Evaluating Kaolin Clay as an Amendment to Container Substrates

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Nature of Work: Amending pine bark container mixes with clay has been suggested as a way to improve the water holding capacity of the mix as well as providing a method of holding nutrients that normally are rapidly leached from potting mixes. A locally mined Kaolinite clay could provide a cheap and uniform source of a clay amendment. The objective was to test kaolin clay rates in the potting substrate on variety of container plants. Test plants included those that were susceptible to nutritional deficiencies as well as fast growing plants that become pot bound therefore might benefit from increased water holding capacity late in the production year.

A local kaolin clay product was obtained from Thiele Kaolin Company. The RC32 kaolin clay is a very fine hydrous aluminum silicate. The particle size is less than 2 microns. The substrate treatments were 1) Control - standard potting mix of 9:1 Pine Bark:Sand, 2) 5% RC32 in the standard mix, 3) 10% RC32 in the standard mix and 4) 20% RC32 in the standard mix. The clay treatments were based on volume of the substrates.

Five container nursery crops were selected and are listed below:

Cupressocyparis leylandii -- Leyland Cypress
Lagerstroemia × 'Zuni' -- Zuni Crape Myrtle
Ligustrum japonicum recurvifolium -- Wavyleaf Ligustrum
Loropetalum chinense rubrum 'Ruby'-- Ruby Loropetalum
Rhododendron 'Girard Hot Shot' -- Girard Hot Shot Azalea

On April 10, 2002, plants were potted into trade gallons. Osmocote 20-4-8 at 15#/yd^3 and dolomitic lime at 4#/yd^3 were incorporated into the substrates. Twenty replicates were used for each treatment and two guard rows were placed around the each crop. Treatments were randomized within each crop. Plants were maintained under normal nursery conditions through out the trial.

On November 6, 2002 the plant tops were cut at the substrate surface, bagged and dried. The top dry weights were recorded and used to compare the treatments. Results were compared by ANOV and means were separated by the Student-Newman-Keuls test. In October 2002 the physical properties of the substrate treatments were determined by Dr. Bilderback and are discussed in the results.

Results and Discussion: The treatment results for the top dry weights for each crop are shown in Figures 1 - 4. The Ruby Loropetalum crop sustained heavy plant loss in mid too late summer. The

Girard Hot Shot Azaleas also suffered from plant loss, but not as severe. No losses occurred in the other crops. The standard nursery substrate of 9:1 Bark:Sand produced significantly more top growth than any of the clay treatments for the azalea, crape myrtle and loropetalum crops. There were no significant treatment differences for the leyland cypress and ligustrum crops. The clay amended substrates were not different from the standard nursery substrate.

The physical properties showed a decrease of total porosity as the amount of RC32 kaolin increased over the control up to 20% RC32 (Table1). The available water was low for the 5% and 10% RC32 treatments while the 20% and control were similar. The unavailable water was low for the 5% and 10% RC32, while the control was similar to the 20% treatment. The cation exchange capacity of all the RC32 treatments was greater that the control. The physical properties suggest the kaolin filled pore space as the rates increased. Kaolin did decrease available water at the 5% and 10% levels and improved the cation exchange capacity.

Significance to the Industry: RC32 Kaolin clay was not effective in improving plant growth over the control 9:1 Bark:Sand substrate. The clay treatments decreased plant growth in three crops when compared to the standard substrate. At this time, the RC32 Kaolin cannot be recommended as a component in Bark:Sand mixes.

Table 1. Physical properties of Kaolin clay amended container substrates.

*Sub-strates	Total Pore Space	Air Space	Container Capacity	Available Water	Unavailable Water	†Bulk Density	††Cation Exchange
BS 9:1	83%	35%	48%	18%	30%	0.3	5.2
KC 5%	88%	43%	45%	12%	33%	0.2	8.3
KC 10%	85%	44%	41%	12%	29%	0.2	7.2
KC 20%	83%	39%	44%	20%	24%	0.3	7.1

* Substrates: PB=Pine Bark, BS=Bark:Sand, BN=Bark:Mini Nuggets, and BC=Bark:Clay.
†Bulk Density in g/cc.
††Cation Excange Capacity in Meq/100 cm.

