of microelements on the content of sugar, potassium, sodium and alpha-amino nitrogen in sugar beet roots

Wpływ dolistnej aplikacji mikroelementów na zawartość cukru, potasu, sodu i azotu aminowego w korzeniach buraka cukrowego

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Microelements are indispensable for the adequate pattern of physiological processes in plants. The microelements deficit in soil or inhibited uptake caused by habitat conditions; moisture and soil reaction, soil and air temperature as well as the condition of plants have an unfavourable effect on the yield and its quality. For growing sugar beet, boron and other elements affecting the effectiveness of photosynthesis and macro nutrients menegment, e.g., manganese, copper, zinc or molybdenum, are very important microelements.

From 2008 to 2015 in the Nordzucker Polska S.A. experimental fields, with the employees of the Department of Plant Production and Experimentation, the University of Science and Technology in Bydgoszcz, taking part, a few series of field experiments were performed. The aim of the research has been to evaluate the effect of the application of microelements on the internal technological quality of sugar beet roots. The research involved the use of simple and compound fertilisers and biopreparations containing microelements. There were used fertilisers with a varied content and form of boron, e.g., $Na_2 B_8 O_{13} \cdot 4H_2O$, sodium octaborate, boron ethanolamine. There were also investigated fertilisers containing chelated and non-chelated forms of manganese, copper, zinc and ammonium molybdate in a form of molybdenum oxo complex. Microelement compound fertilisers contained boron, manganese, iron, copper, zinc, molybdenum and cobalt, and with the effect of bioregulators: boron, iron, manganese, zinc, copper, molybdenum, silicon, cobalt and titanium. After the root harvest from each experiment, the evaluation of the internal technological quality, namely polarization as well as the content of potassium, sodium and α-amino nitrogen were performed using the Venema automatic line.

The effect of respective microelements, including boron, applied in foliar fertilisers, on the content of sugar in beet roots was, in general, non-significant and the difference in the polarization of plants fertilised and non-fertilised was about 0.1–0.5 percentage point. That feature was stronger and usually more favourably affected by microelements applied together in compound fertiliser. With it there was found an increase in the content of sugar even by 0.8 percentage point. A variation in the content of molasses-producing compounds in the root pulp varied more across the years and research locations due to the fertilisers applied. Absolute differences in the content of potassium, sodium and alpha-amine nitrogen in the roots of plants fertilised with microelement compound fertiliser and the non-fertilised plants were 5.3; 0.7 and 0.5 mmol/1000 g, respectively. The application of molybdenum showed a relatively high effect on the inhibition of the accumulation of harmful nitrogen in the roots. Due to the fertiliser containing that microelement, the content of alpha-amino nitrogen decreased by 2.7 mmol/1000 g of pulp.