PROCESSING POTATOES IN THE MAGNETIC FIELD BEFORE PLANTING

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To improve the efficiency of potato should implement energy- and resource-saving technologies, including one of the most promising is the magnetic treatment of potatoes. Compared with other methods is the high-performance electro, energy-efficient, ecological and safe method for staff.

Implementation of magnetic treatment determines the choice of potato processing parameters and the creation of appropriate equipment that enhance productivity and quality of commercial products, which is an actual problem.

The purpose of research - increased yield of potatoes by direct action on its magnetic field before planting.

Materials and methods research. Theoretical studies of the magnetic field to change the pH of potatoes and biopotential conducted on the theory of collisions.

Experimental studies were carried out using the method of design of experiments in a laboratory setup with electromagnets. Platinum and glass measuring and auxiliary electrodes hlorsribnyy vstromlyuvaly in potatoes and through ionomer measured redox potential and pH potatoes to magnetic treatment and after it.

In studies used orthogonal central-composite magnetic induction plan was changed in the range of 15 to 45 mT, and the speed of the conveyor belt - from 0.5 to 1.5 m / s.

Field studies of potato varieties "Lugovskiy" performed as follows: option 1 (control) - potatoes grown without treatment in a magnetic field; 2nd option - potatoes before planting obroblyuvaly in a magnetic field of 13 mT magnetic induction; 3rd option - magnetic induction 20 mT; 4th option - magnetic induction 30 mT; 5th option - magnetic induction 45 mT.

Experiments were performed four times in repetition. The test area of 20 m2 placed by conventional repetition. Effect of magnetic treatment potato assessed by biometric parameters and yield of plants.

Results. Stimulation of potatoes associated with the effect of ions on the Lorentz force that changes the normal component of velocity:

This changes the kinetic energy of the relative motion of ions along the center line:

Changing the kinetic energy of the relative motion of ions causes a change in pH biopotential and potatoes :

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

$$\Delta pH = \frac{2{,}3K\mu}{RT}\left(\frac{KB^2}{2} + v_n B\right). \quad (2)$$

where z - valence ion; F - Faraday number, C / mol; R - universal gas constant, J / (K • mol); T - temperature, K; vn - normal component of velocity, m / s; B - magnetic induction, T.

Conducted multivariate experiment made it possible to determine the effect of treatment on the energy dose and pH changes biopotential potatoes. Established that most biopotential and pH change when potato processing energy dose of 0.23 J • s / kg, which corresponds to a magnetic induction of 30 mT and conveyor belt speed of 1 m / s. This mode is most effective at magnetic processing potatoes.

Defined Mode magnetic treatment of potatoes from changing its bioelectric potentials and pH was tested by examining the productivity and performance of biometric potato plants at magnetic treatment according to known methods of field experiment

Determined that biometric parameters and yield of potatoes were at magnetic induction of 30 mT and speed of the belt conveyor 1 m / s (0.23 dose treatment J • s / kg). By increasing or decreasing the dose of processing biometric parameters and yield of potatoes decreased, but remained higher compared to untreated potatoes in a magnetic field.

Defined Mode peredposadkovoyi processing potatoes in a magnetic field was the basis for creating installations for magnetic treatment of potatoes (Figure 4). Construction of the unit for magnetic treatment of potatoes envisages four pairs of permanent magnets NdFeB intermetallic composite parallel above and below the conveyor with variable polarity. Magnets glued to steel plates, the intervals between them filled with PCB. With facial sides are covered with stainless steel plates. The drive carrier is made of three-phase asynchronous motor through reducer downward.

Past studies of magnetic treatment plant for potato have shown that the deviation of the magnetic induction in the working area of the estimated value of 30 mT does not exceed 5%, and the speed of the conveyor belt when changing load and voltage deviation - 4%.

Conclusions

Based on the studies found that the most effective mode of magnetic treatment before planting potatoes is 30 mT magnetic induction at four times the magnetization and the speed of the conveyor belt 1 m / s. The yield of potatoes in peredposadkoviy processing in a magnetic field is increased by 17 - 21%, the number of tubers trade increased by 15% in potato tubers treated in the magnetic field increases starch, vitamin C, dry matter by 3 - 4%, and the concentration of nitrates decreased by 6%.

The use of electro-technological complex for magnetic treatment of potatoes provides an area of 4 hectares discounted net profit 3164 USD. with payback period of 1 year. Profitability index of the first year of operation greater than one, which confirms the high efficiency of development.