Figure 1. Response of Girard Hot Shot Azalea to four production substrates.

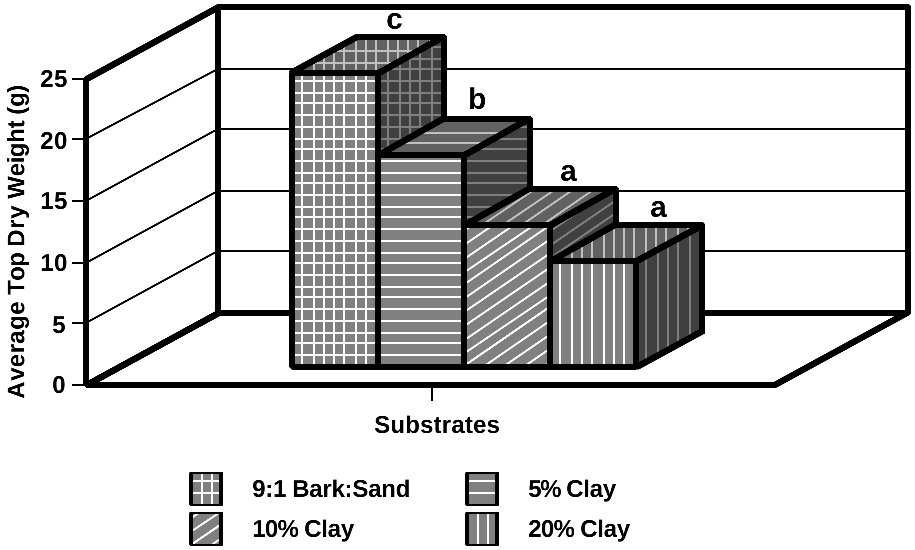

Figure 2. Response of Zuni Crape Myrtle to four production substrates.

