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Effects of Low Frequency Electromagnetic Radiation on L. minor growth parameters and generation of point mutations at GPx, CAT and APx genes

Development of new technologies distributing electric power from power stations to our homes through a network of cables and wires, including numerous electric devices at working places and home environment become a source of electromagnetic radiation (EMR) much stronger than EMR of natural origin. To provide a better understanding of the impact of the EMR of anthropogenic origin on living organisms, we investigated the long-term effects of EMR on Lemna minor. In this study, plants of the L. minor laboratory clone were exposed to LF EMR (50 Hz) growing clones in Petri dishes placed on the coils generating magnetic flux ranging from 1 – 300 μT. We examined the response of the plants on molecular (variability of DNA sequences of ascorbate peroxidase (APx), glutathione peroxidase (GPx), and catalase (Cat) genes) and physiological (plant growth, frond area, and number) level.

Comparison of growth parameters of L. minor clones exposed to 1 μT, 2 μT, and 300 μT magnetic flux revealed positive effect stimulating growth of experimentally affected plants at 2 μT. After the first 14 weeks of treatment, the growth parameters were lower in the directly exposed by LF EMR group than in the group grown distantly from the source of EMR. However, after 18 weeks from the beginning of the experiment no significant difference was observed between two groups of L. minor including directly and indirectly affected by LF EMR plants. Moreover, the signals of the impact of LF EMR on the plants rising point mutations were detected. The significantly enhanced number of variations in DNA sequences of L. minor clones directly affected by LF EMR in comparison to indirectly affected clones were revealed at the introns of APx (P=0.011), GPx (P=0.009), and Cat (P=0.044) genes starting from the 10th week of the experiment.

In conclusion, the data on molecular and physiological levels provide evidence that L. minor clones experimentally affected by LF EMR respond to the impact depending on the time and the magnetic flux density.

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