FACT SHEET No.20 Silicon and Cell Strength

mineral magic

Making soils better & wetter - permanently

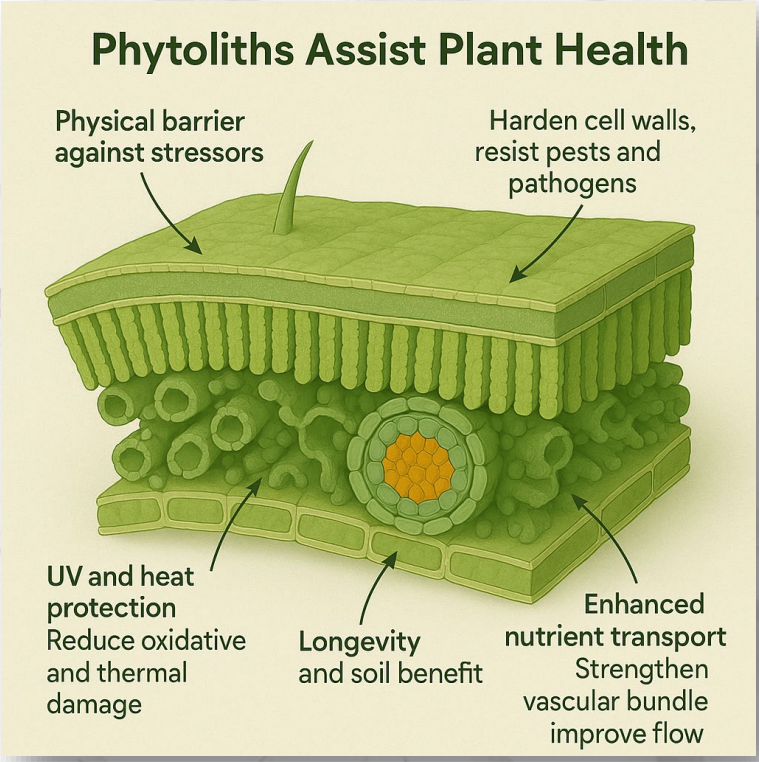
Amorphous Silica – So what does the Silicon do ?

The Plant Available Silicon **(PAS)** in the form of monosilicic acid produces what is known as a **phytolith** which essentially puts a lining on each cell wall.

A **phytolith** (from Greek phyto- = plant, -lith = stone) is a microscopic structure made of silica (SiO_2) that forms within plant tissues.

It results from the uptake of monosilicic acid (H_4SiO_4) from the soil, which plants deposit in their cells as solid silica bodies.

Why Phytoliths Assist Plant Health:



1. Structural Reinforcement & Mechanical Strength

Phytoliths integrate into the cell walls of epidermal, mesophyll, and vascular tissues, effectively increasing tensile strength and rigidity. This ;

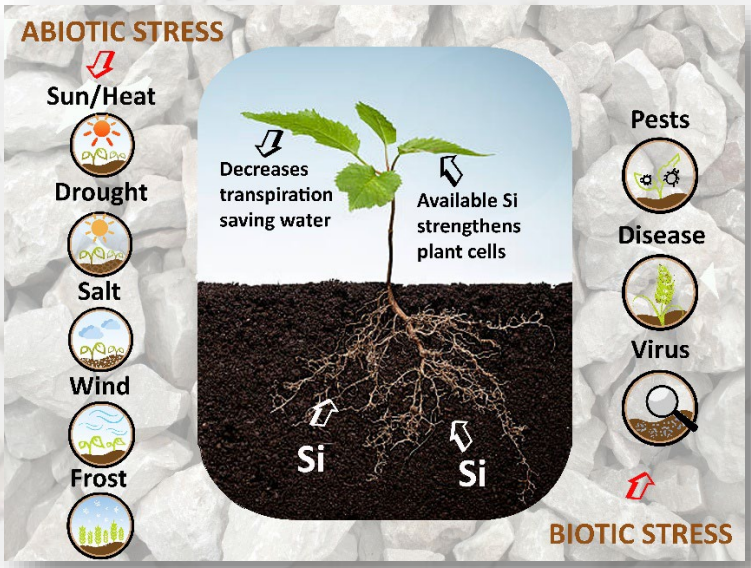
- Improves leaf erectness, allowing better light interception for photosynthesis.
- Reduces lodging in cereals and turf, which can significantly impact crop yield or playability (e.g. in sports turf).
- Helps leaves retain form and resist drooping during water stress or heat.
- This "internal scaffolding" makes the plant physically more resilient to environmental pressures.

2. Pest and Pathogen Defense

Silicon-accumulating plants exhibit enhanced resistance to biotic stressors through:

- A physical barrier that deters insect feeding by toughening epidermal cells, making leaves less palatable to chewing and sap-sucking insects (like aphids, beetles, and caterpillars).
- Reduced pathogen penetration by inhibiting fungal appressoria (penetration pegs) from breaching the cuticle and epidermis.

- Inducing systemic acquired resistance (SAR) – silicon can act as a secondary messenger in plant immune responses, leading to upregulation of defensive enzymes like peroxidases and phenolics.



3. 💧 Water Retention & Abiotic Stress Tolerance

Phytoliths play a role in reducing transpiration losses by:

- Reinforcing cuticles and stomatal guard cells, limiting unregulated water vapor loss.
- Creating a hydraulic buffer within tissues, helping maintain turgor pressure during drought or high evaporative demand.
- Supporting better resilience in salinity-affected or heat-stressed environments, where water-use efficiency and ionic balance are critical.
- This benefit is especially important for plants growing in Western Australia's sandy soils or arid regions where water is scarce.

4. 🌱 Soil Regeneration & Silica Cycling

When phytolith-rich plant residues return to the soil:

- Their slow dissolution over time gradually releases monosilicic acid, acting like a slow-release silica amendment that replenishes the root zone.
- Phytoliths contribute to the permanent soil silica pool, improving nutrient retention and soil buffering capacity.
- Their persistence supports long-term sustainable agriculture by reducing reliance on repeated inputs and enabling biogeochemical cycling of essential micronutrients.

This "legacy effect" enhances soil health and plant resilience over successive cropping cycles or turf renovations.