

LOW-TEMPERATURE PLASMA AND PLASMA-ACTIVATED LIQUIDS IN SOLVING AGRICULTURAL PROBLEMS: EXPERIMENTAL TECHNIQUE

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Abstract. An emerging area of global research focuses on discovering new non-chemical methods to accelerate seed germination, enhance plant growth and development, and increase resistance to various stress factors. Recently, low-temperature plasma (LTP) has shown significant potential in this domain, as evidenced by numerous scientific studies (see Gudkov et al. 2024; Konchekov et al. 2023). Despite its promise, scaling LTP sources and ensuring consistent and reproducible results pose significant challenges. These challenges make it difficult to implement LTP generators directly on plants (see Konchekov et al. 2022) and seeds in practical agriculture, necessitating interdisciplinary efforts across physics, chemistry, and biology. A more scalable alternative to direct LTP application is the use of plasma-activated water (PAW) or plasma-treated solutions (PTS). PAW and PTS are produced by treating water or other solutions with LTP, thereby imparting reactive species into the liquid (Gudkova et al. 2024). This method allows for easier and more uniform application in agricultural practices compared to direct LTP treatment. This report reviews the scientific and technological advancements made at the Prokhorov General Physics Institute of the Russian Academy of Sciences. The Institute has developed innovative LTP generators and methods, conducting extensive studies on both direct LTP treatment of biological objects and indirect treatment using PAW and PTS. These studies have demonstrated improvements in seed germination, plant growth, and resistance to stress factors, showcasing the potential of LTP-based methods to enhance agricultural practices.

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References

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