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Research Biopotential Seeds of Various Crops and the Effect of Magnetic Fields on This Indicator.

Ivan Vyacheslavovich Atanov, Shaliko Zhorayevich Gabriyelyan*, Maxim Alekseevich Mastepanenko, Evgeny Viktorovich Konoplev, and Pavel Viktorovich Konoplev.

Stavropol State Agrarian University, Zootekhnicheskiy lane 12, Stavropol 355017, Russia.

ABSTRACT

This article discusses the effect of treatment with different magnetic field induction of seed crops.Study the influence treatment on the action potential of seeds and its relationship with seed germination.It is proved that by using the value of the directional control biopotential can effectively influence the germination of seeds.
Keywords: seed, biopotential, magnetic field, germination of seeds, yield

Corresponding author

INTRODUCTION

Bioelectric potentials of plant (BP) - is an electric potential difference between the outer and inner surfaces of cell membranes and organelles, as well as between organelles, cells, tissues and organs of plants differing in functional or metabolic activity [2, 8, 10].

There are bioelectric potentials of rest and action potentials.Biopotentials rest - is the level of the potential difference between the intracellular and environment, between the root zones in stationary conditions.Under the influence of stimuli (temperature, illumination, mechanical pressure, electrical current, etc.), this level may vary, causing a decrease - hyperpolarization.

Any physical or chemical impact of sufficient force to change the cell structure, function and the electrical properties of cell membranes, causing a redistribution reaction and bioenergy ions.

Research has shown that resting cell membrane has a constant negative potential which varies depending on the plant species [1, 5, 9].

The amount of biopotential in the period when the seeds from condition of rest (when injury of the cells) has significant differences. So pea it is 175 mV, sunflower - more than 125 mV, while the cereal crops (oats and barley) in the range of 50-60 mV.

These differences are determined by the accumulation of power reserve nutrients in the seed: for peas - protein in the range of 30%; sunflower - up to 48% oil; whereas the protein content of oat and barley is 8-12% [3, 6, 11].

Processing of the magnetic field increases the permeability of cell membranes, of cytoplasm after exposure to a molecule that increases significantly during certain peak biopotential.Then the repolarization of the electric field (the natural discharge of the capacitor cells to restore the level of the natural state) [4, 7].

Thus, the energy reserves of nutrients and cell dissociation the determined by level their biopotential seed or plant.At the same time, when making additional energy in the form of the natural amplification of the magnetic field (MF) can have a stimulating effect on cell permeability and dissociation of ions therein.

Weakened seeds having relatively high viability but low laboratory germination require milder conditions of the environment for the normal germination and subsequent survival of of plant during the growing season.

Thus, the study of the increase viability of the seeds with the use of physical methods, in this case directed magnetic field, there are two options:

- First - increase the low viability of seeds having relatively high laboratory germination;
- The second - improving laboratory germination due to the treatment in a magnetic field.

MATERIALS AND METHODS

As a result of field experiments examined the efficacy of seed treatment in the magnetic field on seed survival. Presowing seed treatment with magnetic fields lay in the fact that the seed is placed at a certain time between the poles of an electromagnet. During the experiments, the seeds were treated with a constant magnetic field. When determining the optimum magnetic induction regimes were tested 14 range from 1 to 100 millitesla (mT) with the same time a seed treatment. For the selected mode by the magnetic induction in the range from 2 to 120 seconds was selected optimum exposure. The value of magnetic induction experience when subjected to pea seeds corresponded indicators 30, 50, 70 and 90 mT.As a control, seeds were studied, which were not treated in a magnetic field.

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RESULTS AND DISCUSSION

Research has shown that the highest value obtained biopotential 30 mT in the embodiment, however, the amount supported biopotential fall on comparative level to 50 min. (Figure 1).

This difference is at the point overshoot (maximum value) of 11-17 mW, and values in the transient zone 4-5 mV.

