by Bradford C. Bearce and Rebecca W. McCollum

# A comparison of peat-lite and noncomposted hardwood-bark mixes for use in pot and bedding-plant production and the effects of a new hydrogel soil amendment on their performance

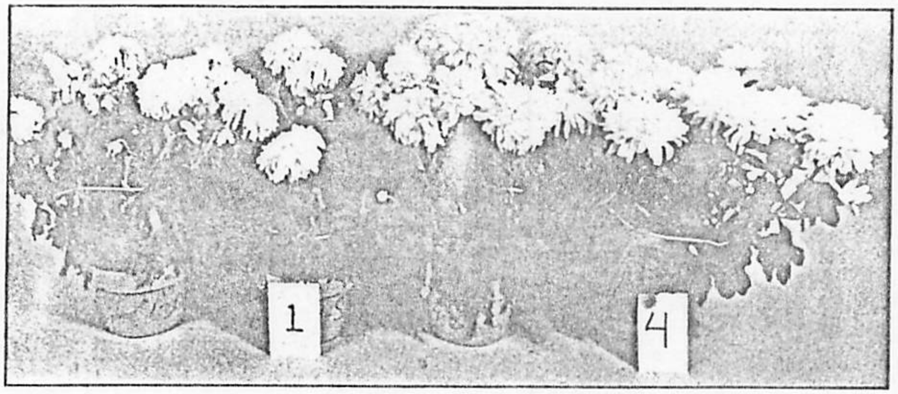


Figure 1. Bright Golden Anne mums grown in a peat-lite medium, seven days after final watering. The two pots on the left contain a peat-lite mix only, the two on the right, peat-lite plus hydrogel.

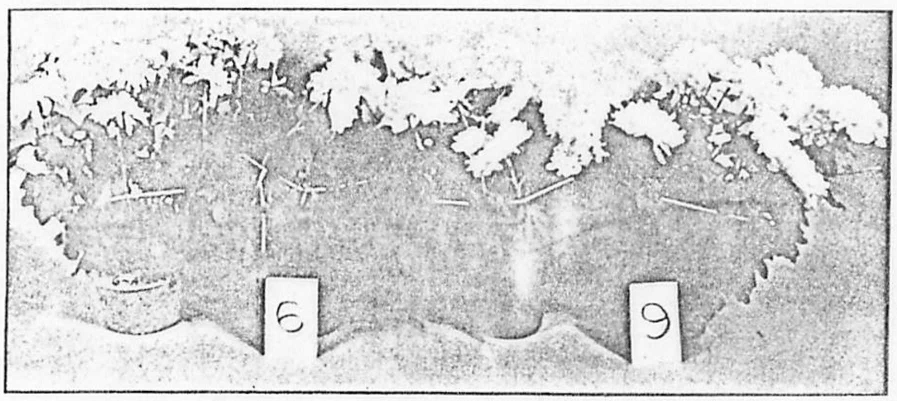


Figure 2. Bright Golden Anne mums grown in a noncomposted, hardwood-bark-mix medium, eight days after final watering. The pots on the right had hydrogel added to the mix.

| Medium | Plant height (cm) | Flowers per pot | Largest bloom (diameter) (cm) | Plant dry weight (5 plants per pot) (g) |
|---|---|---|---|---|
| Peat-lite mix | 31.19 a | 12.90 a | 8.79 a | 28.7 a |
| Peat-lite mix w/Viterra 2 hydrogel | 35.22 b | 14.00 b | 10.11 b | 35.9 b |
| Bark mix | 30.30 a | 13.90 ab | 7.62 c | 25.4 a |
| Bark mix w/Viterra 2 hydrogel | 29.41 a | 15.20 c | 9.63 b | 28.0 a |

Note: Values within each column with the same sub-letter are not significantly different by means of Duncan's Multiple Range test at the 5 percent level

Table 1. Growth response of mums in various soil mixes

THIS SERIES of growth trials had two purposes: To compare a peat-lite and a noncomposted bark mix as growing mediums and to investigate the effect of a new hydrogel soil amendment on the physical properties and performance of these mediums.

Pot chrysanthemums, tomato bedding plants and Easter lilies were grown during their individual, normal growing seasons in a University of West Virginia, Morgantown, greenhouse, using standard horticultural practices for that area. Results indicate that the hardwood bark mix performs at least as well as the peat-lite mix. The bark mix also tends to retain more practical available water than the peat-lite mix.

