STABY

Argo - 96

Component comparisons: coconut coir

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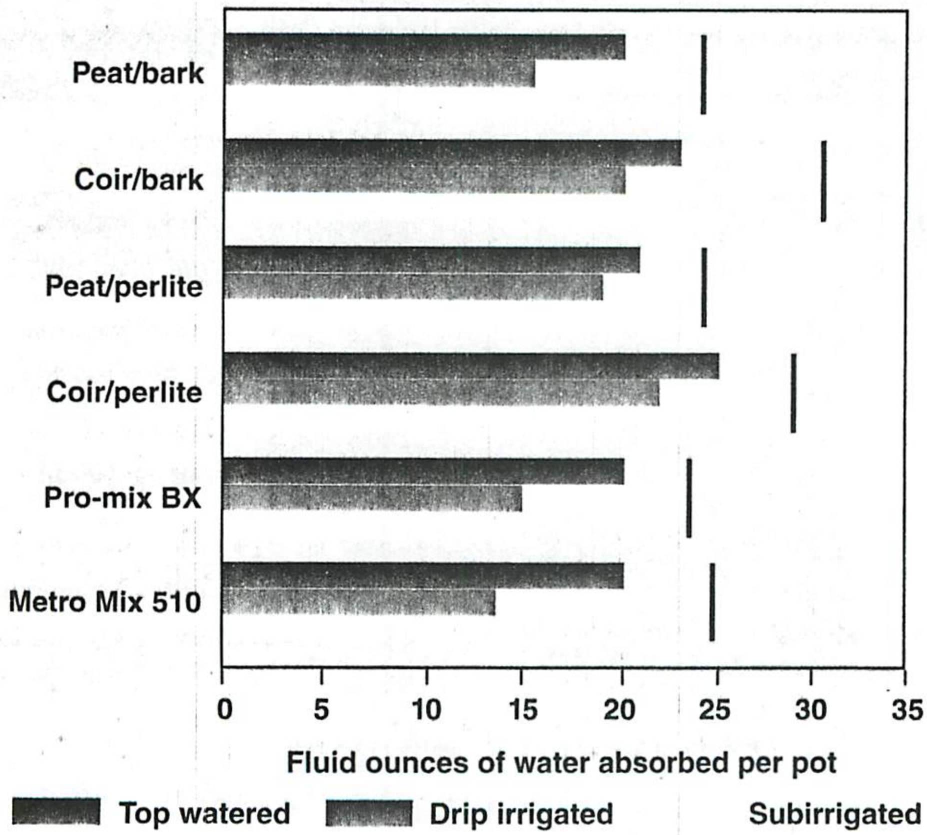
Slowly increasing in availability, coconut coir shows promise as a media component

Coconut mesocarp pith, or coir as it is more commonly known, is the short fibers and dust remaining after coarse fibers are extracted from the coconut mesocarp or husk. Coir has accumulated as a waste material for many years, resulting in large deposits at fiber processing sites. It's been considered as an addition to container root media, as it's a renewable resource and has physical properties similar to peat. In Europe, coir has been available for several years, while in the U.S. several companies have been doing research with coir since the early 80s, and the material is currently available either as compressed bricks and bales or blended with other components in commercially-prepared media.

We conducted several experiments at Michigan State University to determine the effectiveness of coir as the primary organic component in container media. For these studies, we incorporated coir into media at 70% of the total volume, with bark or perlite making up the remaining 30%. For comparison, we used Canadian sphagnum peat (Fisons Professional Grower Grade) mixed with bark or perlite in 70%/30% blends or commercial media (Pro-mix BX or Metro Mix 510). We grew impatiens for 16 weeks with either top watering, drip irrigation or subirrigation. Additional research was done with 70% coir/30% perlite media on impatiens grown under a number of different water and fertilizer regimes for 16 weeks.

Impatiens shoot growth after 16 weeks was similar for all media tested. These



Water absorption by dry media (wilted plants) with three irrigation methods. The vertical line on the right side of the graph indicates the maximum amount of water that can be absorbed by the media with one hour of total slow submersion followed by one hour of drainage in a 6-in. standard pot.

results are similar to those of other researchers who have done similar media comparisons with coir media growing both bedding plants and foliage. Root growth was also similar in plants grown in coir media compared to those grown in similar peat media or commercial media. Because of the similarity of growth, we were able to make some conclusions about the physical and chemical properties of coir when used as a component in container media.

Physical properties

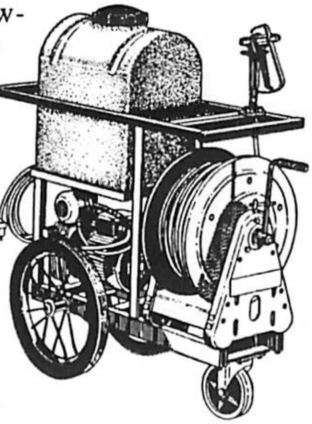
In a 6-inch standard pot, after 24-hour saturation, 70% coir/30% bark or perlite, media air space averaged 22%, and total water-holding capacity was 59%, giving a total porosity of 81% with 19% solid spaces. In comparison, the same peat/bark or perlite blends had 24% air space and 52% total water-holding capacity, giving a total porosity of 73% with 27% solid spaces. For both coir and peat media, physical property values were within established guidelines for container media and are comparable with many commercial root media.