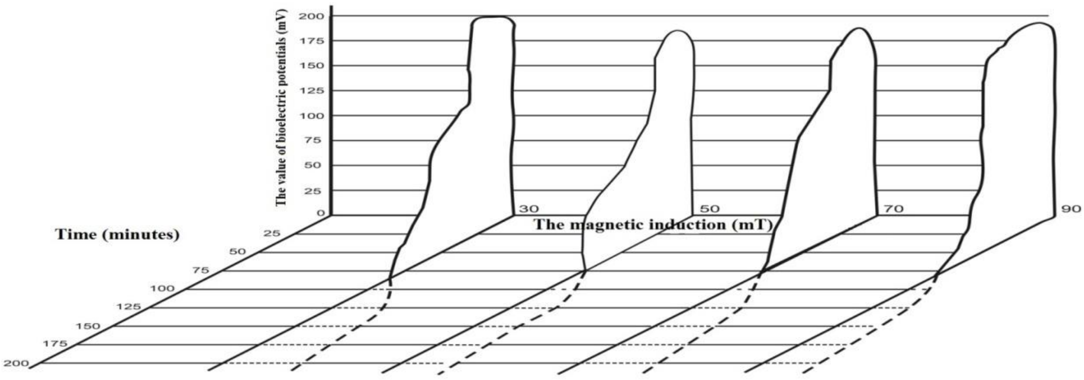

Figure 1: Dependence of the biopotentials seed pea varieties "Truzhenik" from value of magnetic induction

In the control seeds BP value was 144 m, whereas in the processing reached 200 mV in the MF. At that fall in BP control to negative values differed by 8 minutes.

Scientific-practical interest there is in research BP indicators seed lots with a decrease laboratory germination.

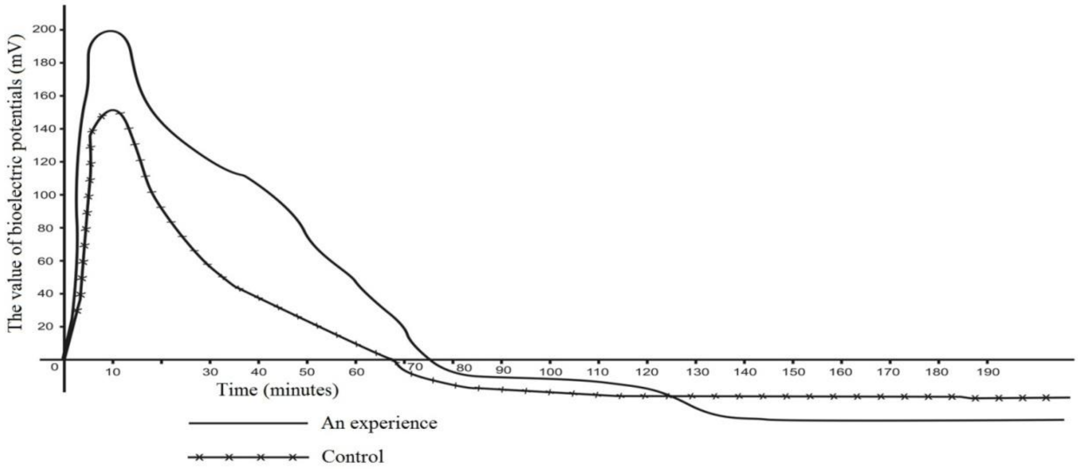

Figure 2: Biopotentials seedlings seeds Pea "Truzhenik"

For this purpose in educational and experimental farm, for analyze were selected the seeds with germination of 66% and 90%.Static data processing on the measurement of biopotentials untreated pea seedlings having different germination (66% and 90%), showed that the seed with a higher germination have a great peak indicator of biopotential.The difference is reliable and is 24 mV.In addition, the seed with better sowing qualities repolarization phase is much slower and the greater numerical value of negative biopotential (Figure 3).