The new hydrogel, Viterra 2 soil amendment, markedly improves the practical available water capacity of both types of mixes. The hydrogel also improves the drainage rate of both mixes and, thereby, the aeration. These effects resulted in improved plant quality, top growth, flowering and better root development. The shelf life, or time between waterings, was significantly increased in both mixes.

PROCEDURES—Classical laboratory conditions were intentionally avoided. Procedures and conditions were quite similar to professional crop production methods; therefore, results should be comparable to those observed in actual commercial practice.

Practical available water content and shelf life were determined by this procedure: When plants had grown to salable size, all containers were thoroughly watered, allowed to drain, then weighed. No plants received additional watering. At the first sign of wilt, each container was again weighed and the days since watering noted. The difference between the weight at last watering and the weight at first sign of wilt is considered the practical available water content of the growing medium.

Dry weights of the plants were determined after each container was weighed at the first sign of wilt. The individual plant was cut at soil level, oven-dried at 80 degrees Celsius (176

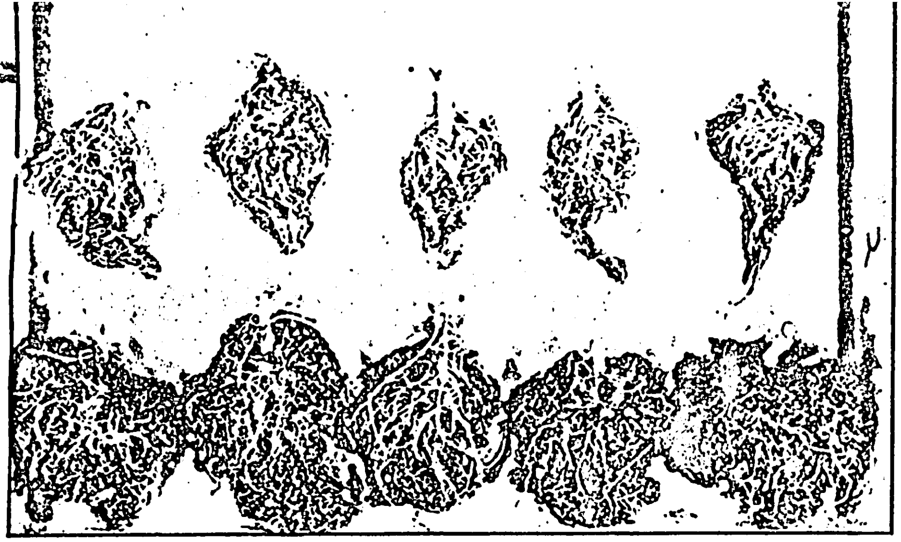

Figure 3. Roots in the top row were grown in peat-lite; the bottom row, peat-lite plus hydrogel.

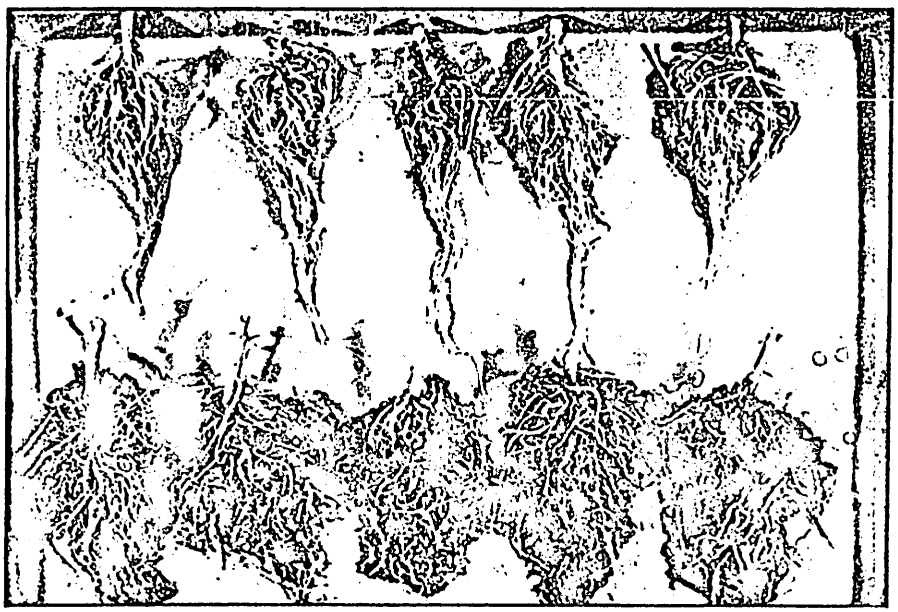

Figure 4. Mum roots grown in bark mix (top row) show greater development than those grown in peat-lite. Roots in the bottom row were grown in bark with hydrogel, which surrounds roots in photo.

