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WHEAT SEED TREATMENT WITH 51,8 GHZ ELECTROMAGNETIC FIELD INDUCES CHANGES IN GERMINATION AND SEEDLING EARLY GROWTH

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Abstract

It is known that exposure to electromagnetic fields (EMF) of millimeter range or extremely high frequencies (EHF) has beneficial effects on seed germination and plant growth [1]. This application in contrast to chemical methods of seeds pre-germination treatment is noninvasive and environmentally appropriate technology what is very important for farming industry. Wheat (*Triticum aestivum* L.), a crop plant of the Poaceae family, is one of the highly demanded major yield crops in the word. The study aimed to investigate the effects of pre-sowing seed treatment with physical factor- EHF EMF (51,8GHz frequency, 3-10 min) on seed germination and seedling performance. For this, seeds of wheat (*Triticum aestivum* L. of "Bezostaya" variety) were imbibed in water for 12 hour then treated once with EMF with 51,8GHz frequency, for 3, 5 and 10 min., then left to germinate on wet filter paper in Petry dishes at 250 C in the dark for 8 days. The irradiation was performed using the generator G4-141 type (State Scientific-Production Enterprise "Istok", Russia) with working interval of 37.50-53.57 GHz and power flux density 64mWt/cm2. The germination rate, seedling length and fresh weight were determined at 3th and 7th day after seeds sowing. Our findings show that the most positive germination effects were in short time EMI treatments (3 and 5 min respectively) groups. The germination tests revealed that EMI-treatments induced increase in germination rate in seeds as compared to control. Thus, the germination rate at 3th day after sowing was significantly ($p<0,05$) higher (by 12% and by 9%) for EMF- exposed seeds, while in the 7th day these indexes did not significantly differ from control. On the other hand, the longer time EMI –treatment (10 min) did not change germination rate for both studied days after sowing. In our previous study [1] we reported that applied seed treatment with EMI not only stimulated seedling growth, but also induced changes in lipid peroxidation activity (MDA-rate) in wheat seedlings. Data, obtained in this work show, that seedlings grown from seeds EMI treated (5 and 10 min) groups had increased seedling weight (up to 12%) and length (up to 8%) compared to control. Applied treatments also remarkably changed the MDA-rate in wheat seedlings. The results suggest promotional effects of MM range electromagnetic waves on germination and growth indexes of wheat seeds. Presumably, the observed influence may be connected with the changes of membrane properties by the means of membrane lipid peroxidation.

Keywords: electromagnetic fields, wheat seeds, germination, seedlings weight, length, lipid peroxidation.

References:

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