

The possibility of using hydrolytic lignin processing waste as a humic fertilizer

Brykovskaya N.N.¹, Romanenkov V.A.¹, Pashkevich E.B.¹

¹Department of Soil Science, Lomonosov MSU, Moscow, Russia, nn_br@mail.ru

Keywords: lignohumate, humic substances, salad (*Latuca sativa* L.)

doi: 10.36291/HIT.2019.brykovskaya.107

Hydrolytic lignin is a valuable raw material used in various industries. After chemical processing of hydrolytic lignin, waste products containing organic compounds, including humic substances (HS), are formed. Biostimulants based on humate-containing raw materials are widely used in agriculture. HS can reduce the influx of heavy metals into the plant, linking them to the HS-metal complexes, which limits the bioavailability of metals [Koukal, 2003; Vereshchagin, Reyzvich, 2005]. The scientific literature provides information on the use of lignohumates (LH) in soils with polymetallic pollution [Izosimov, 2016].

The possibility of using hydrolysis lignin processing waste as a humic fertilizer is a promising direction in addressing waste management issues. This study examined three types of hydrolysis lignin processing waste. Results revealed the presets of organic matter in waste, including HS. The possibility of using these wastes as LH is assessed. Based on the growing experience, biological activity, fertilizer value, and remediation potential of LH were studied when applied at various concentrations. The effect of different concentrations of LH obtained during the processing of hydrolytic lignin on the value of biomass and quality indicators of salad «Vitaminnyy» (*Latuca sativa* L.) was evaluated. LH was added in two concentrations - 0.05 and 0.1 mg C per 1 kg of soil. The comparison was carried out with absolute control and control with the introduction of full mineral fertilizer. The addition of salad biomass to the control with full mineral fertilizer for both doses of LH1 was 38-39%, for LH2 17-38%, which indicates the high efficiency of the tested LH (Fig. 1), while the high concentration of LH turned out to be more effective.

When full mineral fertilizer was applied, the content of nitrates in the lettuce exceeded the maximum concentration limit and amounted to 4782.5 mg per kg of crude material. The use of all LH test subjects made it possible to obtain environmentally friendly products, the nitrate content of which was lower than the maximum concentration limit (MCL), while the absolute nitrate content was more than halved compared to the control with full mineral fertilizer (Fig. 2). The effect of LH1 on an increase in the level of chlorophyll in salad and LH3 on an increase in the content of carotenoids was traced.

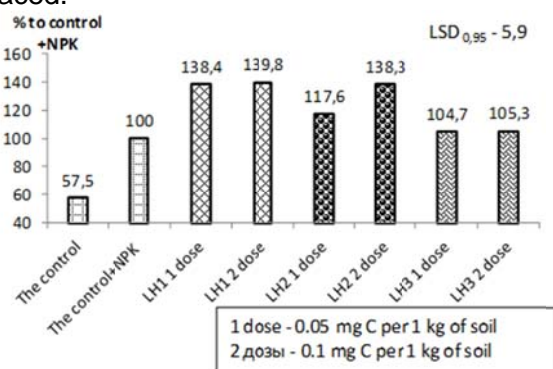


Fig.1. It is the biomass of salad «Vitaminnyy»

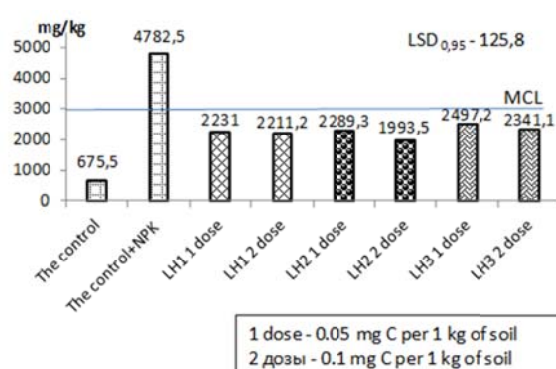


Fig.2. The nitrate content in the green mass of salad «Vitaminnyy»

On soils with a soil pollution level of copper 1 the MCL produced by the introduction of copper chelate, the responsiveness of salad plants to the use of three tested LH was analyzed. When copper was introduced into the soil, its content in salad leaves on the variant without LH reached the MCL. When LH1 was added at a high dose and LH2 at a low dose, the copper content in plants was significantly lower than the MCL, all other doses of LH did not allow lowering the copper content below the MCL. The effect of the changes made in the content of total chlorophyll, carotenoids, cellular proteins, and protein, compared with a positive result, was weakly expressed in comparison with the experiment with the original soil and more often turned out to be unreliable.