

Environmental Compatible Nursery Production

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Significance to Industry: Amending bark substrates with clay significantly increases water use efficiency and decreases phosphorus leaching from containers. Best results were achieved with a small particle 24-48 sieved clay that was heat treated at 1472° F (800° C) (LVM).

Nature of Work: Three years of research focused on determining benefits of adding industrial mineral aggregate clays to pine bark nursery potting substrates. The first study, "Does Clay Save?" compared irrigation requirements and nutrient losses between a traditional pine bark:sand (8:1 by vol.; 11% sand) substrate with four industrial mineral aggregate products including two particle size distributions and two temperature treatments (1). The objective of the study was to determine if any of the industrial mineral aggregates significantly reduced irrigation requirements and/or reduced nutrient leaching from nursery containers. The four industrial clays were incorporated into pine bark at 8% by volume based upon a previous study (4). Water application to maintain a 0.2 leaching fraction, nutrient leachate losses and growth of *Cotoneaster dammeri* 'Skogholm' were compared among substrates. The second sequential study "Finding the Balance" sought to find the optimal rate of incorporation for water savings and nutrient leaching reduction benefits. In this study a 24/48 sieve range (0.25 to 0.85 mm) high temperature 1472° F (800° C) treated low volatile material (LVM) clay was incorporated into pine bark at 0,8,12,16 and 20% (by vol.). The third study "How Low Can You Go" manipulated irrigation by reducing leaching fraction to 0.1 compared to 0.2 and reducing phosphorus using Harrell's/Polyon 19-2-8 compared to 19-4-8.

Results and Discussion: *Does Clay Save?* The 24-48 small particle size & high temperature heated clay reduced water application required to maintain a 0.2 leaching fraction (20% of the volume applied) by $\geq 100,000$ gallons of water growing acre-1 season-1 resulting in 60% less phosphorus leaching from the container

Finding the Balance!- Skogholm cotoneaster growth was maximized at 11% LVM clay amendment .

How Low Can We Go? Irrigation application was reduced from 0.2 to 0.1 leaching fraction with a 15% increase (43 mL g⁻¹) in water use efficiency. Reducing the phosphate rate by 50% increased P use efficiency 64% while plant growth was increased 46%.

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