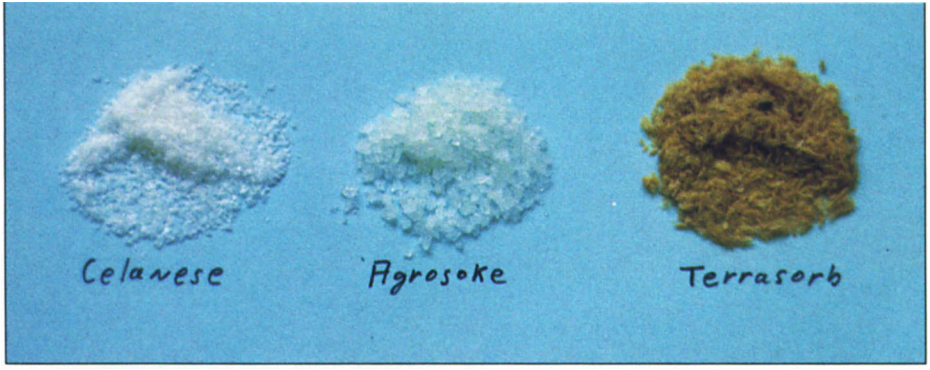


***Water-absorbing soil additives don't always reduce irrigation needs or benefit plants grown in containers***

# Hydrophilic polymers in potting soil mix

Tok Furuta ❑ Richard Autio

The use of water-absorbing compounds, hydrophilic polymers, as soil additives for container-grown plants has been discussed recently as a means of reducing water consumption and irrigation frequency. These compounds generally consist of starch or synthetic polymers that have been estimated to hold from 40 to 800 times their own weight in water.

Although hydrophilic polymers have been highly praised, especially by sales representatives, tests of their effectiveness by numerous scientists have had mixed results. Researchers have reported increased growth in some plants, no ill effects in others, and reduced vigor in others. Growth reductions, when they have occurred, have been attributed to decreased soil aeration, toxicity, or both. Results have been influenced by the frequency of irrigation, presence of free salts in the soil, and soil texture.

We conducted three experiments in 1984-86 at the University of California, Riverside, to observe the effects of hydrophilic polymers on water use and irrigation frequency in container-grown plants.

In the first experiment, we compared water absorption and retention of two commercial soil additives, Agrosoke and Terrasorb. The materials were mixed at a ratio of 1 to 100 (10 cc polymer + 1,000 cc UC #2 soil mix [75% sand, 25% peat moss]). UC #2 was used alone as a control with four replications completely randomized.

The materials were placed in 3-inch-diameter clear plastic tubes, which were closed at the bottom with a paper towel to retain the mixture. The tubes were placed in a plastic dishpan and water was added to a depth of 2.5 inches and kept at that level with regular checks. The water level was never less than 2 inches.

Water absorption was measured periodically. After soaking for 72 hours, the soil mixtures were transferred to clay pots of known weights and weighed. The pots were weighed daily to measure water loss in grams. Pots were kept in the laboratory at 72°F.

Although water absorption differed little in rate during the 72 hours, the total amount of water absorbed, as well as the remaining grams of water per day, was greater with polymer/soil mixes than with UC #2 soil mix alone. There was little difference in amount of water lost per day to evaporation.

In the second experiment, we used Celanese in a 1/100 mix (8 cc Celanese + 800 cc UC #2) planted to dianthus in clay pots. Six pots of UC #2 + Celanese and six of UC #2 alone were weighed dry, saturated, and reweighed. Dianthus plants were then placed in the pots and irrigated only when severely wilted. Fertilization consisted of Hoaglands solution applied through the irrigation system. There were six replications, completely randomized. Irrigation frequency and water use were recorded.

**TABLE 1. Effect of three polymers at two rates on irrigation frequency and water use and on zinnia plants, 1986**

| Mixture | Rate (polymer/soil) | Compared to soil: Irrigation frequency | Compared to soil: Water used | Height at planting | Height after 3 wk | Total growth | Percent growth | Leaf color* |
|---|---|---|---|---|---|---|---|---|
| Soil plus: | | % | % | cm | cm | cm | % | |
| Celanese | 1/100 | 65 | 75 | 12.04 | 16.00 | 3.96 | 33 | 3.00 |
| Celanese | 1/500 | 94 | 98 | 11.28 | 16.97 | 5.69 | 50 | 5.50 |
| Agrosoke | 1/100 | 106 | 115 | 12.32 | 20.24 | 7.92 | 64 | 7.50 |
| Agrosoke | 1/500 | 102 | 101 | 11.48 | 17.42 | 5.94 | 52 | 7.00 |
| Terrasorb | 1/100 | 98 | 104 | 13.26 | 21.79 | 8.53 | 64 | 5.50 |
| Terrasorb | 1/500 | 108 | 104 | 11.91 | 18.11 | 6.20 | 52 | 6.50 |
| Soil alone | — | 100 | 100 | 11.68 | 17.68 | 6.00 | 51 | 5.75 |

* Scale of 1 to 9: 9 = dark green, 1 = yellow.

UC #2 + Celanese absorbed almost 1.9 times as much water as UC #2 alone. UC #2 required replacement of 80 percent of the water every 5 to 6 days, while UC #2 + Celanese required replacement of 55 percent of the water every 13 to 16 days. Water use was reduced to 64 percent and irrigation frequency to 43 percent by the use of this polymer with dianthus.

The third experiment compared three polymers—Celanese, Agrosoke, and Terrasorb—mixed in UC #2 soil at rates of 1/100 (8 cc polymer + 800 cc soil) and 1/500 (1.6 cc polymer + 800 cc soil), with a control (800 cc UC #2). Treatments were replicated four times and completely randomized. For fertilization, Hoaglands solution was applied through the irrigation system. *Zinnia elegans* 'Thumbelina' was seeded to vermiculite in early July and transplanted to the pots a month later.

All pots were saturated at transplanting and observed daily for wilt. Individual pots were irrigated at wilt with a measured amount of water, and runoff was collected and measured to determine actual water retention. Irrigation frequency and water use were recorded. Plant growth was recorded for the first three weeks. Pots were kept on a bench in a greenhouse until early October, when all pots were saturated and the experiment terminated.

Celanese at the 1/100 rate noticeably reduced both water use and irrigation frequency, while the other two treatments had almost no effect on these factors (table 1). Although Celanese had had no apparent negative effects on dianthus in the second experiment, reduced growth and leaf discoloration were noticeable in zinnia with Celanese, while Agrosoke improved leaf color.

Results of these three experiments indicate that polymers may be useful in some contexts, but several uncertainties remain. The effects of the various polymers on particular plants in particular soils have not been established.

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