

Chapter 11

Technology of Managing Reactions of Biological Objects at Anthropogenically Transformed Territories

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ABSTRACT

Solving the problem of increasing plant resistance, the development of environmentally-friendly technologies is particularly important, which also contribute to the reduction of resource costs for production and load on the environment. The research results indicate a positive effect from the treatment of plants and seeds with electrochemically activated (ECA) water, electric fields, and impulse pressure (IP). Pre-sowing treatment of seeds with ECA water increases the germination rate and seed germination energy, improves the development of plants, improves morphological parameters, etc. The reactions of economically dangerous pests and causative agents of infectious plant diseases to the use of ECA water are identified. The combination of pre-sowing seed treatment with the treatment of vegetative plants provides the highest possible result.

INTRODUCTION

Crop production is currently accompanied by a high level of energy and economic costs, as well as the adverse effects of technological processes and certain operations on the environment. Currently, the trend of greening food production on the basis of alternative farming systems with the minimization of environmental pollution is of particular relevance.

In most cases, the yield and resistance of the crop are inversely related, so the optimal balance between the resistance of plants to adverse environmental conditions and their resistance to pests and diseases is important. The creation and development of efficient environmentally friendly technologies and technical means for the management of agro-ecosystems are of particular importance. A simultaneous increase in the productivity and stability of plants with the help of stimulating physical or chemical effects is accompanied by an increase in product quality and a decrease in cost, which also ensures the growth of its competitiveness. Physical stimulants reduce the risk of overdose, leading to ecological imbalances, mutations, etc., and besides that they are harmless to the persons performing the treatment, technologically effective, productive and economically viable.

The concept of environmentally friendly farming involves the regulation of components of biocenoses, which reduces the number of pest populations to an ecological and economic imperceptible level that does not exceed the economic threshold of harmfulness.

The implementation of this concept will allow optimizing plant growth, changing the biocenotic situation in the direction of worsening conditions for the development of pests, reducing their numbers and reducing damage with minimal environmental pollution. To achieve this, the task is to improve the technology, taking into account the adaptive potential of plants, increasing the efficiency of the natural regulation of the biological component of agrocenoses, as well as direct impact on pests with environmentally safe methods and means.

The goal of the research is the scientific substantiation of the application of the electric field and electrochemical means for optimizing the processes of controlling the reactions of biological objects in agro-ecosystems.

BACKGROUND

Plant organisms are highly sensitive to biotic, physical, and chemical factors (Vartapetian, 1985). Their responses include a cascade of events at the molecular, cellular, tissue, organ, organism, and population levels (Polevoy, 2001). Functional and structural changes, at the molecular level, manifest themselves in changes in plant growth, development, stability, viability and productivity (Tarchevsky, 2002).

The disclosure of plant response mechanisms to such effects is of research and practical interest. Electromagnetic fields (Pietruszewski, Muszynski & Dziwulska, 2007; Kasakova et al., 2018), structured, ionized and magnetically activated water (Booth, 1992) are effective plant growth stimulators that affect the physiological spectrum processes occurring in them (Opritov, Pyatygin & Retivin, 1991).

At present, ideas about the effect of doses of a stressor are justified (Pakhomova, 1995). If we consider resistance as the proportion of surviving individuals in per cents of the control, then it follows that small exposures increase resistance, a greater number of individuals survive than in the control (the hormesis

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