Simulation-dynamic model for estimation of the physiological activity of humic preparations

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To estimate the biological effect of humic substances on plants, various methods are currently used, based mainly on the determination of the viability (germination energy) and on the germination of seeds. Various biotests are also used. One of such testing systems is the biotest of Grodzinsky (BG), which makes it possible to determine the LD₅₀ index by germination of 50 out of 100 tested seeds in the control variant. In relation to this indicator, seed germination is estimated in the studied variants. The indicator BG is more informative than the estimation of the viability and of the seed germination. However, all these methods for estimation of the biological activity have static indicators at a fixed point in time. At the same time, all biological objects develop in dynamics; therefore, to assess their state, it seems expedient to move from static indicators to dynamic ones.

The objects of research were model humic substances extracted from peat (preparation No.1) and from kraft lignin (preparation No.2) by using of various technologies.

Figure 1. Seed germination model according to the length of seedlings (linear trend)
1 - control group, 2 – preparation №1, 3 – preparation № 2.

Fig. 1 shows the results of estimation for a sample of seed germination according to the length of seedlings. It can be seen that preparation No.1 provides more significant results than preparation No.2. The sampling is made in Excel. Sampling results were sorted in row from lowest to highest. The resulting dataset was transferred to the histogram. A simple linear trend has been added to the histogram. This trend is acceptable only for the initial stages of seed germination, when only growth reserves in the endosperm are used. When switching to nutrition from the soil and to photosynthesis, there will be another curve.

All seeds with a linear trend then "line up" in terms of germination intensity, covering the entire sample. It turns out the simulation dynamics of seed germination under the influence of the studied factor (or preparation).