Commercial Produced Superabsorbent Material Increases Water-Holding Capacity of Soil Medium

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Four levels of a commercially available superabsorbent material (Terr-sorb, a starch-based polymer) were applied to a soil medium used in container seedling production. The superabsorbent treatments were very effective in increasing the water-holding capacity, which was directly related to the rate of application of the superabsorbent material. After watering was stopped, tomato (Lycopersicon esculentum var. pelican) seedlings in control medium (no superabsorbent) died rapidly, but seedlings planted in media with the superabsorbent remained viable for a longer period of time, which varied with the concentration of superabsorbent in the medium. Tree Planters' Notes 38(1):24-25; 1987.

The use of containers for growing plants has become commonplace in forest and horticultural industries. All types of plants, from trees to squash, are grown for the commercial market in container of various sizes, shapes, and materials *(2).* Plants are grown in media ranging from pine bark to commercially available materials. Regardless of the container and the medium used, the basic requirement for successful production of plants in container is water. Design of containers has helped reduce the problem of too much water of waterlogging, a common problem with some of the earlier container designs. *(1)*

However, the problem of maintaining adequate moisture in containers has been solved primarily by overwatering and allowing excess water to drain through the soil medium. This procedure is inefficient and leads to a greater likelihood of nutrients leaching out of the growth medium if liquid fertilizer is used.

In the past few years, a group of commercial products, known as "superabsorbents," have been advertised as having large water-holding capacities. These products are claimed to greatly increase water retention in an available from for plants without causing the problems associated with excess water. These claims by the producers of the materials are impressive, but little information that validates the perfomance of the materials has been published. We conducted the following experiment to determine if the use of a superabsorbent material (a starch-based polymer) can increase the water-holding capacity of a growth medium and increase the availability of the water to plants growing in the medium.

Materials and Methods

A growth medium consisting of peat moss, vermiculite, and perlite (1:1:1) was mixed thoroughly and divided into four portions. Superabsorbent (Terr-sorb, a starch-base polmer) was added to the portion sat the following rates: control, 0; low level, 1 pound per cubic yard; high level (recommended by the manufacturer), 2 pounds per cubic yard; double-high level, 4 pounds per cubic yard. The media were then each thoroughly mixed and put into planting containers that measures 3¼ by 3¼ by 3 inches and were lined with polyethylene. A total of 70 containers were filled for each medium.

Field capacity was determined for each growth medium, and the appropriate amount of water to bring the medium to field capacity was calculated. Seedlings of tomato (*Lycopersicon esculentum* var. *pelican*) were chosen to test the effectiveness of the media because of their rapid development and sensitivity to changes in moisture.

Plants were germinated in early May 1982 and allowed to grow 1 week to two-leaf stage in seed flats containing the same medium as the control. The water level in containers was brought to field capacity and one tomato seedling was planted in each. The containers were then placed on a greenhouse bench. The seedlings were watered three times after transplanting, bringing the soil to field capacity each time.

On May 24, 1982, the plants were watered for the last time. The seedlings were checked every day until wilting was observed. Thereafter, wilted seedlings were counted at 2-day intervals until the end of the study.

Table 1—*Number of wilted tomato seedlings grown in media with four levels of superabsorbent after watering ceased on 5/24/82*

Date	Control	Low level	High level	Double-high level
5/24/82	0	0	0	0
6/5/82	3	0	0	0
6/7/82	16	0	0	0
6/9/82	32	9	1	0
6/11/82	70	21	9	0
6/14/82	70	59	54	1
6/16/82	70	66	66	16
6/18/82	70	68	66	30

Low level = 1 lb/yd^3; high level = 2 lb/yd^3; double-high level = 4 lb/yd^3 of superabsorbent in peat moss/vermiculite/perlite (1:1:1).

Results and Discussion

The superabsorbent added to the growth media improved the available water-holding capacities. After watering was stopped, seedlings wilted after 12 days in the control medium, after 16 days in the low and high treatments, and after 22 days in the double-high treatment. Sixteen days after watering was stopped, 46 percent of the controls, 13 percent of the low, and 1 percent of the high treatment seedlings were wilted. Eighteen days after watering was stopped, 100 percent of the controls, 30 percent of the low, and 13 percent of the high treatment seedlings were wilted. No double-high seedlings were wilted. Twenty days after watering was stopped, 77 percent of the high and 1 percent of the double-high treatment seedlings were wilted.

The mortality patterns of the plants grown in the different levels of the superabsorbent were similar. After the first plants wilted, the majority of the plants would wilt within 6 days (table 1). The seedlings growing in the media with the superabsorbent lasted 4, 6, and 10 days longer than controls before wilting started. This indicated that the superabsorbent material, a starch-based polymer, was effective in retaining water, and that this water was available for the plants.

Superabsorbent materials added to growth media should alter timing and reduce the amount of water used, as well as reduce labor and the amount of fertilizer lost through leaching. The superabsorbent materials are relatively inexpensive, but only if water consumption is reduced. If superabsorbent materials are used and the schedules for water applications are not adjusted, little will be gained by the use of such materials and the cost will be higher.

Literature Cited

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