WholeTree as a Substrate for *Lantana camara*

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Significance to Industry: This study evaluated growth of *Lantana camara* in substrates composed of 100% *WholeTree* (WT), WT mixed with 25% or 50% pine bark and a standard substrate mix (6:1 pine bark:sand). Results indicate that *Lantana camara* has similar growth when produced in any of the tested substrates. This research adds to the body of evidence suggesting that substrates containing a high percentage of wood can be used for containerized nursery crop production.

Nature of Work: As forestry production in the U.S. decreases, and is moved away from tree processing at mills and toward in-field harvesting of trees, the supply of pine bark available to nursery growers has and will continue to steadily decrease. Competition for pine bark from various other industries (3) and high shipping costs are adding to the rising costs of pine bark. Thus a serious need exists to develop an alternative to pine bark substrates. Recent studies (1, 2) have identified a potential material to meet nursery grower's needs: *WholeTree* (WT). WT is composed of whole pine trees (small caliper < 6 in.) that have been chipped and further processed through a hammer mill to reduce particle sizes before being used as a growth substrate.

In a study by Fain et al. (2) three pine species were prepared as WholeTree substrates and evaluated as growth substrates for container-grown annual vinca (*Catharanthus roseus*). While shoot dry weight for plants grown in WT was 15% less than that of plants grown in pine bark, all plants had similar growth indices, root growth and macro-nutrient leaf tissue content. Results indicated that *WholeTree* substrates derived from loblolly pine, slash pine, or longleaf pine have potential as an alternative, sustainable source for producing short term horticultural crops. The objective of this study was to evaluate the potential of

whole chipped pine trees (wood, needles and bark) as a horticultural substrate for *Lantana camara*.

This study was conducted at Auburn University to evaluate freshly ground whole pine trees as an alternative substrate in container nursery crops. Whole tree substrate (WT) was tested alone and in combination with aged pine bark (PB) and peat (P). A 6:1 (v:v) PB:sand control treatment was also included. WT substrates were composed of small caliper (1 to 6 in.) *Pinus taeda* processed in a chipper (including needles), followed by further processing through a hammer mill with a 3/8 inch screen. Treatments included were 100% WT, 3:1 (v/v) WT:PB, 3:1 (v/v) WT:P, 1:1 (v/v) WT:PB, 1:1 (v/v) WT:P and 6:1 PB:sand as a control. Each substrate was amended per cubic yard with 1 lb. gypsum, 14 lb Polyon 17–6–12 and 1.5 lb. MicroMax. Trade gallon (2.8-L) containers were filled with respective substrates and planted with *Lantana camara* 'New Gold' on July 20, 2005.

Results & Discussion: Shoot dry weight (Fig. 1) and plant growth index ([height + width at widest point + perpendicular width] / 3, data not shown) data indicated that WT combined with peat had similar growth to the control while all other treatments had less growth when compared to the control. This is most likely due to greater water holding capacity provided by the peat. Root rating data showed that 1:1 WT:PB had less growth when compared to the control while all other treatments were similar to the control (Fig. 2). Substrate shrinkage was the greatest in treatments containing peat. All treatments had greater shrinkage than the control treatment (0.4-0.7 in.). No differences existed among treatments for leaf chlorophyll content at 27 days after planting (DAP) or 70 DAP (data not shown). Air space (AS) in all treatments was above the recommended level with the exception of 3:1 WT:peat and 1:1 WT:peat (Table 1). Similarly water-holding capacity (WHC) was lower in treatments with a high percentage of AS.

Plants grown in whole chipped pine trees grew as well as plants grown in a standard media when peat was a component of the substrate. Additional work is needed to determine optimal blends of substrate amendments utilizing WT to obtain similar plant growth to the control. Research looking at different particle sizes and particle size distribution of the whole tree substrate blends could result in a substrate with WHC and AS within recommended ranges. Also, additional research is needed to establish fertilizer practices to address possible N immobilization that might occur with the whole tree substrate. However, freshly ground *WholeTree* has potential as a sustainable and economical growth substrate for horticultural crops.

Literature Cited:

1. Fain, G.B. and C.H. Gilliam. 2006. Physical properties of media composed of ground whole pine trees and their effects on vinca (*Catharanthus roseus*) growth. HortScience 40:510. Abstr.

2. Fain, G.B., C.H. Gilliam, J.L. Sibley and C.R. Boyer. 2007. WholeTree substrates derived from three species of *Pinus* in production of annual vinca (*Catharanthus roseus*). HortTechnology 14:(In Press)

3. **Lu, W., J.L. Sibley, C.H. Gilliam, J.S. Bannon, and Y. Zhang. 2006. Estimation of U.S. bark generation and implications for horticultural industries. J. Environ. Hort. 24:29-34.**

Fig. 1. Shoot dry weight (g) of *Lantana camara* 'New Gold' in various substrates 92 days after planting. Values within column followed by a different letter are significant using Waller-Duncan k ratio t tests (a = 0.05, n = 6).

