MAGNETIC FIELD EFFECT ON THE CHANGE IN REDOX POTENTIAL OF AQUEOUS SOLUTIONS

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The use of electro-technological methods, in particular magnetic treatment of irrigation water and fertilizer solutions, enables to increase productivity of crops and pidvysyt quality agricultural products.

A common drawback of known magnetic treatment plants for water solutions is that they do not provide optimal treatment dose. For their successful implementation is necessary to establish the mechanism of action of a magnetic field on water solutions and determine the optimal treatment regimes.

Under the influence of the magnetic field changes the rate of chemical reactions and shifting their balance. This causes a change in pH and redox potential.

The purpose of research - the establishment of the magnetic field to replace the redox potential of aqueous solutions of salts and justification of optimal modes of treatment.

Materials and methods of research. Experimental studies changes ORP water solutions of salts at their treatment in the magnetic field were conducted in a laboratory setting. Solution passed through a magnetic field, which created permanent magnets. Experiments conducted with solutions in which the concentration of ions according to their value in nutrient solutions and plant cells.

ORP solution was determined to magnetic treatment solution and after using ionomer I-160M. By measuring the difference did conclusion about the effectiveness of magnetic treatment.

Research carried out using the method of experiment planning. For this orthogonal used centrally compositional plan. By changing the feedback received ORP solution at magnetic treatment. By taking factors mentioned magnetic induction and velocity of the solution.

Limits changes of magnetic induction was determined on the basis of one-factor experiments. The value of the upper, lower and main levels accounted for magnetic induction respectively 0, 0.065 and 0.13 T, to the speed of the solution - 0.4, 0.6 and 0.8 m / s.

The coefficients of the regression equation as determined by known methods and the resulting regression equation adequacy was assessed by Fisher's criterion.

Results. Changing ORP solution at magnetic treatment will be:

$$\Delta OB\Pi = -\frac{2{,}3^2 \mu N_a K}{zF}\left(\frac{KB^2}{2} + v_n B\right) \tag{1}$$

or

$$\Delta OB\Pi = A_3 B^2 + A_4 Bv. \tag{2}$$

The coefficients in equation (2) can not be determined analytically. They determine experimentally based on multivariate experiment.

Regression equations were obtained that in physical terms are as follows:

for potassium nitrate

$$\Delta OB\Pi = -222{,}2B + 28.2Bv + 1065B^2 \tag{3}$$

magnesium sulfate

$$\Delta OB\Pi = -164.1B + 12.8Bv + 907.3B^2. \tag{4}$$

Changing magnetic induction from 0 to 0,065 T ORP solution decreases, and with further increase of magnetic induction ORP increases. Increase the speed of the solution reduces the effect of magnetic treatment, although the speed of the solution is a less significant factor than magnetic induction. As follows from the presented dependence, the optimum value of magnetic induction in the processing of aqueous solutions of 0.065 Tesla.

The effect of magnetic treatment depends on the chemical composition of the solution, that is, the concentration and composition of ions.

Conclutions

Studies have shown that treatment of aqueous solutions of salts necessary to conduct a periodic magnetic field gradient in a magnetic induction of 0,065 T. The effect of magnetic treatment depends on the square of the magnetic induction and velocity of the solution.