

BioNatra

**A Review of BioNatra's Effects on Plant Water Consumption**

A White Paper

David N. Sasseville, PhD  
Lincoln University

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Real world experiences have shown that the addition of BioNatra as part of a comprehensive plant/turf fertilization program may reduce water consumption by as much as 30%. While the exact water reduction will be affected by many variables, this paper is designed to overview BioNatra's ability to enhance the "water use efficiency" of plants.

BioNatra provides plants with micronutrients and other natural growth promoting substances not found in traditional fertilizers. These ingredients can improve plant health and stimulate a more extensive root mass for better water and nutrient absorption. In addition, BioNatra is an all-natural biological growth stimulator that increases the natural microbial activity in the soil. This increase in microbial activity promotes the release of nutrients and also accelerates the breakdown and conversion of organic matter (i.e. the decomposition of plant, animal and microbial residues) into usable plant food - the most natural source of nutrients for plants. BioNatra is able to increase water efficiency in the plant in the following ways:

✓ **Increase in root mass; improving water uptake and absorption.**

BioNatra increases the availability of phosphorus and other essential plant nutrients in the soil. Phosphorus is important in root growth. With increased root growth, there is a larger root surface with which to take up water. Thus, water uptake is more efficient by the plant. Also, with a more extensive root system, the roots occupy a larger volume of soil, which in turn, increases the volume of water available to the plants.

✓ **Better water regulation and retention within the plant.**

BioNatra influences other essential plant nutrients making them more available to plants. For example, BioNatra increases potassium levels in the plant. Potassium regulates water uptake by controlling transpiration through the leaves. Potassium also helps to move nutrients into and within the plant. Other plant nutrients, such as calcium, influence the thickness of cell walls and also the thickness of the cutin layer on leaves, stems and fruits. The cutin layer is the waxy surface on plants that reduces water loss.

✓ **Improved porosity, friability and drainage in the soil.**

BioNatra increases the porosity of many soils and makes the soil looser. Roots have difficulty penetrating heavy clay soils. BioNatra increases the friability (looseness) of soils and allows roots to be grow longer and deeper, and they will tend to be more branched. This increased root growth increases the surface area of the roots and the volume of soil and amount of water available to the plant. Another aspect of increasing friability is that with increased pore space, the water holding capacity of the soil also increases. Thus, there is more water available to the roots in a given volume of soil. As the soil becomes more porous, water drains from the soil more easily. While this would appear to have a negative effect on water conservation for lawns and gardens, it does not. Plant roots require oxygen to grow and thrive. They require oxygen to be able to take up plant nutrients AND water. If

the soil around the roots is too wet (a condition called "wet feet"), the plants do not have enough energy (from respiration) to take up water. That is why over watering can cause a plant to wilt! Poorly drained clay soils tend to become wet and stay wet, making it difficult for plants to take up water. What is needed is a balance between water and air in soil pores. BioNatra, by increasing friability, porosity, and good drainage increases the water efficiency of plants and contributes to water conservation.

✓ **Reduction in sodium levels; increasing water retention and absorption.**

Another issue related to water conservation involves water quality. Research findings have validated that BioNatra reduces sodium levels in soils and in plants. Additional research has shown that BioNatra reduces the SAR (sodium absorption ratio) of water. This is important in the arid or coastal parts of the country where water high in salts is used to water lawns and gardens. High salt concentrations in the soil reduce the ability of plants to take up water. Reducing sodium levels in the soil will help plants better to utilize available water, and may even allow the plants to tolerate water that is higher in sodium levels. More research is needed on this interesting aspect of BioNatra, but the use of BioNatra in this way is very promising.

In summary, BioNatra is designed to promote plant growth and improve soil conditions. Water use efficiency and water conservation are only side benefits of the use of this product.