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PROCEEDINGS

Enhancing Rhizobium performance in common bean plants through Fe₃O₄ nanoparticles

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This study investigates the effects of Fe₃O₄ nanoparticles (NPs) on nodulation, nitrogen fixation, and growth of common bean plants. Plants were exposed to Fe₃O₄ NPs, Rhizobium inoculation, and Fe₃O₄ NPs + Rhizobium inoculation. Results showed that treated plants exhibited improved symbiotic performance, with increased nitrogenase activity, nodule leghaemoglobin, and iron content. Additionally, the number of active nodules per plant and nodule dry weight significantly increased. Symbiotic nitrogen fixation was enhanced, leading to higher shoot and root total nitrogen content. Treatment combining Fe₃O₄ NPs and Rhizobium inoculation yielded the best results. Fe₃O₄ NPs were taken up by plants, accumulating in organs including nodules. Moreover, treated plants displayed increased root and shoot lengths, leaf area, and dry weights. Magnetization curves indicated the accumulation of Fe₃O₄ NPs in nodules, enhancing symbiotic performance. The study suggests a novel strategy for improving common bean growth through Fe₃O₄ NPs and Rhizobium inoculation, offering potential benefits for sustainable agriculture, and reducing nitrogen fertilizer use. These findings contribute to a non-genetic approach in legume research, emphasizing long-term improvements in common bean growth and symbiosis [1-2].

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References:

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[2] H. Jangir, A. Bhardwaj and M. Das, Applied Nanoscience 10, 445 (2020)