

## The effect of organic acids on growth characteristics and accumulation of nitrate ions by plants of lettuce

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### Abstract

Modern technologies in agricultural production involve the use of artificial media for the cultivation of crop production, and this makes necessary the active introduction of new chemicals with high biological activity in the production of agricultural food products. However, traditional mineral fertilization, especially with high content of nitrate ions, remain widely popular. The use of large quantities of nitrogen in nitrate form leads to its accumulation in various parts of plants and jeopardize food security of the person.

The objective of this work is to study the effect of three representatives of dicarboxylic acids on the growth and accumulation of nitrate ions by plants of lettuce. We selected the sort of lettuce "Ozornik" for the study, plants of which were treated with aqueous solutions of oxalic, malonic and succinic acids simultaneously with mineral fertilizers with high concentration of nitrogen in nitrate form. Acid concentrations in the solution were chosen according to the literature. A solution of mineral fertilizers was prepared according to the proposed commercial formulation.

The influence of oxalic, malonic and succinic acids on sowing qualities of seeds of lettuce sort "Ozornik" had been studied. The amount of energy of germination of lettuce's seeds was determined on samples treated with aqueous solutions of nitrogen fertilizer with the addition of dicarboxylic acids on the second and the fourth days. In particular, we educed a positive effect of all studied acids on the germination of seeds of lettuce sort "Ozornik", and the best growth of germination energy is observed in seed treatment with a solution of succinic acid. The biometric measurements were carried out on the lines of B.A. Dospekhov's method. The analyzed acids had no noticeable effect on growth rates of the plants at the initial stages of germination. Herewith oxalic acid decreased the growth (a decline of 7.1%), and malonic and succinic acids slightly increased it.

At the stage of commercial ripeness the concentration of nitrate ions in samples of green lettuce was determined. Analysis of the concentration of nitrate ions is performed on the spectrophotometer SF-2000 on the lines of the Method of determining nitrite and nitrate in forages, vegetables, melons, blood, pathological material, milk and dairy products". The lowest quantity of nitrate parameter fixed in the samples treated with oxalic acid. In particular, it was found that in samples of lettuce treated with a solution of oxalic acid, the concentration of NO<sub>3</sub><sup>-</sup>-ions decreased in comparison with the control plants in 61 times, and by the treating malonic acid concentration of nitrate ions decreased in 45 times, and succinic acid – in 1.3 times. Thus, the combined use of preparations based on oxalic, malonic and succinic acids can increase the yield of crop production and reduce the risk of accumulation of nitrate ions in vegetables.

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