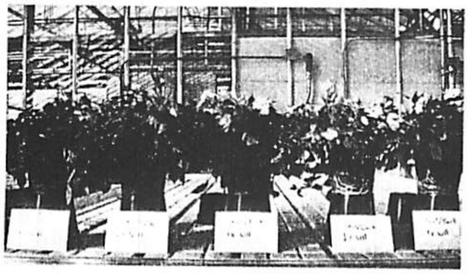
We didn't find any limitations with coir at 70% of the media volume. However, we were testing coir from only one source. It's likely that different sources have different physical properties, just like peat. If you're incorporating coir into your own media formulation for the first time, we suggest that you evaluate physical properties before planting into the media.

Available water-holding capacity and rewetting

Available water-holding capacity, the amount of water held in a root media that is available to the plant between a normal irrigation and wilt, and rewettability, the capacity of dry root media to quickly absorb water, are both important in determining how a media will perform, as media with a high available water-holding capacity doesn't guarantee rapid rewetting.

In our experiments, coir media had a greater available water-holding capacity than similar





Impatiens grown in media containing coir (Lig)/bark or peat/bark after 16 weeks.

peat-based or commercial media. In general, dry coir media (with a wilted plant) absorbed more water than other root media using three different irrigation methods. However, rewetting calculated as the percent available water-holding capacity obtained from different methods of irrigation was similar for both coir and peat media. This indicates that while the coir media could absorb more water than other media tested, it wasn't any more efficient at rewetting.

While there are advantages of higher available water-holding capacity media, claims that root media with a large available water-holding capacity (such as the coir media) will automatically reduce the amount of water and fertilizer runoff aren't justified. To reduce fertilizer runoff, you must maximize the rewetting rate and control the amount of water and fertilizer leached from root media.

Concern often cited for media with a large available water-holding capacity is that the number of water-soluble fertilizer applications to the crop will be reduced, and therefore, the water-soluble fertilizer concentration may need to be increased above that normally applied to lower available water-holding capacity media. We've found that because more water is applied with every irrigation, more water-soluble fertilizer is also applied. It isn't necessary to increase the water-soluble fertilizer concentration when using high available water-holding capacity media. However, increasing time between irrigation, missing fertilization or using clear water applications, especially early in the crop, may result in low media nutrient levels.

Media settling

We measured less settling in coir media (8%) than in similar peat-based (14%) or commercial media (15%) with both irrigation methods. Media settling (loss of media volume after planting) is important because of changes in media physical properties.

Settling can be caused by small particles moving into spaces around larger particles in the media. In general, media with less shrinkage contain components with similar particle sizes, while media with more settling contain components with a wider range of particle sizes.

Excess settling could also be caused by rapid degradation of organic components or by particles being washed from the pot. From previous research with hanging baskets, we found that the average amount of media settling from 22 different top-watered, peat-based root media ranged from 11% to 24% of the total volume of the pot after 32 weeks of growth. Most settling occurred with the first irrigation with little occurring thereafter.

Chemical properties

The pH of unamended coir is generally found to be slightly acidic (5.4 to 6.4). Media containing coir require less lime to increase the starting pH of the media to the suggested 5.5 to 6.4. In our research with lime and preplant fertilizers, we found lime to be a significant source of long-term pH, calcium and magnesium (if dolomitic lime) buffering capacity.

Alternative sources of calcium or magnesium such as gypsum or $MgSO_4$ weren't found to be persistent in the media for more than a few weeks after planting if some leaching occurs.

If coir is used as the primary organic component of the media and limited lime is incorporated, make sure you apply calcium and magnesium in the irrigation water or water-soluble fertilizer solution. In addition, you may need to use a less acidic water-soluble fertilizer to prevent the media pH from falling below the suggested 5.8 to 6.4.

Shoot-tissue analysis

Based on the analysis of shoot tissue after 16 weeks of growth, tissue nitrogen and phosphorus concentrations were similar; sodium and potassium concentrations were generally higher, and calcium and magnesium concentrations were generally lower for media containing coir when compared to peat-based or commercial media. Covering root media surfaces with an evaporation barrier exaggerated the effect of high potassium and sodium found in the coir but had no detrimental effects on plant growth. One of the reasons we included covered treatments in the experiment was because high concentrations of water soluble salts or organic compounds that may be toxic to plants and are initially contained in the media are kept in the root zone instead of moving to the root media surface (top layer of the pot). Since there wasn't a limitation in growth with covered peat/bark or coir/bark treatments, the assumption is that nothing in the coir would initially be expected to limit growth compared to peat.

Summary

Our experiments as well as others suggest that coir can be used as the primary organic component or mixed with other organic components such as peat or bark with equal success. However, unprocessed coir can have considerable physical and chemical variation, particularly in potassium, sodium and chloride content. High potassium, sodium and chloride concentrations are naturally found in coir but can also be due to fertilizer applied at the coconut plantation or brackish water used at the processing site to loosen fibers.

The coir we used in our research had an EC of 0.9 mS/cm and 65 ppm potassium, 85 ppm sodium and 250 ppm chloride measured with the saturated media extract. Concentrations much higher than these have been reported in unamended coir.

Coir in media provides adequate drainage and air space, high available water-holding capacity, rapid rewetting, minimal settling and adequate nutrient availability. If you want to use coir as a media component, do a preliminary analysis of unamended coir to find out if high salt concentrations will be a problem. In addition, make sure the supplier has good quality control and enough coir supply to meet your needs over the growing season. ❑

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