Where Did That Originate? #1
Ground Pine Bark in Container Growth Media

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I first became interested in growing plants in containers is the late 1950's. Placing productive field soil in containers worked fair at best, but only inside a greenhouse where water could be carefully monitored. Adding peat moss or other organic matter to the field soil was of little or no assistance. Adding sand was also of no benefit.

A search for answers in the library turned up the John Innes mix from the UK, introduced in 1934. One "potting compost" consisted of; "7 parts medium loam, by volume, 3.5 parts peat, by volume and 3.5 parts sand, by volume. To each cubic yard add 2 pounds of hoof and horn meal, 2 pounds superphosphate, 1 pound of sulfate of potash and 1 pound of chalk (calcium carbonate)". I used this mix in some early studies and it worked fair, but, again, only in a greenhouse.

During the 1940's and 50's, scientists at the University of California began searching for a more productive medium and one that could be used in containers out of doors. This work was summarized in Manual 23, The U.C. System for Producing Healthy Container-Grown Plants published in 1957. The primary U.C. mix consisted of 50% fine sand and 50% peat moss, plus there were pages of chemical additives described for specific crops. There was also a notation that redwood sawdust could be substituted for part of the peat. The success of this growth medium was directly related to the fact that in most areas of the near-desert west coast and desert southwest, it rains only when the irrigation is turned on, -- like being in a greenhouse. But the other practical problem was the weight, which added a great deal of shipping cost.

When I joined the faculty at the University of Florida in 1967, much of the plant production in containers throughout Florida was in a U.C. type mix. And with hand watering in greenhouses it was working fairly well. But, out of doors with the frequent rains common in Florida it was a disaster. Plant growth was poor; root rot diseases were rampant and seldom were roots found in the bottom half of the container.

Serendipity is a wonderful thing. In early 1968, I visited a number of nurseries in south Florida. It was mostly a get acquainted / find out what nurseries were doing kind of trip. At that point in time my experience with growing plants in containers consisted of lots of reading but growing only a modest number of plants while a student at Kansas State and Iowa State. But to the nurserymen I visited, I was viewed as an expert and they had lots of problems and needed answers. I tactfully tried to avoid answering the first few questions, and then quickly shifted to the correct answer ---- I don't know, but will try to find out!

One particularly frustrated and outspoken nurseryman was George Behrens. He had spent considerable dollars over a number of years trying to grow Carissa grandiflora in containers. Carissa is a beautiful evergreen, low growing shrub with dark green leaves, white flowers and edible bright red fruits the size of a plum. It is native to a few Caribbean islands where it grows in deep sand and develops a deep taproot. I had heard from field growers that they could grow the plant but it would not survive transplanting. George was convinced that the plant could be best grown in containers and that the problem was with drainage. Wooden benches had been built on which plants in containers were placed, but that did not help. The containers he was using had drain holes only in the flat bottom, so he theorized that the wood against the plastic bottom sealed off water escape. His latest try consisted of using heavy welded wire panels suspended about 20 inches above ground. Wire spacing allowed containers to be placed and held securely and nothing touched the container bottom. No improvement.

By the time I left Mr. Behrens, I had 40 Carissa plants in one gallon containers, all showing about the same level of symptoms. My plan was to divide the plants into groups and try drenching with several concentrations of the new systemic fungicide called Benlate. When I got back to Gainesville, it was nearly dark. As I unloaded plants from the old station wagon, some were placed on an empty corner of a greenhouse bench, but there was not enough room so nine plants got placed on the floor. The nine plants were apparently in someone's way so got pushed back under the bench and out of site. All plants in all greenhouses got watered by hand every day by the greenhouse crew under strict supervision of an old English gardener.

The study had six treatments: a zero fungicide control and five levels of Benlate applied as a drench and five replications. The one extra plant was about to crash and was set to one side. There were no detectable benefits from any fungicide treatment after two weeks, and after three weeks all of the plants looked worse than when they arrived. I took two plants to the disease diagnostic lab to look for pathogens. I was taking notes and photographs when I remembered that I could only account for 31 of the original 40 plants. When I located the nine plants under the bench, they were very dry, but all looked great as they had not been watered in three weeks. I moved all 40 plants to an empty greenhouse and

placed a big sign --- Do Not Water! Within a week there was a dramatic improvement in the 31 plants I had considered throwing away. Mr. Behrens was right; drainage was the problem, but drainage from within the container, not drainage around the outside.

Clearly the Carissa plants needed a more porous mix, but since they were in a mix of about 50% peat and 50% sand, what could be added to provide even better drainage? I was teaching a class called Nursery Management and Production at the time and shared what had happened with a very inquisitive group of about 20 students. I mentioned that the U.C. manual had noted that redwood sawdust could be used for at least a portion of the peat, but getting redwood sawdust to Florida was not practical. Adding ground pine bark to the mix became part of the class discussion. There were reports that pine bark was toxic due to the high levels of phenol compounds and tannic acids. But there was no supporting evidence of this problem, just speculation. One student said his dad worked for a mill near Jacksonville and he could get bark if I wanted to do a study. The pulp mill at that time burned huge quantities of pine bark to get rid of it. Arrangements were made and a pickup load was hauled to Gainesville. Coarse particles were screened out and the rest used as part of several mixes for containers. Plants in mixes with pine bark grew better than those with just peat and concrete sand and far better than those that contained sandy field soil. In addition, only those containers with pine bark had white roots all the way to the bottom. Clearly plants grew much far better with the addition of pine bark (Figure 1), but some species developed chlorosis and other signs of micronutrient deficiencies. A possible solution to one piece of the puzzle of growing plants in container had been identified, but much work with improved nutritional additives was clearly needed.

We published our findings in an Ag. Experiment Station Report in 1971 and a second report in 1972. We also shared our findings with nurserymen during an open house in 1971 and with variations in 1972. One look at the plant response and the interest by nurserymen in adding ground pine bark as part of the container growth medium skyrocketed. Over the years, pine bark would go from being burned as an unwanted byproduct to being in short supply due to the high use. Scientists and nurserymen elsewhere may have been studying using ground pine bark as part of container growth media at this same time, but these two studies were where it began in Florida.

Figure 1. Growth of Carissa grandiflora with a container growth medium of 50% peat and 50% concrete sand (left), versus a mix with 40% ground pine bark, 30% peat and 30% sand (right). Immediately upon sharing this plant response with nursery owners, pine bark went from unwanted to where can I get it!

1. Whitcomb, Carl E. 1971. Effects of Container Sidewall Porosity, Growth Media and Presence or Absence of Micronutrient Fertilizer on Root and Top growth of Carissa grandiflora, var. Boxwood Beauty.Univ. of Florida, Institute of Food and Agricultural Sciences, Research Report. Pages 23-25.

2. Whitcomb, Carl E. 1972. Effects of Watering Frequency, Growth Media and Nutritional Conditions of Stock Plants on Growth and Quality of Carissa grandiflora var. Boxwood Beauty. Univ. of Florida, Institute of Food and Agricultural Sciences, Research Report. Pages 30-31.