Why Growers Need INTEGRATE™ Soil Surfactant

Water movement problems in agriculture impact growers in a variety of ways. If the water does not get to its intended target, the rootzone, then the chemicals being carried in that water will not get there either. In addition, the lack of proper water movement into the soil can impact the ability for plants to thrive. Listed below are several water movement problems.

Water Movement Problems Impact on Agriculture

- Infiltration/Run Off
- Lateral Movement
- Availability of Water
- Tilth of Soil
- Uniform distribution of chemicals
- Stand Count

In order to better understand water movement problems, let's review the classification of soil water.

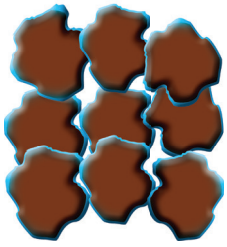
Soil Water Classifications

Hygroscopic Water -

The water that directly contacts the soil particle

- Held tightly on the surface
- Tightly bound to the soil
- NOT available for plants to use
- Important because it's required for capillary water to accumulate over it
- Finer textured soils (clay) contain more hygroscopic water than coarse (sand)

Hygroscopic Water

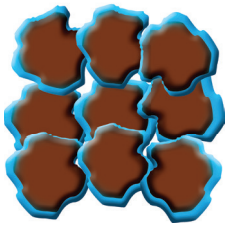


Capillary Water-

The water that is held by the soil particle

- Remains in the soil after irrigation or rain
- Provides water and dissolved nutrients to the plant
- Available for plants to use
- Evaporates easily
- Lower range of capillary water is the wilting point
- Upper range is field capacity

Capillary Water

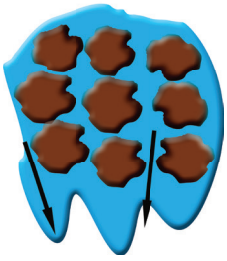


Gravitational Water -

The water that moves through soil by force of gravity

- Water in excess of field capacity
- Loosely held by soil
- Reduces aeration in the soil
- NOT Available for plants to use
- Flows more easily in coarse textured soils (sandy) due to particle size

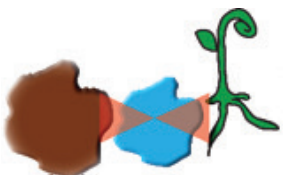
Gravitational Water



Plant roots and soil particles are in competition for applied water.

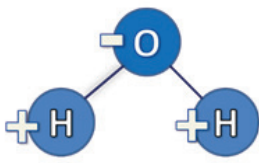
Water Potential

- Attraction of water from one place to another
- Measure in terms of pressure
- Describes the competition between roots and soil for water



Water Molecules

- Water is dipolar – it has both a positive and negative end
- Water will not bond with non-polar (no charge) molecules such as oil, wax, and the organic coating on soil particles



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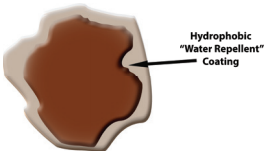
Now let's look at the soil. As we know soil texture/type greatly influences the movement of water in the soil. Water percolates better in soils with large/coarse soil particles (sandy soils) due to increased pore space, than in that of smaller size particle (clay). Finer textured soil (clay) can retain more capillary water than a larger/coarse textured soil (sandy) and also typically retain more hygroscopic (available water) than a coarse textured soil.

Soil Particle

In an ideal situation, soil particles accept water. Conditions in the soil profile are:

- Maintained between wilting point and field capacity
- Capillary water is available for plant
- Air to soil ratios are at optimum levels

Over time, soils that were previously receptive to water can become water repellent (hydrophobic). This is caused by a variety of factors.

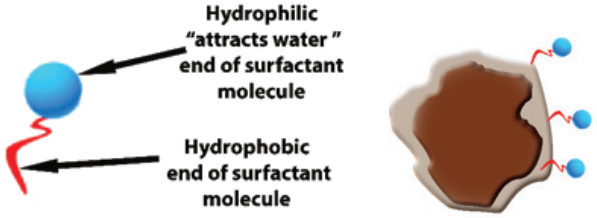


- Hydrophobic "Water Repellent" Organic Coating on Soil Particle
- Produced by plant roots, certain fungal species, surface waxes from plant leaves, and decomposing soil organic matter
- Intensified by wet/dry cycles
- Coating bonds strongly with soil particles forming a "non - polar" hydrophobic/water repellent surface
- Prevents water from infiltrating and adhering to soil particles

INTEGRATE™

How It Works

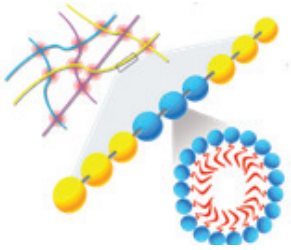
- Integrate Soil surfactant molecules are amphilic- have a polar (attracts water) and a non - polar end
- Non polar end of surfactant molecule will attach to non –polar site (organic coating)
- Provides points for hydration of the soil particle



What Makes It Unique

Three different surfactant categories linked together

- Long chain- repeating surfactant chain provides continual surfactant performance beyond just a penetrant
- Blend of surfactant produces results in a variety of soil types – not just sandy soils
- Formulation also includes Glucoethers (plant sugars) which are rapidly absorbed and assimilated by the roots, providing an immediate energy source.
- Allows water to move into the soil in a lateral and downward pattern



How it Improves Water Movement Problems in Agriculture

Infiltration /Run Off

Integrate allows water to be attracted to regions of the soil where it otherwise would not be. Increases the surface area for attraction, soil water potential is increased and water moves into the soil much faster and run off is significantly reduuced.

Lateral Movement

Similar to reasons for improved infiltration, however water moves in all directions and not just downwards.

Availability of Water

Increases available water by increasing capillary water by providing sites for hydration on previously water repellent soil particles.

Tilth of Soil

By maintaining optimum moisture levels in the soil profile at increased depths, Integrate improves the tilth of the soil and provides a better environment for plant roots to flourish.

Uniform Distribution of Chemicals

When Integrate is applied to the soil, water infiltrates and moves laterally in the soil profile. With Integrate's continued surfactant performance, subsequent soil applied chemicals reach their target- the rootzone!

Stand Count

Soil particles are now surrounded by water as Integrate has provided attachment sites on the soil. Uniform moisture is achieved throughout the soil profile providing improved conditions for seedlings to thrive.