degrees Fahrenheit) for 24 hours and weighed.

To test Bright Golden Anne chrysanthemums, two soil mixes were used, a peat-lite mix (Pro-Mix C) and a fresh, noncomposted, shredded-hardwood-bark mix (Hammer Milled fines, screened through ½-inch mesh). Four treatments were tested:

- Peat-lite mix with fertilizer components,
- peat-lite mix and fertilizer with .25 pound of Viterra 2 hydrogel per cubic foot (equivalent to 4.4 grams per pot),
- bark mix with fertilizer components and
- bark mix with fertilizer with .25 pound of Viterra 2 hydrogel per cubic foot (equivalent to 4.4 grams per pot).

The fertilizer mix, per bushel of medium, was 8 ounces dolomitic limestone, 1.6 ounce 20 percent Superphos, .8 ounce calcium nitrate, .3 ounce fritted trace elements, 1 teaspoon iron chelate, 10 ounces Osmocote 18-6-12 and 3.6 ounces Magamp 8-40-7.

Twenty 6-inch pots were prepared for each treatment. The same volume/weight of mix was placed in each pot. In September 1975, five rooted cuttings were transplanted into each pot. All transplants were of comparable size.

Plants were grown to salable size (flowering) using standard commercial cultural practices, including water and fertilizer as required for each treatment. When plants had bloomed, quality data were taken on all specimens (table 1).

All 80 pots were then thoroughly watered and allowed to drain for the practical available water content and shelf-life tests described earlier. Pots were placed in a well-lit room, in a random arrangement, to await the first signs of wilting. Finally, the root development of all treatments was examined and photographs taken.

RESULTS—The results from the two mixes without hydrogel show no significant difference in plant quality, as reflected in the figures in table 1. There is a significant difference of practical value when the plants grown in the Viterra 2 hydrogel-treated mixes are compared with plants grown in the untreated mixes.

If the practical available water content is considered, the two mixes without Viterra 2 hydrogel showed significantly less available water than the mixes with the hydrogel (table 2). In the peat-lite mix, Viterra 2 hydrogel resulted in 57 percent more available water; in the bark mix, 37 percent more water was available.

Table 3 contains the average rates of evapotranspiration of the four treatments during the shelf-life test. The peat-lite mix containing the Viterra 2 hydrogel lost water at a much faster rate than the controls. It is reasonable to assume that this is because the hydrogel-treated plants were larger and had more transpirational area (both leaf and petal) than the control. The differences in size make interpretation of the shelf-life test (table 4) ambigious. However, using the transpirational rate and available water data (table 2), it can be calculated that if the plants had been of equal size the Viterra 2 hydrogel treatment would have lasted for 11 days, a 57 percent increase in shelf-life.

FOR ACE EASTER LILIES, the two soil mixes used were a peat-lite mix (Pro-Mix C) and a fresh, noncomposted, shredded-hardwood-bark mix (Hammer Milled Fines, screened through ½-inch mesh). Four different treatments were tested:

- Peat-lite mix with fertilizer components,
- peat-lite mix and fertilizer with .25 pound of Viterra 2 hydrogel per cubic foot (equivalent to 4.4 grams per pot),
- bark mix with fertilizer components and
- bark mix and fertilizer with .25 pound of Viterra 2 hydrogel per cubic foot (equivalent to 4.4 grams per pot).

The fertilizer component mix, per cubic foot of medium, was 6 ounces of lime, 1 teaspoon fritted trace elements, 1 teaspoon Aqua-Gro, .5 ounce $MgSO_4$ and .2 ounce Osmocote 14-14-14.

