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Impact of amino acids amount changes in winter wheat (*Triticum aestivum* L.) and relation with grain quality due to manganese and molybdenum foliar application

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Statement of the Problem: Numerous researches describe the influence of micronutrient elements (Cu^{2+} , Mo^{6+} , Mn^{2+} etc.) for the winter wheat growth and grain yield. Deficiency or excessive rate of microelements can cause functional disorders for many crops due to that yields can be significantly lower instead of higher. There are relatively few scientific papers with anticipate biochemical effects after combinations of two or more microelements (e.g. $\text{Mn}^{2+}/\text{Mo}^{6+}/\text{Zn}^{2+}$) sprayed on crops. The purpose of this study is to describe relation between quantitative changes of amino acids in winter wheat during growth periods (tillering and stem elongation stages) and qualitative parameters of wheat grains.

Methodology & Theoretical Orientation: Molybdenum (Mo^{6+}) and manganese (Mn^{2+}) as micronutrients were sprayed twice in three different combinations: $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24}\cdot 4\text{H}_2\text{O}/\text{MnSO}_4\cdot \text{H}_2\text{O}$; $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24}\cdot 4\text{H}_2\text{O}$ and; $\text{MnSO}_4\cdot \text{H}_2\text{O}$. During both applications in all combination was 300 g of each cation. Control field was sprayed just with water. This research is mainly focused on molybdenum and manganese influence for grain quality parameters via quantity of amino acids.

Findings: Foliar applications of different micronutrients combinations cannot always have a positive effect despite the fact that Mo^{6+} and Mn^{2+} cations involving nitrogen to further metabolism process and required for normal assimilation of N.

Conclusion & Significance: Due to very important synergistic and/or antagonistic action of micronutrients combinations for crops the amount of amino acids were influenced by spraying inorganic salt solutions. A significantly higher amount of γ -amino butyric acid is determined after Mo^{6+} and $\text{Mo}^{6+}/\text{Mn}^{2+}$ treatments than in other treatments. These changes also had impact for some of wheat grain quality parameters. A higher amount of proteins in treatments sprayed with Mn^{2+} have been determined rather than in Mo^{6+} . Other grain quality parameters have been also differently affected due to different treatments.

Recent Publications

1. Stepien A and Wojtkowiak K (2016) Effect of foliar application of Cu, Zn, and Mn on yield and quality indicators of winter wheat grain. *Chilean Journal of Agricultural Research* 76(2):220-227.
2. Schmidt S B, Jensken P E and Husted R (2016) Manganese deficiency in plants: the impact on photosystem II. *Trends in Plant Science* 21(7):622:632.
3. Arnold A, Sajitz-Hermstein M and Nikoloski Z (2015) Effects of varying nitrogen sources on amino acid synthesis costs in *Arabidopsis thaliana* under different light and carbon-source conditions. *PLOS One* 10(2):e0116536.
4. Anjum N A, Singh H P, Khan M I, Masood A, Per T S, Negi A, Batish D R, Khan N A, Duarte A C, Pereira E and Ahmad I (2015) Too much is bad-an appraisal of phytotoxicity of elevated plant-beneficial heavy metal ions. *Environmental Science and Pollution Research* 22(5):3361-82.
5. Hausler R E, Ludewig F and Krueger S (2014) Amino acids-a life between metabolism and signalling. *Plant Science* 229:225-237.

Biography

Jurgita Spokaite is a PhD student. She has expertise in Agronomy and Organic Chemistry and has been practicing in both areas. The scopes lead to developing a new scientific area in Lithuania-plant biochemistry in crop production. Direction of her doctoral studies is just a beginning and very first steps to join two fields of science into one. She has built this model after some time of experience in research, agronomy and chemistry studies. She is working as a Private Agronomist and Junior Researcher.

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