

## Synthesis of bioavailable zinc-humic compounds

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Goal of this research was synthesis of humic-based compounds of zinc and to evaluate zinc bioavailability for plants.

Zinc-humic preparations were prepared from commercially available potassium humate and hydrated zinc sulfate. Reaction was carried out with stirring under pH control. Humate dissolution was conducted using ultrasound bath and small amount of alkaline to reach target pH. Then sulfate was mixed with humate solution by dropwise addition. The solid sample was isolated using rotor evaporation. To test reproducibility of the given synthesis, five batches were prepared under the same conditions. The content of zinc in the prepared samples varied from 4 to 5 % (mass).

Biotesting of the obtained preparations was conducted using wheat plants. The plants were grown on Knopp media with and without addition of different zinc sources. As those were used zinc sulfate and five batches of zinc humate synthesized as described above. Bioavailability of zinc was evaluated by the content of zinc in the harvested plants. Determinations of zinc were conducted both in roots and stems. Dry biomass was used for analysis. Prior to determination, the biomass was digested in FOSS Tecator Digester 8. ICPMS technique was used for zinc determination in the obtained solutions. The results are shown in Figure 1.

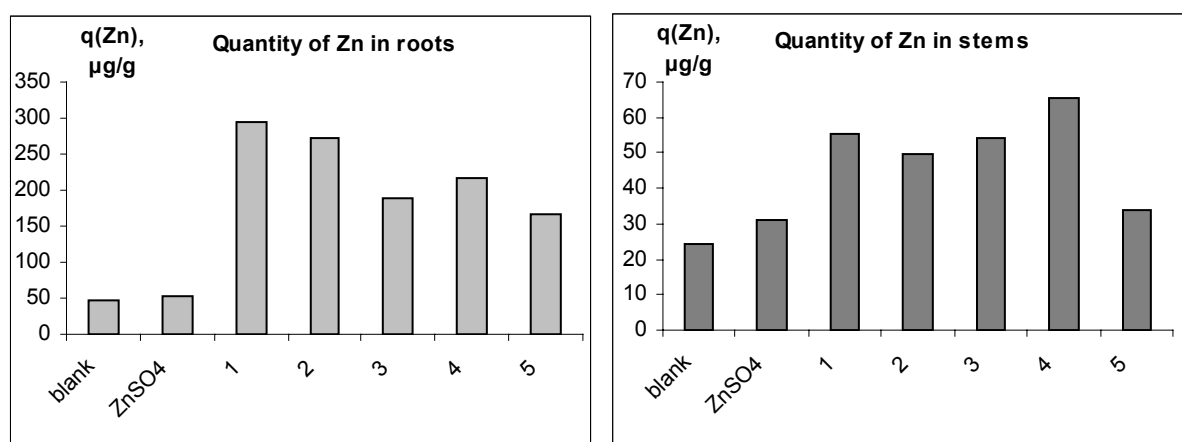


Figure 1. Content of zinc in wheat plants cultivated with different zinc sources: blank - no zinc added; ZnSO<sub>4</sub> - zinc sulfate; 1,2,3,4,5 - five different batches of zinc humate.

As it can be seen from Figure 1 the synthesized zinc-humic compounds were bioavailable for plants. In general the roots contained more zinc as compared to stems. Comparison of the zinc content in plants treated with five different batches of zinc humates has shown relatively stable beneficial impact on wheat plants: the content of zinc in treated plants was a factor of five higher as compared to blank for roots, and a factor of 2 - for stems. The obtained results show a good promise for a use of zinc humates as a source of bioavailable zinc suitable both for plant and animal nutrition.

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