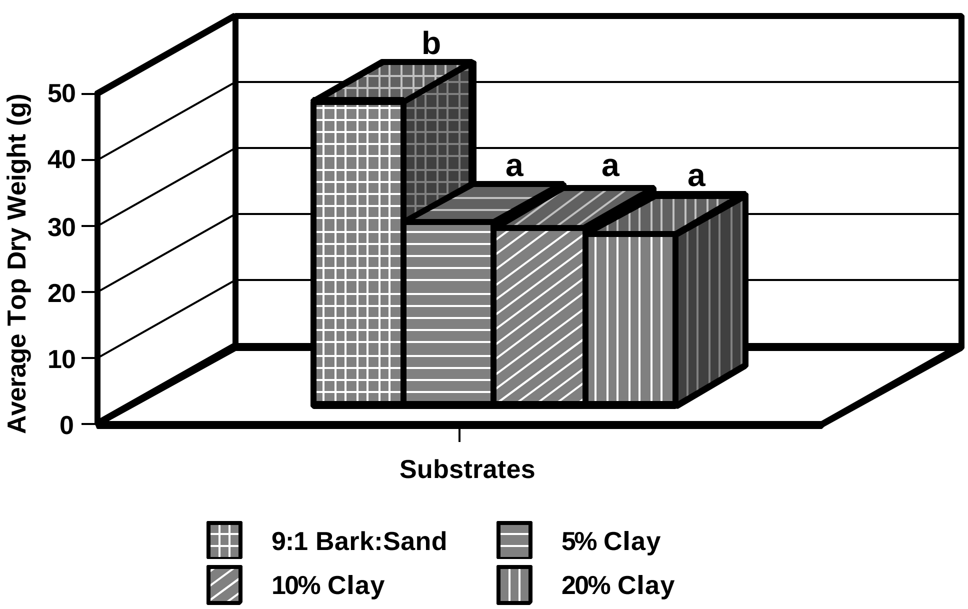

Figure 3. Response of Leyland Cypress to four production substrates

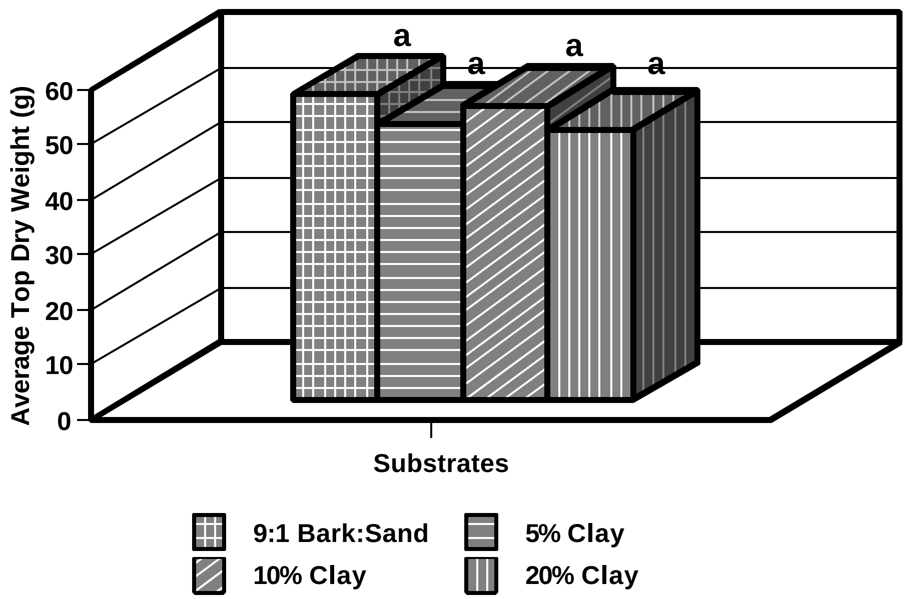

Figure 4. Response of Wavyleaf Ligustrum to four production substrate

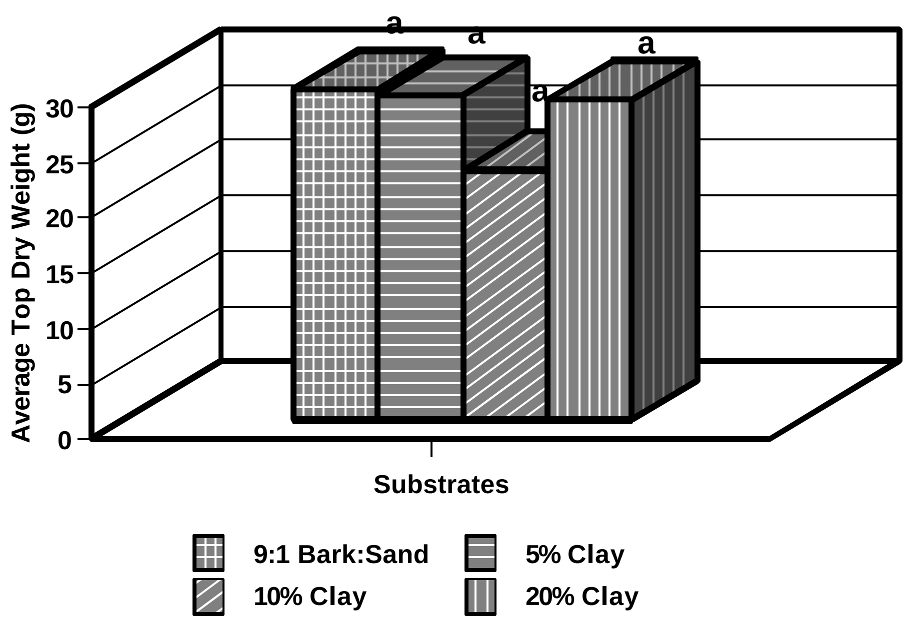

Figure 5. Response of Ruby Loropetalum to four production substrates.