

The role of silicon in sustainable potato production

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In the current conditions of climate change, factors such as heat and water availability are the foremost abiotic stressors affecting the development of growing crops. Potatoes are thought to be one of the vegetable species most sensitive to water deficiency, which may cause a significant reduction in yields. Recent findings have established silicon (Si) as an emerging eco-friendly and sustainable solution for relieving plant stress and ultimately improving plant health under different environmental constraints.

A silicon shield

Silicon is the second-most abundant element within the Earth's crust and is found in significant quantities in soil. However, Si can only be taken up by the plant in the form of mono-silicic acid.

Fertilisation with plant absorbable forms of Si has been shown to play a multidimensional part in potato cultivation due to its role in improving the use and uptake of nutrients and mechanically strengthening the crop, especially under stressful conditions such as water deficiency, high salinity, unfavourable temperatures, and biotic stress factors. The accumulation of Si in the cell wall reduces the loss of water through transpiration, shielding the effects of hydric stress.



Additional benefits of supplementing the soil with Si include:

- Plant dry weight, assimilation rate and chlorophyll biosynthesis are increased.
- Oxidative damage in stressed plants (abiotic stress) is alleviated.
- Various pests and diseases caused by both fungi and bacteria (biotic stress) are effectively controlled.
- Soil stability and structure as well as soil moisture levels are enhanced, while phosphorous availability and resistance to metal toxicity are increased.
- Plant stem strength is increased to withstand lodging.

Silicon and phytohormones

Phytohormones play a pivotal role in plants' broad-spectrum biochemical and physiological processes during normal and extreme environmental conditions. Frontline phytohormones include auxin, cytokinin, ethylene, gibberellin, salicylic acid, abscisic acid, brassinosteroids, and jasmonic acid. These phytohormones are internally correlated with Si in regulating abiotic stress tolerance mechanisms.

The biostimulant *Ascophyllum nodosum* (seaweed extract) is enriched in phytohormones such as auxins, gibberellins and cytokinins. These growth regulators have been shown to:

- Enhance crop quality and promote plant growth and yield.
- Increase nutrient acquisition, accumulation and biosynthesis.
- Decrease the plant's fertiliser requirement.

- Improve salinity tolerance and mitigate drought stress in plants.
- Improve the plant's defence against various pathogens.
- Improve soil health.

Soil conditioning

Silicon fertigation also improves soil properties such as its water-holding capacity, which indirectly leads to improved plant health. Rhizospheric micro-organisms contribute to efficiency by increasing the bio-availability of Si in soil.

The activity within the rhizosphere can be increased by soil supplementation with humic substances. Humic and fulvic acids are the most characteristic compounds of soil humic substances and stimulate plant root growth while enhancing nutrient uptake.

Stimulation of root growth may improve the plant's resistance to disease as well as its response to feeding by herbivores and nematodes, and water stress caused by drought.

SILCO: A three-in-one solution

SILCO (Reg No M192, Act 36/1947) is a soil conditioner and plant nutrient that promotes effective water utilisation and increases plant biomass. This unique three-in-one solution combines the synergistic benefits of silicon and humic acid, as well as *Ascophyllum nodosum* (seaweed extract) in an easy-to-use, water-dispersible powder format.

SILCO contains Si (300 g/kg), potassium (30 g/kg) and carbon (163 g/kg). These three elements are scientifically combined to form part of a sustainable approach to mitigate biotic and abiotic stress factors during potato production.

For more information on how SILCO can form part of your sustainable potato farming operation, contact your local Nutrico SA qualified agronomist at 011 392 4072 or visit www.nutrico.co.za.