Nanomaterials may enhance plant tolerance to high soil salt levels

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Soil salt concentrations above the optimal threshold for plant growth can threaten global food security by compromising agricultural productivity and crop quality. An analysis published in *Physiologia Plantarum* has

examined the potential of nanomaterials—which have emerged over the past decade as a promising tool to mitigate such "salinity stress"—to address this challenge.

Nanomaterials, which are tiny natural or synthetic materials, can modulate a plant's response to salinity stress through various mechanisms, for example by affecting the expression of genes related to salt tolerance or by enhancing physiological processes such as antioxidant activities.

When investigators assessed 495 experiments from 70 publications related to how different nanomaterials interact with plants under salinity stress, they found that nanomaterials enhance plant performance and mitigate salinity stress when applied at lower dosages. At higher doses, however, nanomaterials are toxic to plants and may even worsen salinity stress.

Also, plant responses to nanomaterials vary across plant species, plant families, and nanomaterial types.

"Our analysis revealed that plants respond more positively to nanomaterials under salt stress compared with non-stressed conditions, indicating the ameliorative role of nanomaterials," said corresponding author Damiano R. Kwaslema, MSc, of Sokoine University of Agriculture, in Tanzania. "These findings pave the way for considering nanomaterials as a future option for managing salinity stress."

More information: Meta-analysis of nanomaterials and plants interaction under salinity stress, *Physiologia Plantarum* (2024). DOI: 10.1111/ppl.14445

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