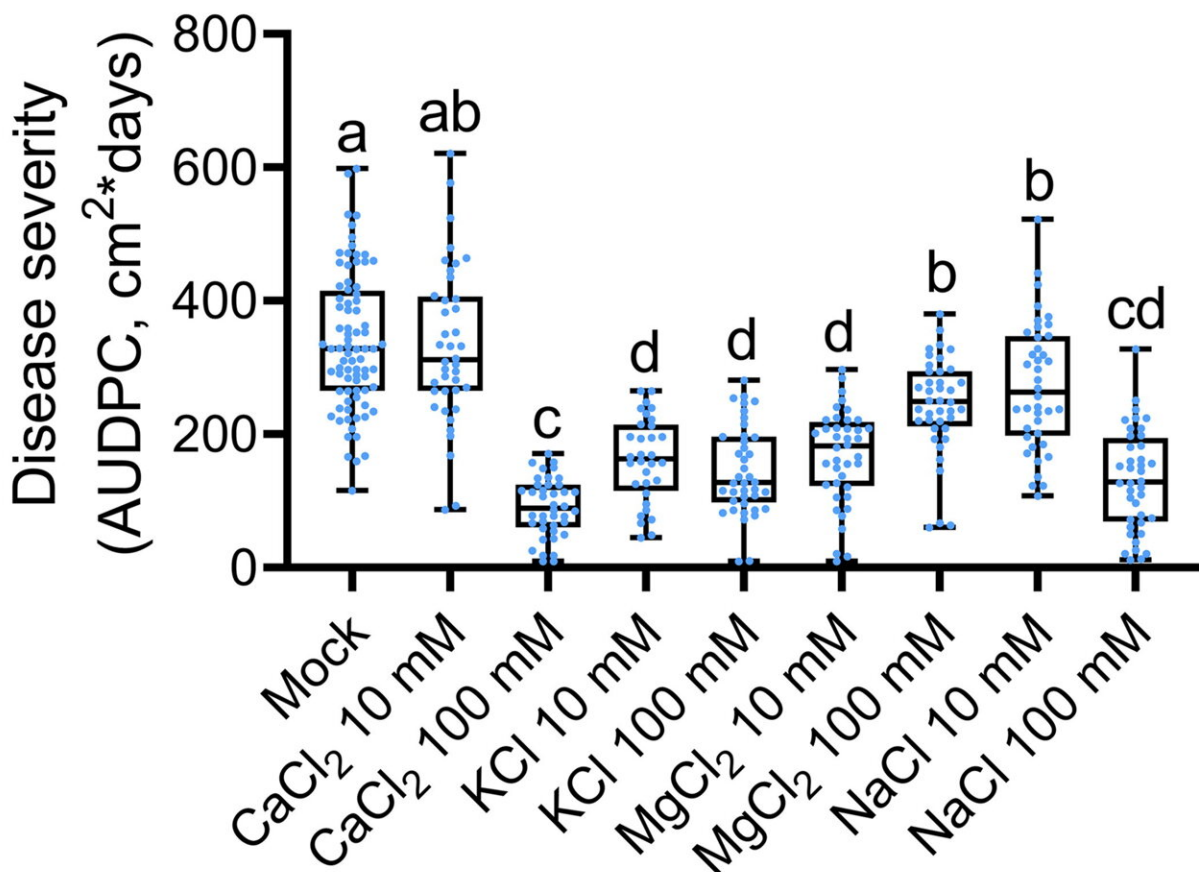


# Molecular mechanism behind nutrient element-induced plant disease resistance discovered

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Elements promote tomato resistance to *Botrytis cinerea*. *Solanum lycopersicum* 'Ram' plants were sprayed twice (at day 0 and day 7) with a solution of each salt in concentrations as indicated (15 ml/plant). Plants were inoculated with *B. cinerea* conidia ( $10^6$ /ml) 3 days after the second treatment. Disease was monitored for 7 days and area under the disease progression curve was

calculated. Minimum to maximum values of six independent experiments are presented,  $N = 42$ . Box plots are shown with inner quartile ranges (box), outer quartile ranges (whiskers), and median (line in box), all points shown. Letters represent statistical significance in Welch's analysis of variance with a Dunnett post hoc test, P

Just as humans can't subsist on a diet of only French fries and brownies, plants must also consume a balanced diet to maintain optimal health and bolster their immune responses. Nutrient element uptake is necessary for plant growth, development, and reproduction. In some cases, treatment with essential elements has been shown to induce plant disease resistance, but conclusive research on the molecular basis of this remedy has been limited.

In one of the few studies to directly investigate the mechanism underlying the effect of essential elements on plant disease resistance, Rupali Gupta of Volcani Institute and colleagues demonstrate that nutrient elements activate immune responses in tomato plants through different defense signaling pathways.

Their paper, recently published in *Phytopathology*, outlines the molecular mode of action that potassium, calcium, magnesium, and sodium take to minimize both fungal and bacterial plant diseases.

Using straightforward laboratory methods, the authors demonstrate that essential element spray treatment sufficiently activates immune responses in tomato—including defense gene expression, cellular leakage, reactive oxygen species production, and ethylene production—leading to disease resistance. Their results suggest that different defense signaling pathways are required for induction of immunity in response to different elements.

Understanding the genetic mechanism underlying this process may provide new insights into crop improvement. Corresponding author Maya Bar comments, "We are excited to probe the molecular basis of this phenomenon, define another facet of induced resistance, and provide data that will assist in applying this principle to agricultural systems in a more purposeful, reproducible manner."

The tenets of mineral nutrient-induced [disease resistance](#) discovered in this study

can be exploited in [agricultural practices](#)—benefiting growers/farmers and protecting valuable crops.

**More information:** Rupali Gupta et al, Nutrient Elements Promote Disease Resistance in Tomato by Differentially Activating Immune Pathways, *Phytopathology* (2022). [DOI: 10.1094/PHYTO-02-22-0052-R](https://doi.org/10.1094/PHYTO-02-22-0052-R)

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