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SUMMARY OF PhD THESIS

Organic-mineral fertilizers with microelements based on keratin protein hydrolysate for foliar application

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The increasing cost of fertilization and the expectations of farmers and consumers to the quantity and quality of crops, as well as the necessity of environmental friendly cultivation, require adequate fertilizing. Recently, fertilization of plants with microelements became significantly important also. Micronutrients deployed in foliar application effectively supply the plants. It is especially important due to weather and environmental stresses, when their uptake and assimilation of the soil is limited. Equally important is to achieve the highest degree of efficiency, which can be achieved by providing them in the form of amino acid chelates, in which a chelating agent is further a factor that stimulates plant growth. Additionally, in the production of fertilizers the possibility of use of waste materials, which are a cheap source of nutrients (organic substances, macro- and microelements), is one of the recommended strategy for dealing with waste in the current legal regulations, and their further processing into useful products, and thus contributing to environmental protection.

The purpose and scope of the thesis is related to the research and development program whose final objective, realized in cooperation with Intermag Co. within the project entitled: "The new technology of production of preparations stimulating plants growth from protein hydrolysates" /No. POIG.01.03.01-02-016 /12/, it is to develop methods for the production of the new foliar fertilizers based on highly mineralized mixture of short peptides and amino acids with bioavailable form of microelements (Fe, Mn, Cu, Zn, B, Mo) and the necessary plant nutrients (N, P, K, S, Mg), and the plant growth stimulants. The thesis, as a part of this program, relates to the identification and description of the chemical and agricultural of the new organic-mineral fertilizers enriched with microelements and the biostimulants.

The presented in PhD thesis the method of producing organic-mineral fertilizers assumes the use of the waste of animal origin - poultry feathers. Chicken feathers are made of keratin protein (>90%) and this is a cheap material to obtain amino acids for the production of fertilizers. The method of manufacture of fertilizers based on keratin protein allows to obtain products of the composition adjusted to the nutritional requirements of a variety of crop species. The presence of amino acids in products increase the value of fertilizer. Amino acids stimulate growth and development of plants and act as chelating agent facilitating nutrient uptake by plants. On the other hand, the use of the sulfuric acid

in the hydrolysis of feathers enriches the product in sulfur - often mentioned as a deficient component in agricultural soils. The fertilizers with high sulfur content are recommended for plants such as rapeseed, legumes and many vegetables. The produced fertilizers are also in according with the requirements for the content of chemical contaminants (toxic elements) and biological, which specifies the Polish Regulation of Minister of Agriculture and Rural Development of 18 June 2008 on the implementing some provisions of the Fertilizers and Fertilizing Act.