



SoilWealth | ICP
nurturing crops · protecting crops



5th Soilborne Disease Masterclass

Can nutrients make crops more or less susceptible to diseases

Len Tesoriero

Adelaide 8th and 9th May 2024

Hort Innovation ONION FUND

This project has been funded by Hort Innovation using the onion research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au

Hort Innovation MELON FUND

This project has been funded by Hort Innovation using the melon research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au

Hort Innovation VEGETABLE FUND

This project has been funded by Hort Innovation using the vegetable research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au



Overview

- Mineral nutrients improve plant health & quality
- They can have a significant effect on plant diseases – can be front-line defence
- Uptake of nutrients via roots depends on several environmental and plant physiological factors e.g. temperature, moisture, oxygen, pH, soil type, organic matter content, balance of cations etc
- Likely differential uptake due to nutrient formulations – e.g. chelated forms, nutrient composition and type e.g. compound, blend, liquid



Nutrient Deficiencies affect immune systems and overall plant health

Balanced Nutrition fosters strong cell walls, defense compounds, and optimal physiological functions,

Specific Nutrient Effects: Calcium can strengthen cell walls, Silicon can enhance structural integrity, micronutrients play crucial roles in various biochemical pathways

Excessive Fertilisation causes nutrient imbalances, e.g. excessive nitrogen

Soil pH influences nutrient availability and can indirectly affect susceptibility to diseases, e.g. club root, pythium.

Organic Matter fosters beneficial microbial activity, nutrient holding and cycling, soil structure

Overwatering or underwatering can stress plants, making them more susceptible to diseases. Additionally, poorly drained soils can create conditions conducive to the development of root diseases.



Nitrogen effects on diseases

- Bacterial soft rot and *Botrytis* diseases are favoured by high N use
- *Sclerotium* disease is suppressed by high N
- *Rhizoctonia* species vary in response to NH_4^+ and NO_3^-
- *Fusarium* spp. are favoured by NH_4^+
- *Verticillium vahliae* is suppressed by NH_4^+
- Clubroot is suppressed by NH_4^+
- Root lesion nematodes suppressed by NH_4^+
- *Thielaviopsis* sp. suppressed by NH_4^+

There are complex mechanisms at play e.g. high NH_4^+ increases Mn availability and role in plant defences to some pathogens



Calcium nutrition & diseases

Calcium plays an important role in disease prevention & severity

- Ca strengthens cell walls (Ca pectate), helps maintain the structural and selective permeability of cell membranes, decreases activity some pathogen enzymes & facilitates signal transduction for plant defences to pathogen attack
- Higher Ca is known to suppress several diseases including:
 - Clubroot – related to liming effect on pH
 - Fusarium wilt
 - Pythium & Phytophthora
 - Botrytis & Sclerotium rots

