

PENETRATION OF FERTILIZERS BASED ON HUMIC SUBSTANCES THROUGH PLANT CUTICLES

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Abstract

The surface of a plant, respectively leaf, is formed by a thin layer called cuticle. This layer provides the plants with such important functions as protection against biotic and abiotic effects, or regulation of the uptake of water or other substances (pesticides, fungicides etc.). Plant cuticle forms a primary barrier, which must be overcome by a foliar agent (fertilizer, pesticide) to influence a physiology of a plant. Among the foliar agents, humic acids represent the material of the growing importance. They are known for positive effects on the quality and fertility of soil, growth and productivity of plants. Ability of humic acids to penetrate into the leaf can be studied in laboratory using isolated plant cuticles and simple diffusion techniques. For this purpose, diffusion pair was formed by connecting agarose hydrogel containing dissolved humic acids (Lignohumate, purchased from Amagro, s.r.o.) and blank agarose hydrogel, with the isolated cuticles placed between the gels. In the other set of experiments, humic acids diffused through the isolated cuticles into agarose gels from the aqueous solution. Diffusion experiments were quantified by means of ultra-violet spectroscopy - concentration profiles of humic acids in the gels were determined at different times and effective diffusion coefficient was calculated. Plant cuticles were characterized by optic and fluorescence microscopy, fluorescence-lifetime imaging microscopy and profilometry. These techniques were used in order to study the structure of the cuticles and to investigate their degradation. In structural characterisations of applied hydrogels, scanning electron microscopy, mercury porosimetry and stereomicroscopy were utilized.

Keywords: Humic acids, hydrogels, diffusion, foliar fertilization

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