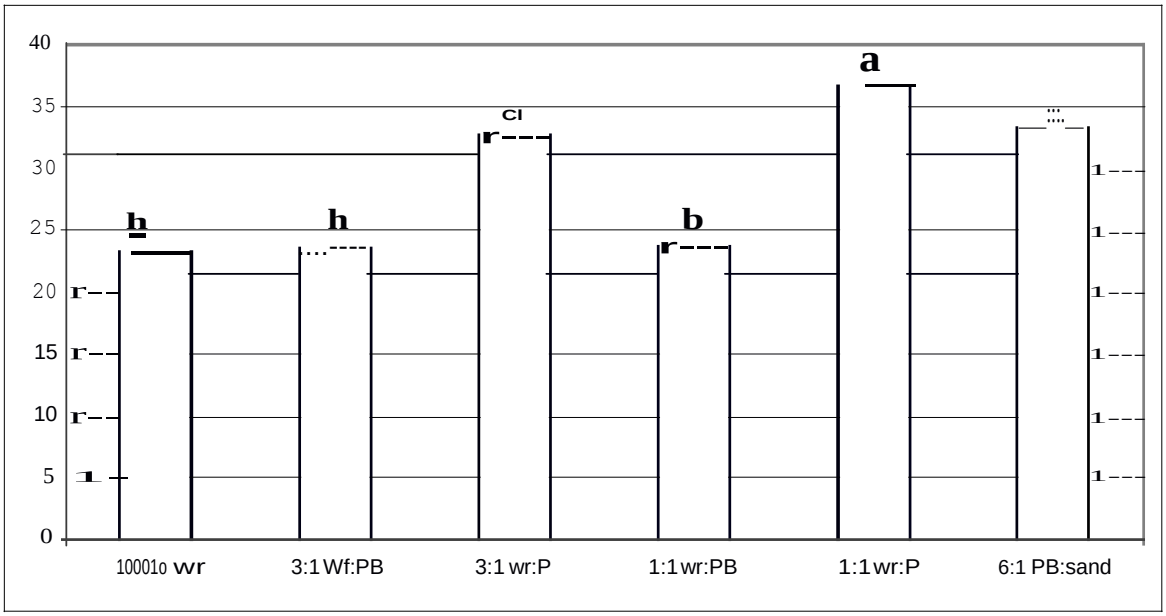

Fig. 2. Root rating (%) of *Lantana camara* 'New Gold' in various substrates 77 days after planting. Values within column followed by a different letter are significant using Waller-Duncan k ratio t tests ($\alpha = 0.05$, n = 6).

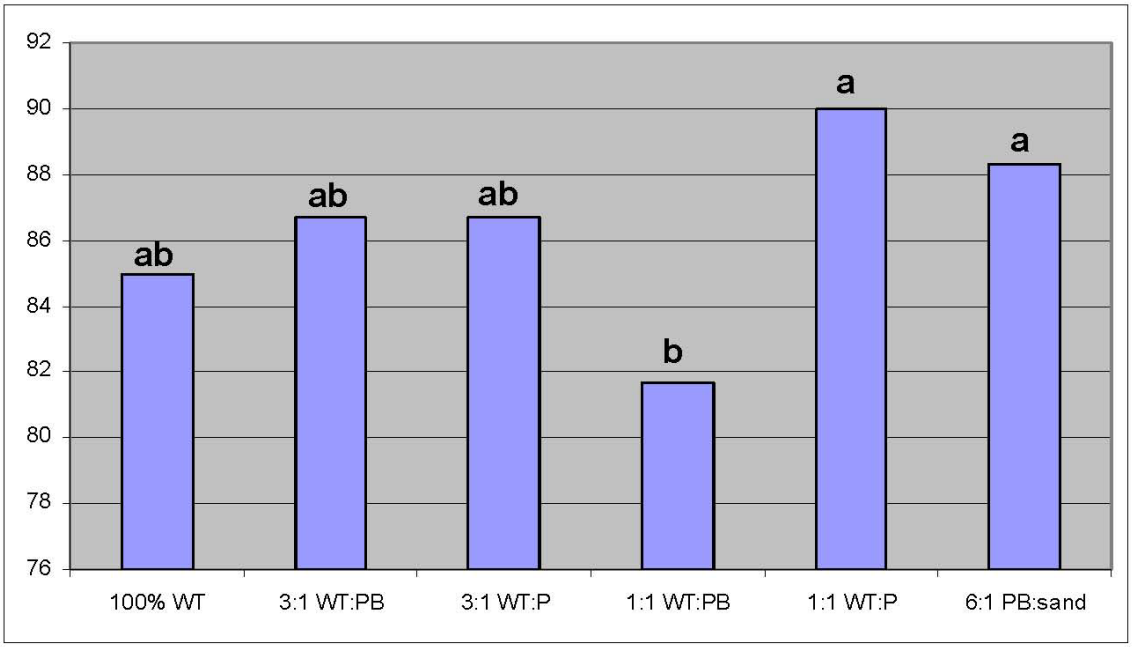

Table 1. Physical properties of horticultural substrates.

Treatments[z]	AS[y]	WHC[x]	TP[w]	BD[v]
100% WT	55.8[u] a	29.1 d	84.9 a	0.131 c
3:1 WT:PB	46.8 b	35.7 c	82.5 ab	0.143 b
3:1 WT:P	29.3 c	51.6 b	80.8 b	0.131 c
1:1 WT:PB	50.4 b	32.0 d	82.4 ab	0.146 b
1:1 WT:P	22.1 d	59.5 a	81.6 ab	0.125 c
6:1 PB:sand	33.0 c	38.1 c	71.1 c	0.347 a

[z]WT = whole chipped pine tree processed to pass a 0.95 cm screen, PB = pine bark, P = sphagnum peat moss.

[y]Air space. Recommended range is 10-30%.

[x]Water holding capacity. Recommended range is 46-65%.

[w]Total porosity. Recommended range is 50-85%.

[v]Bulk density. Recommended range is 0.19-0.70 g/cm^3.

[u]Values within column followed by a different letter are significantly different using Waller-Duncan k ratio t-tests (α =0.05).