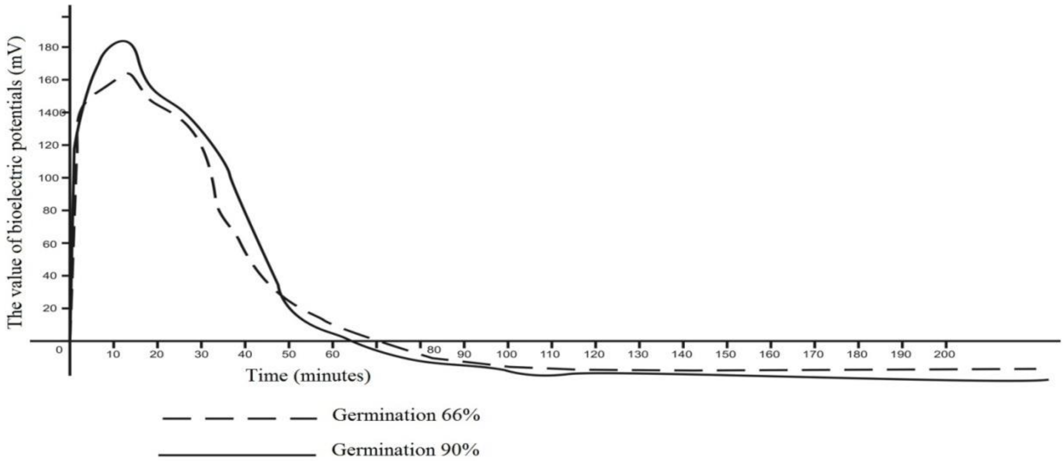

Figure 3: Biopotentials seedlings seeds pea variety "Truzhenik" various parties depending on their laboratory germination

Statistics biopotential changes in three-day seedlings of pea seeds with germination of 80%, showed that the seeds have been subjected to the effects of a constant magnetic field B = 30 mT with exposure of 8 seconds; the average peak value increases relative to controls at 47 mV; recovery phase also increases on 14 mV.These results suggest that measuring the potential of the seed sprouts, it is possible to determine the treatment regimen and establish the need in its conduct.

In addition, were conducted experiments to measure the dynamics of biopotentials between the surface of the seed germ and peas as follows:

- The electrode is included in the three-day tip sprout; after 50 minutes, in to the germ bring a flame (protein dies at 60 ° C). There was a sharp increase in the value of biopotential from 65 to 160 mV, and then it instantly fall to 0, and with time value of biopotential has not changed.
- Measuring biopotential values along the growth (over 1 cm) to eight daily pea seedlings showed that as you move up the germ, about in the middle, there is the appearance of a negative value, and the higher, the greater the deviation.When connecting the electrode with growing-point - biopotential sign reversed on inverse.
- We studied the change in the seeds of peas when the electrodes are exposed to the closure of every three minutes 20 seconds.

The process of restarting showed that after each of the next abridgement, the value biopotentials falls that resembles battery operation (Figure 4).

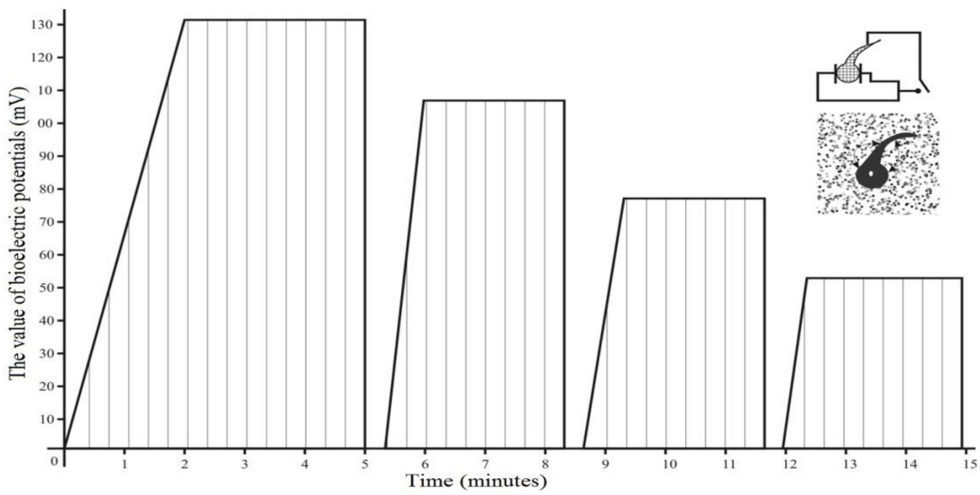

Figure 4: Diagram of biopotentials pea seeds by reconnecting

Thus, replacement nutrients into the cells and dissociation of salt ions across the membranes act as a supporting electrolyte electrolytic corresponding voltage promotes the passage of excellent reactions required for life support seeds.

CONCLUSION

Based on the above study, we can conclude that the biological potentials of germinating seeds, which are party is characterized by certain of their biological characteristics, together reflecting the vitality of the plant and the cenosis as a whole.

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