

DEVELOPMENT OF THEORETICAL INSTALLATION FOR THE STUDY OF ELECTROPLASMOLYSIS OF CEREAL CULTURES

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Abstract. *This work is devoted to the development of an effective and safe experimental setup for the study of electroplasmolysis of grain crops. The process of electroplasmolization includes the effect of electric current on the cellular structures of plants, which can lead to the rupture of cell membranes and changes in the internal structure of cells. The experimental setup includes a regulated power source, thyristors, a measuring shunt, an oscilloscope, and working electrodes. Analysis of the results of the experiment using a biological microscope and a digital camera confirms the presence of electroplasmolysis and its effect on cell membranes. The obtained results indicate an increased permeability of membranes and a positive effect on the quality and germination of grain. The developed installation is promising for further research in the field of electroplasmolysis of grain crops.*

Keywords: *electroplasmolysis, experimental setup, grain cultures, thyristors, cell membranes, grain quality and germination.*

Electroplasmolysis can play a role in decontamination of grain crops, especially in the context of seed treatment to ensure preservation and increase yield. Can stimulate the destruction of cell membranes of microorganisms, such as bacteria or fungi, which can lead to their death. This can help reduce the number of pathogens and other harmful microorganisms that may reside on the surface of the grain or in its structure. The permeability of cell membranes also increases, which makes the grain more accessible to disinfection agents, such as antimicrobials or chemical solutions [1].

Contaminated seed may have better quality and germination capacity. Electroplasmolysis can contribute to improving conditions for germination and grain development, making it less susceptible to pathogens. The use of electroplasmolysis can help reduce the reliance on chemicals for disinfection, which can be important in the context of sustainable agriculture and environmental protection.

It is important to conduct research and testing to determine the optimal conditions and parameters of electroplasmolysis for specific grain crops and disinfection purposes, so it can be said that the introduction of the electroplasmolysis process into the technological processes of rural production will have a qualitative effect.

Rdevelopment of an effective and safe experimental setup that can serve as a basis for further research in the field of electroplasmolysis of grain crops.

Electroplasmolization is a physical process used to treat plant materials, particularly grains. The procedure includes the effect of electric current on the cellular structures of plants, which can lead to the rupture of cell membranes and changes in the internal structure of cells. It is important to note that electroplasmolysis can have certain effects on the quality and properties of plant materials, and its use should be made with caution, taking into account the specific needs and requirements of research or production [2].

During the development of the installation, it is necessary to take into account the use of a regulated power source and devices for fixing transient processes and changing the cell structure. The appearance of the experimental setup shown in fig. 1, it can be seen that it consists of a laboratory autotransformer T1, two thyristors VD1 and VD2, which are connected in opposite parallel, a measuring shunt R1 with limiting resistors, an oscilloscope and working electrodes. Thanks to the control of thyristors, we can adjust the duration of processing within the specified limits.

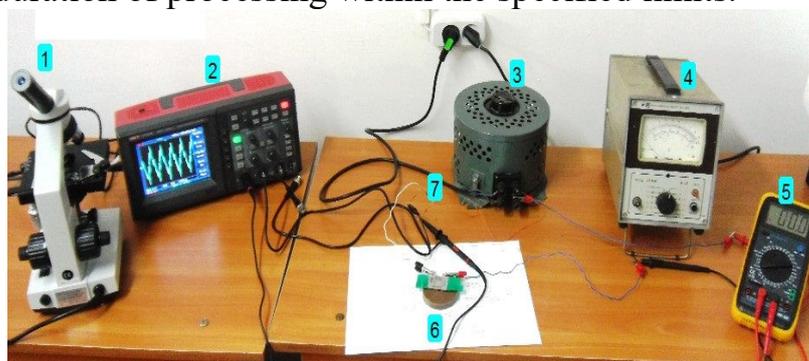
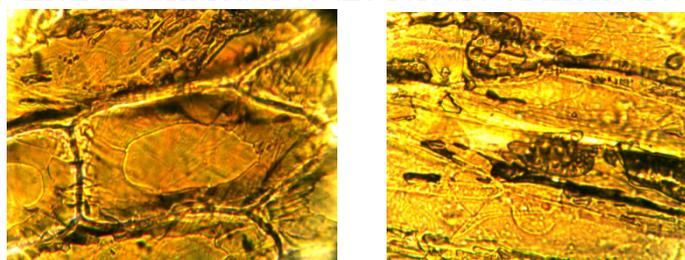


Fig. 1 – Appearance of the experimental setup for the study of electroplasmolysis: 1 - biological microscope; 2 - digital oscilloscope; 3 - autotransformer; 4 - millivoltmeter; 5 - digital multimeter; 6 - experimental sample of plant raw materials; 7 - shunt for current measurement

The analysis of the results of the experiment was performed using a biological microscope and a digital camera (Fig. 2). The obtained data indicate the presence of the phenomenon of electroplasmolysis during the passage of electric current through plant material [3]. This is determined by partial deformation or complete destruction of the cell membrane, which in turn leads to the release of moisture.



a

b

Fig. 2 – Photographs of cells with an increase of 150 times: a - before the beginning of the process; b - at the end of processing

The obtained results also indicate the increased permeability of cell membranes, making the grain more accessible to the action of disinfection agents, such as antimicrobial drugs or chemical solutions. This is important to ensure the quality and safety of cereal seeds. It was also found that disinfected seeds can have improved

quality and ability to germinate, which indicates a positive effect of electroplasmolysis on grain development.

The developed experimental setup looks promising for further research in the field of electroplasmolysis of grain crops. The presence of an adjustable power source and devices for registering transient processes allows effective control and analysis of the electroplasmolysis process.

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ВПРОВАДЖЕННЯ ЕКОЛОГІЧНО ЧИСТИХ ЕНЕРГОТЕХНОЛОГІЙ В КОНТЕКСТІ КЛІМАТИЧНОЇ ПОЛІТИКИ ЄС

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Анотація: розглянуто сучасний стан і перспективи розвитку альтернативних джерел енергії в Європі та Україні з акцентом на зниження викидів парникових газів, енергетичну незалежність і впровадження екологічно чистих технологій опалення та охолодження. Особливу увагу приділено аналізу потенціалу сонячної, вітрової та біоенергетики як ключових напрямів забезпечення сталого енергетичного розвитку.

Ключові слова: альтернативна енергетика, відновлювані джерела енергії, сонячна енергетика, вітрова енергетика, біоенергетика, енергоефективність, сталий розвиток, декарбонізація.