SOME OF EPIGENETIC EVENTS IN WHEAT SEEDLINGS NUCLEI ON MM-WAVES RESPONSES

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With the development of civilization and technology, our living space is filled with a variety of electromagnetic fields, the sources of which are computers, cell phones, various radiological diagnostic and physiotherapy equipment in medicine, cellular antenna amplifier, etc. The problem of electromagnetic safety becomes extremely relevant, since the most medical devices and technical devices radiate mm-wave in the range of 1-300 GHz. The plant's ability to respond to stresses largely depends on its capacity to modulate the transcriptome rapidly and specifically. Epigenetic mechanisms, including DNA methylation, chromatin dynamics and small RNAs, play an essential role in the regulation of stress-responsive gene expression. Stress-related covalent modifications of DNA and histones can be passed on during mitosis and meiosis to the next generation and provide a memory that enables the plant and even its offspring to adopt better to a subsequent stress [1, 2].

In our study the adaptation of plant to the new abiotic stress, such as emission extremely high frequency of electromagnetic irradiation (EHF EMI) by different type of electromagnetic equipment and power station of cellular phone communications have been investigated. The impact of EHF EMI of the mm-range (45-53 GHz) on growth parameters, nuclear envelope content as PL, (as well as protein, DNA and RNA content, for control on a purity of extraction), DNA melting parameters and DNA methylation of wheat seedlings on 4 day after irradiation have been studied.

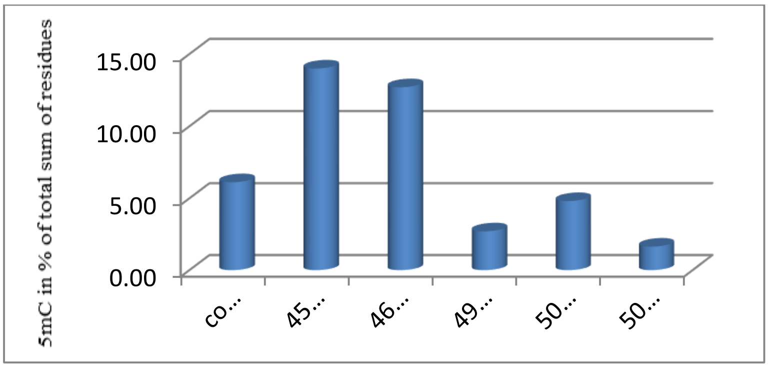

Fig.1. DNA methylation of wheat 4-day seedlings dependence from frequency of EMI (first generation).

These data present beginning of evoke an adopt mechanisms in the plant model. For revealing long term responses of the plant the 4-day seedlings treated by different exposition of EHF EMI part of treated seedlings was growing in soil for grow harvest of wheat treated seeds in second generation. After that we investigate (without any treatment seeds of second generation) DNA methylation of 4-day seedlings of that seeds, data presented on Fig 2.

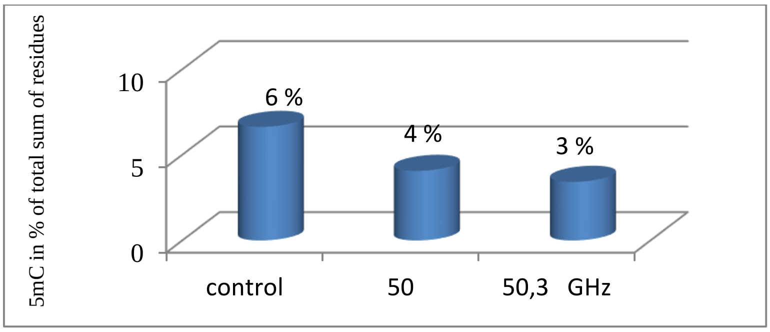

Fig.2. DNA methylation of wheat 4-day seedlings in second generation.

Stress-related covalent modifications of DNA and histones can be passed on during mitosis and meiosis to the next generation and provide a memory that enables the plant and even its offspring to adopt better to a subsequent stress. Depending on the amount of stress, the damage might still be repairable by the specialized cellular machinery or may lead to premature senescence of organs or eventually the whole plant. These diverse molecular mechanisms have all been found to be closely intertwined and stabilize each other to ensure the faithful propagation of an epigenetic state over time and especially through cell division.

As it is known DNA methylation is a mechanism for diversification of DNA identity by providing within the same chemical entity two layers of information: the ancestral identity encoded on the level of sequence and the cellular identity encoded on the level of the DNA methylation pattern A major knowledge on molecular mechanisms that occur in stress conditions are the one way pass for the improvement of stress tolerance in crop plant. While deeper understanding of plant responses to the RF-EMF is still needed, these treatments may initiate a set of molecular responses that may affect plant resistance to environmental stresses, as have demonstrated on the wheat seedlings, and constitute a valuable strategy to increase plant resistance to environmental stressful conditions.

References

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