

DEVELOPMENT OF MICROFUNGAL INFECTION AND GROWTH INDICATORS OF WHEAT UNDER THE INFLUENCE OF PARACETAMOL-CONTAINING PHARMACEUTICAL DRUG IN A LABORATORY STUDY

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New compounds, in particular, pharmacological drugs, are emerging as pollutants in the environment [1-2]. The issue of the impact of such compounds on wheat as a valuable agricultural plant deserves attention. It is known that paracetamol has a suppressive effect on wheat [3]. However, pharmacological drugs, in addition to the main active ingredient, contain auxiliary compounds with bioactive properties [4]. Therefore, the aim of this work was to study the development of infection by microscopic fungi and the growth characteristics of wheat seeds and seedlings under the influence of the medical drug “Infulgan” containing paracetamol and auxiliary substances.

The study used winter wheat of the Bohdana variety, in which the germination energy, seed germination, biometric and morphometric indicators of seedlings (coleoptile length, number of roots) were evaluated in the growth test, and the Disease incidence percentage was determined. The biological activity of the pharmacological drug “Infulgan” was studied, containing 10 mg/mL paracetamol in an aqueous solution with excipients citric acid monohydrate, sodium citrate, sorbitol, sodium sulfite anhydrous. Aqueous solutions with a paracetamol content of $0.25 \times 10^{-4}\%$ to 0.2% w/v were prepared from this drug. Distilled water was used as a control. All variants of the study were carried out in triplicate. The results were evaluated using statistical methods: the arithmetic mean, the error of the mean, and the significance of the differences according to the Student’s t-test were determined.

It was found that the growth rates of wheat were statistically significantly inhibited by a 0.2% solution of paracetamol. At the same time, the seeds were heavily affected by fungal infection - Disease incidence percentage was 83.3% (with 6.7% in the control). A statistically significant decrease in the length of the coleoptile was observed in comparison to the control value (by 2.5 times). In addition, a statistically significant increase in the number of roots per 1 seed was defined - 6.0 ± 0.4 compared to 4.4 ± 0.2 in the control. A statistically significant increase in root formation was also revealed in the variant treated with the drug “Infulgan”, where the concentration of paracetamol was 0.025% - 5.2 ± 0.2 roots per 1 seed. It should be noted that previous publications did not note significant changes in the number of roots under the influence of paracetamol [5]. It is likely that the induction of root formation was stimulated by metabolites of microscopic fungi, which is consistent with the data of previous studies [6]. The variety-specific reaction to the drug treatment could also explain our observation.

A decrease in the concentration of the drug in solutions led to a decrease in the negative impact on wheat growth rates. Thus, when wheat was exposed to the studied solutions with the paracetamol concentration of 0.025%, 0.002% and $0.25 \times 10^{-4}\%$, no statistically significant

difference in the length of the coleoptile was observed compared to the control. For wheat germinated after treatment with solutions of “Infulgan” where the paracetamol concentrations were 0.002% and 0.25×10^{-4} %, no statistically significant differences in the number of roots per 1 seed were also detected. Disease incidence percentage in these variants was at the same level as the control - from 3.3 to 6.7%.

Thus, the use of the drug “Infulgan” could cause a significant infection of wheat seeds with microscopic fungi and increased the level of root formation, which cannot be explained by the effect of one active ingredient - paracetamol. Therefore, a scientifically sound approach to assessing the ecotoxicological effect of therapeutic agents on agricultural plants should consist in studying the impact not of individual active ingredients, but of pharmaceutical preparations as a whole, considering the role of auxiliary compounds in the formation of their biological activity.

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