The impact of electromagnetic fields (EMF) on the germination, morphology and physiological responses of *Triticum aestivum* seeds.

Abstract

The application of electromagnetic fields (EMFs) in agriculture has garnered increasing attention in recent years, primarily due to its potential to enhance plant growth parameters and improve the physiological responses of plants to a wide array of environmental stress factors. The use of EMFs represents an innovative approach to mitigating these stresses by promoting plant resilience and overall growth efficiency. Despite this growing interest, the precise mechanisms through which EMFs influence plant processes remain widely unexplored, particularly in relation to how they interact with seed size and quality.

Most existing research has focused on the broad benefits of EMF exposure on plant growth, but the finer details - such as how seed characteristics like size and aging influence the outcomes of EMF treatments - have not been studied. Addressing this gap is crucial, as seeds are the foundation of crop productivity, and their ability to germinate and grow effectively can make or break agricultural success. My research aimed to delve deeper into these interactions by exploring how EMF exposure affects winter wheat (*Triticum aestivum* L.) seeds. In this study, the seeds were divided into two size groups - small and big - and two quality categories - freshly harvested (referred to as "young") and aged seeds. This dual categorization allowed for a comprehensive analysis of how seed size and age impact the effectiveness of EMF treatments, offering a more nuanced understanding of its potential applications.

One of the most significant findings of my research is the differential response of small and big seeds to EMF exposure. While big seeds appeared to benefit more from EMF treatment, particularly in terms of early growth under dark conditions in both young and aged seeds, smaller young seeds show to have a natural advantage and perform better under control conditions and then their ability is compromised after being subjected to aging conditions. This suggests that the effectiveness of EMF treatment may depend on seed size and potentially other factors such as the specific crop species or environmental conditions.

The findings suggest that EMF treatment holds significant potential as a tool for enhancing seed viability, particularly in the face of environmental stressors and aging-related decline in seed quality.

Cristina Daniela

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