1989

Tests with a Product Having Alleged Value for Increasing Plant Available Water in Soil

Gale Dunn
University of Kentucky

Click here to let us know how access to this document benefits you.

Follow this and additional works at: https://uknowledge.uky.edu/pss_views

Part of the Soil Science Commons

Repository Citation
https://uknowledge.uky.edu/pss_views/27

This Report is brought to you for free and open access by the Plant and Soil Sciences at UKnowledge. It has been accepted for inclusion in Soil Science News and Views by an authorized administrator of UKnowledge. For more information, please contact UKnowledge@lsv.uky.edu.
TESTS WITH A PRODUCT HAVING ALLEGED VALUE FOR INCREASING PLANT AVAILABLE WATER IN SOIL

Gale Dunn

Background

Currently, there are a number of products being marketed for agricultural and horticultural use that have tremendous water absorbing properties. Some of these products are polyacrylamides which are synthetic compounds with chemical and physical properties which allow them to absorb large amounts of water relative to their dry weights. The implied advantage for use of such materials is that they can absorb more water than the soil itself, and acting like a sponge, hold more plant available water in the root zone.

One such product, "Water Grabber" \(^1\) was tested for certain physical properties relating to its water absorption capacity. It is commonly available in small packages designed primarily for use in potted plants and is similar to the polyacrylamides available in bulk for use in production agriculture. The product tested was purchased off the shelf of a retail garden supply store. It was tested alone and in soil columns to determine water holding and release properties, rate of water absorption, and the effects of water application rates and water quality on water absorbing potential of the material.

Amount of Water Absorbed by the Material

The manufacturer indicated on the product package that the material could absorb 500 times its weight in water. Although the material did absorb great quantities of water relative to its dry weight, the maximum amount of pure distilled water absorbed in this experiment just exceeded 350 times its dry weight. It took six hours of soaking to reach this maximum water content. Even though the material did not absorb as much water as the manufacturer claimed, the amount was still significant. However, this was accomplished in water which contained no salts. In contrast, soil water will always contain some dissolved salts. In order to determine if dissolved salts would affect water absorption, the material was soaked in salt solutions of varying

---

\(^1\) Testing of the product, "Water Grabber", does not imply endorsement or criticism by the U.K. Agr. Exp. Sta., or of similar products not mentioned.
concentrations. This significantly reduced the amount of water absorbed. In tests with a 0.2 M KCl salt solution the material absorbed only about 10% of its maximum potential. This is notable since use of such a product either in the field or in potting mixtures would put it in contact with salt-containing water. When the material was soaked in a solution of 0.01 molar CaCl₂, which is considered to be similar in salt content to an average soil solution, the material absorbed less than 10% of its maximum potential. In another experiment the material was added to columns of soil and enough distilled water was added to wet the soil to field capacity. Three water application rates were tested, two slow rates and one rapid rate. The material absorbed the most water with the rapid rate of application which was equivalent to a heavy rainfall. Even at this rapid rate the material only absorbed about 20% of its potential. The distilled water used in all of these experiments is lower in dissolved salts than either rain or irrigation water, which explains why the material in the soil columns absorbed more than in the 0.01 M CaCl₂. These two experiments indicate that the material is unlikely to absorb water to its maximum water holding potential when placed in soil or in any potting medium containing soluble salts, even when the salts are at low concentrations or the water is applied rapidly.

Effect of the Material on Soil Water Content
An experiment was conducted to determine if the material would actually increase available water content of soil. The material was soaked in distilled water until fully hydrated and then placed in air-dry soil. It subsequently released much of its absorbed water to the soil. However, this characteristic has little significance since its practical effect on soil moisture would be slight. If the dry material was applied to soil in a seed or root zone at a rate of 10 pounds per acre, it would hold only 5000 pounds of water per acre even if it absorbed to the manufacturer's claim of 500 times its dry weight. Although this may appear to be a great deal of water, an actively growing crop can be expected to use about 40,000 pounds of water per acre per day. The 5000 pounds of water held by the material at the 10 pounds per acre rate would account for only 12.5% of the crop's daily water use and this water could conceivably be used up in less than one day. Since an acre of soil six inches deep could hold approximately 400,000 pounds of plant available water, the contribution of such a material would be less than 1% of the total when applied at 10 pounds per acre. In order for the material to hold as much plant available water as six inches of a Maury silt loam soil the application rate would have to be 800 pounds per acre, which at the current retail shelf price is not economically feasible.

Summary
Based on the experiment conducted, the material does not absorb as much water as claimed even when soaked in distilled water. When the material was added to a soil column and adequate water was applied to wet the whole soil column to field capacity the material only absorbed to 20% of its capacity. Also, when the material was soaked in water containing dissolved salts similar to that found in soil, the amount of water absorbed was reduced by about 90%. It seems apparent then, that at the 10 pounds per acre rate tested, the material will not contribute significantly to a crop's water needs and therefore is unlikely to eliminate or lessen the consequences of drought.

Kenneth L. Wells
Extension Soils Specialist