Ten 6-inch pots were prepared for each treatment. A layer of gravel was placed in the bottom of the pots, and each pot was filled with the same volume/weight of mix. Ace Easter lily bulbs of comparable size were selected for each treatment and planted in January 1976, one bulb per pot.

Plants were grown to salable size (flowering) in the greenhouse using standard commercial cultural practices, including water and fertilizer as required for each treatment. When plants flowered, quality measurements were taken on all specimens. All 40 plants were then watered and drained for the practical available water content and shelf-life tests. While waiting for wilting to occur, pots were placed in a well-lit room in random arrangement.

| Medium | Volumetric water capacity (Cw) | Volumetric available water capacity (Caw) | Available water per pot (cc) | Percent increase in available water, hydrogel over control |
|---|---|---|---|---|
| Bark mix | 70% | 41% | 453 | — |
| Bark mix w/Viterra 2 hydrogel | 73% | 52% | 619 | 37 |
| Peat-lite mix | 67% | 39% | 436 | — |
| Peat-lite mix w/Viterra 2 hydrogel | 75% | 52% | 685 | 57 |

Table 2. Water capacity of mum soil mixes

| Medium | Water lost (grams per day) |
|---|---|
| Peat-lite mix | 72 |
| Peat-lite mix w/Viterra 2 hydrogel | 103 |
| Bark mix | 67 |
| Bark mix w/Viterra 2 hydrogel | 78 |

Table 3. Evapotranspiration—mums

| Medium | Time to wilt (days) | Percent increase, hydrogel over control |
|---|---|---|
| Peat-lite mix | 7 | — |
| Peat-lite mix w/Viterra 2 hydrogel | 8 | 14 |
| Bark mix | 8.5 | — |
| Bark mix w/Viterra 2 hydrogel | 10.5 | 24 |

Table 4. Shelf-life test—mums

| Medium | Time to wilt (days) | Percent increase | Plant fresh weight (6 plants per pack, total grams) | Plant dry weight (6 plants per pack, total grams) |
|---|---|---|---|---|
| Bark mix | 4 | — | 9.28 a | 1.38 a |
| Bark mix w/Viterra 2 hydrogel | 8 | 100 | 10.18 a | 1.18 a |

Note: Values within each column with the same sub-letter are not significantly different by means of Duncan's Multiple Range test at the 5 percent level.

Table 5. Shelf life and plant weights—tomatoes

| Medium | Plant height (cm) | Stems per pot | Buds per pot | Longest bud per pot (cm) | Dry plant weight (grams) |
|---|---|---|---|---|---|
| Peat-lite mix | 49.7 a | 1.5 a | 6.2 a | 11.8 a | 23.2 a |
| Peat-lite mix w/Viterra 2 hydrogel | 45.8 a | 2.1 b | 7.4 b | 11.7 a | 27.5 b |
| Bark mix | 56.4 a | 1.5 a | 6.0 a | 13.2 a | 21.9 a |
| Bark mix w/Viterra 2 hydrogel | 55.9 a | 2.0 b | 6.7 a | 10.8 a | 25.8 b |

Note: Values within each column with the same sub-letters are not significantly different by means of Duncan's Multiple Range test at the 5 percent level.

Table 6. Growth response of Easter lilies in various soil mixes

RESULTS—Upon examining plant quality (table 6), it was noted that the bark mix performed as well as the peat-lite mix, but the presence of the hydrogel produced larger, fuller plants (note number of stems, buds and dry weights in table 6).

Wilting data (table 7) and water-capacity data (table 8) indicate two additional conditions. The practical available water content of the bark mix is higher than the peat-lite mix, and, in the treatments with Viterra 2 hydrogel, available water was greatly increased and added 38 percent more shelf life for plants in the peat-lite mix and 21 percent to plants in the bark mix. These shelf-life results actually underestimate the ability of Viterra 2 to extend the time before wilting, because the plants grown in the mixes containing Viterra 2 were also larger than their respective controls.

BEEF MASTER TOMATOES—Two treatments were evaluated: A fresh, noncomposted bark mix (Hammer Milled Fines, screened through ½-inch mesh); the second, the same bark mix with Viterra 2 hydrogel added. The shredded-hardwood-bark mix included 8 ounces ground limestone per cubic foot, 1 ounce 20 percent Superphos, 1 ounce $KNO_3$, 1 teaspoon fritted trace elements, 4 ounces Osmocote 18-6-12, 4 ounces Magamp 7-40-6 and 1 teaspoon Aqua-Gro. The second mix contained these ingredients and .25 pound per cubic foot Viterra 2 hydrogel (equivalent to 20 grams per flat).

