bettersoil Alliance

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Coping with water stress with PhycoTerra®-enhanced YaraLiva

Where water supplies are limited, it is important to stretch scarce soil moisture to maintain healthy plant growth. If soil conditions are not favorable for root growth, plants will not be able to fully use the water and nutrients. This may include conditions that prevent slow water infiltration or limit the soil's ability to retain the water passing through the profile. Soils with a good physical condition, or "tilth" help optimize water availability to crops during times of stress and support healthy root growth.

Of course, water stress should be avoided whenever possible since it impacts growth, kernel fill, and flower bud development. But there are unavoidable circumstances where water supplies will be limited, and additional management is required. Keep these two factors in mind:

SOIL

The essential role of calcium in maintaining and improving soil properties is well known. Calcium cations bind clay minerals into the microaggregates required for root health. When cations such as sodium or magnesium dominate the cation exchange sites, soil structure is destroyed and the soil develops poor properties for root growth or water movement. In addition to calcium, microbial colonies also form organic bridges that bind soil particles into water-retaining microaggregates.

Good contact between the root and soil is required for water uptake. As soils dry, air enters the large pores and any remaining water is tightly held in thin films by surrounding the soil particles. Eventually the root can no longer take up water from the water films and the air-filled pores.

An overlooked mechanism for utilizing extra water from the soil results from naturally occurring microbial films and root exudates. These biologically produced organic materials form a hydraulic bridge between the root and the water films surrounding the soil particles. Young roots continually exude a thick organic sheath at their tips. Soil microbes also produce biofilms (called extracellular polymeric substances; EPS) when stimulated by adding the correct mixture of soluble carbon that fuels their growth. These EPS materials can retain water themselves, they coat soil minerals that improve their "wettability", and they rearrange the soil pores to increase their capacity to hold moisture. Soil microbes can be triggered to produce additional EPS when provided with the right mix of carbon-based food.

The benefits of root exudates and microbial EPS for improving soil water extraction during drought stress are well recognized.

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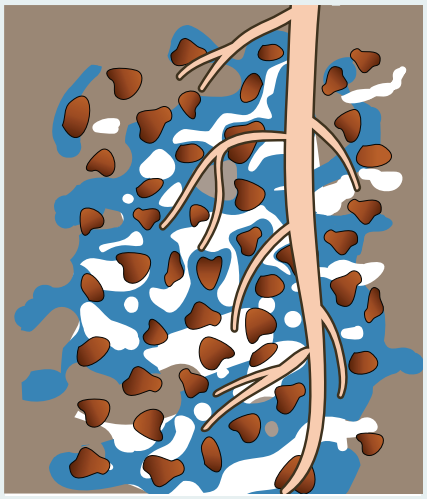
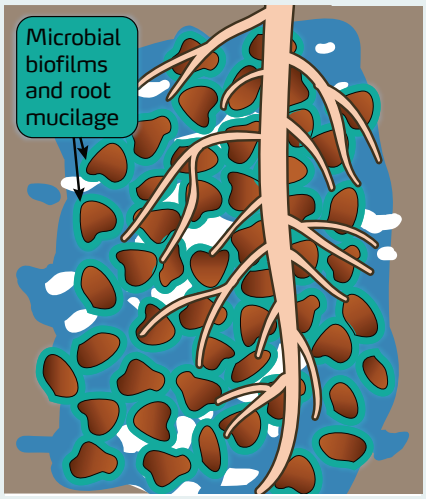
YaraLiva®
More than calcium nitrate

Traditional Soil

with PhycoTerra®





- *Better soil aggregation*
- *Greater water holding capacity*
- *Supports healthy root development*

PLANT

As more is known about stress management, the key role of calcium is often reported. Calcium serves as an internal signal for cells to produce a variety of stress-coping compounds. It also is a messenger to regulate the potassium ions that control the function of leaf stomata. Calcium plays an essential role in neutralizing the damaging reactive oxygen molecules that are produced in the plant, especially during times of water and salt stress.

Calcium uptake by the plant occurs as water is taken up at the root tips in the transpiration stream. When water uptake is restricted (such as the result of drought stress), calcium uptake is also reduced. Lower transpiration and inadequate calcium accumulation often result in a variety of calcium-related disorders in fruit. A continuous supply of soluble calcium is required near the root tip for cell expansion and further exploration of the rootzone for soil moisture.

Drought stress is something that every farmer wants to avoid. Although we cannot control the rainfall, there are several factors that can be managed to help plants get through the worst of the dry spells.