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BIOACTIVITY OF SYNTHETIC HUMIC-LIKE SUBSTANCES ON EARLY STAGES PLANT GROWTH

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Abstract. Biostimulating properties of humic acids and humic-like substances are of significant interest in the field of plant biochemistry, while the nature of their actions at various levels of the substance organization is not sufficiently studied. The use of natural humates as growth regulators is associated with a number of limitations, in particular, their preservation of natural genesis, low solubility in water, a narrow range of active concentrations, insufficient biological activity [1], as well as the labour intensity of substances isolation from natural raw materials, which suggests the relevance of the development of synthetic growth regulating compositions, including based on products of sugar-amine reactions [2].

In present investigation the biologically active melanoidin products in *p*-aminobenzoic acid – monosaccharide systems have been synthesized and tested as growth regulating preparations. Their structural-group composition and hydrophobicity index have been also estimated and shown to be similar for natural humic substances [3]. In a series of laboratory experiments, it was found that aqueous solutions of synthesized products have a noticeable biostimulating effect on the cucumber (*Cucumis Sativus* L.) and wheat (*Triticum Aestivum* L.) seeds growth at low content of active substance, increasing with a solution concentration decrease. Structural changes in the root system of the test plant seedlings, occurred during their germination in the medium of synthesized substances solutions (0.01–0.002%), were investigated using IR-Fourier transform spectroscopy method [3]. To study the action nature of synthesized products on growth processes, samples (2 mg) of biotested seedlings samples after germination were dried, homogenized and ground to a uniform mass, tableted with KBr (1:300) and IR Fourier transform spectra were recorded in region of 4000–400 cm^{-1}.

Spectra of samples, treated in 0.004 and 0.002% solutions, show significant increase in band intensity at 1240 cm^{-1} and especially in the 960–1200 cm^{-1} region for both test plants compare to control samples, correlating with positive seeds germination. The increase in the intensity of IR bands is associated with the formation of appropriate substances, in particular, the biosynthesis processes of organophosphorus compounds and also with stimulation the carbohydrates accumulation. Samples, germinated in 0.01 and 0.008% solutions, show no appreciable changes neither in growth parameters, no in spectra profiles.

The investigated products are synthesized from available and environmentally safe biologically active substances, which, together with their growth-activating action and simple preparation, makes it promising to further study the activity mechanisms of these compounds on plant systems in order to create the production technology of effective preparations for plant industry on its basis.

References

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