Ten flats, each containing 48 individual cells (AC-6/8), were used for each treatment. All flats were filled with the same weight of soil mix. The tomato seedlings were transplanted in April 1976, one plant per cell for a total of 480 plants per treatment.

Plants were greenhouse-grown to a salable size using standard commercial cultural practices, including water and fertilizer as required for each treatment. When plants had reached salable size, both treatments were thoroughly watered for the practical available water content and shelf-life tests. Then, flats were left in the greenhouse with no additional watering.

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| Medium | Time to wilt (days) | Percent increase, hydrogel over control |
|---|---|---|
| Peat-lite mix | 6.5 | — |
| Peat-lite mix w/Viterra 2 hydrogel | 9 | 38 |
| Bark mix | 7 | — |
| Bark mix w/Viterra 2 hydrogel | 8.5 | 21 |

Table 7. Shelf-life test—Easter lilies

| Medium | Volumetric water capacity (Cw) | Volumetric available water capacity (Caw) | Available water per pot (cc) | Percent increase available water, hydrogel over control |
|---|---|---|---|---|
| Peat-lite mix | 67% | 32% | 349 | — |
| Peat-lite mix w/Viterra 2 hydrogel | 73% | 37% | 445 | 28 |
| Bark mix | 66% | 35% | 390 | — |
| Bark mix w/Viterra 2 hydrogel | 73% | 43% | 516 | 32 |

Table 8. Water capacity of Easter lily soil mixes

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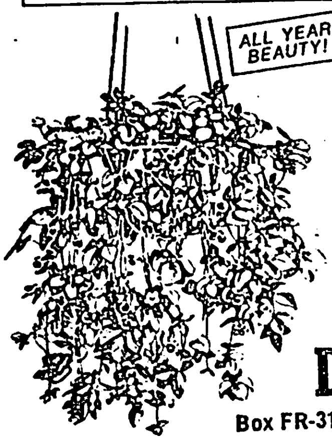


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struct the nonprofessional plant hybridizer in the basic concepts of genetics, plant structure and physiology that contribute to successful development of improved varieties. Horticulture faculty members H. T. Erickson, Jules Janick, J. A. Wott, E. C. Tigchelaar and Mike Hasegawa are workshop instructors.

The workshop session will be held from 2 to 5 pm on Thursday, 8:30 am to 9 pm Friday and 9 am to noon Saturday. Registration is $30, and preregistration is necessary. Registration deadline is November 2. For further information and to register, contact John A. Wott, extension horticulturist, Horticulture Building, Purdue University, West Lafayette IN 47909, (317) 749-2261.

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Hydrogel

(Continued from page 23)

RESULTS—The practical available water content of each medium was measured. The flats containing Viterra 2 had an average of 3,400 grams per flat vs the controls at 2,755 grams per flat. As in the other tests, when more than 50 percent of the plants in a treatment began to wilt, the treatment was considered to have reached the wilting point. Table 5 shows that the Viterra 2 hydrogel treatment lengthened the time-to-wilt by 100 percent under greenhouse conditions. Because both treatments were of statistically comparable size, the lengthening of the time the plants lasted without wilting due to Viterra 2 should be a true measure of its ability to provide extra water for the plants.

CONCLUSION—Examination of the data confirms that the noncomposted bark mix makes a growing medium at least as effective as the peat-lite mix and that the bark mix alone retains more practical available water than peat-lite mix. Moreover, with the addition of Viterra 2 hydrogel soil amendment to either growing medium, practical available water content was increased up to 57 percent, resulting in larger, fuller plants and increases in shelf life (time between waterings) of up to 100 percent. Also, improved drainage and thereby better aeration was observed with both hydrogel treatments. These factors, combined with the increased available water, account for the markedly improved root development observed.

*EDITOR'S NOTE: The authors, Bradford C. Bearce, professor of horticulture, West Virginia University, Morgantown, and Rebecca W. McCollum, department of horticulture, West Virginia University, thank the Agricultural Systems Group of Union Carbide*