White Pine as a Pine Tree Substrate

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Significance to the Industry: This research demonstrates that a pine tree substrate (PTS) produced from eastern white pine (*Pinus strobus* L.) can be a suitable container substrate when amended with peat moss for the production of greenhouse and un-amended for woody nursery crops. The use of PTS manufactured from eastern white pine is thus a possible container substrate throughout the northern part of the U.S where loblolly pine will not grow.

Nature of Work: The use of a pine tree substrate (PTS) produced by grinding loblolly pine trees (*Pinus taeda* L.) for the production of a wide variety of nursery and greenhouse crops has been demonstrated (1, 2, 4, 5, 6,). One advantage of PTS is that substrates can be produced locally where pine trees are grown, however, loblolly pine is typically limited to the southeastern states. We have evaluated a number of tree species for their desirability as container substrates and have found that eastern white pine shows promise as a species for PTS, even though growth of marigold seedlings was less in eastern white pine than in loblolly pine (3). Therefore, the purpose of this work was to evaluate the growth of marigold (*Tagetes erecta* Big. 'Inca Gold'), garden mums (*Chrysanthemum x morifolium* 'Mary') and spiraea (Spiraea *x bumalda '*Anthony Waterer') in PTS produced from eastern white pine tree substrate with or without peat moss. For the marigold and mum experiment PTS was prepared by further grinding coarse white pine chips through a hammer mill fitted with a 3/16-inch screen. The PTS was then amended with either 25 % or 50% peat moss by volume. A control treatments included peatlite [PL; 80% peat moss / 20% perlite (v/v)] amended with calcium sulfate ($CaS0_4$) at 0.6 kg·m^3 (1 lb/yd^3) and dolomitic limestone at 5.3 kg·m^{-3} (9 lbs/yd^3). On 25 July, 2008, mum rooted cuttings (Yoder Brothers, Inc., Barberton, OH) were potted into round (l.25 L) plastic containers with the different substrates. Plants were glasshouse grown in Blacksburg, VA and fertilized at each watering with 300 mg·L^{-1} N from a Peters 20-10-20 (20N-4.4P-16.6K) Peat-Lite Special (The Scotts Co., Marysville, OH). On 3 September, 2008 shoots were severed at the substrate surface, oven dried, and weighed. On 5 August, 2008 marigold seedlings from 144 units plug trays were transplanted into 10-cm square (l L) plastic containers with the different substrates. Plants were glasshouse grown in Blacksburg, VA and fertilized at each watering as above. On 26 August, 2008 shoots were severed at the substrate surface, oven dried, and weighed.

To further explore the potential of eastern white pine as a desirable tree species for PTS spiraea was selected to evaluate the growth of woody plants produced in pine bark, loblolly pine-based PTS, and eastern white pine-based PTS. Pine tree substrates were prepared by further grinding coarse chips of *Pinus taeda* and *Pinus strobus* through a hammer mill fitted with a 1/4-inch screen. The PTS was then amended with calcium sulfate ($CaS0_4$) at 0.6 $kg \cdot m^3$ (1 lb/yd^3). A control treatment of pine bark was included; it was amended with calcium sulfate ($CaS0_4$) at 0.6 $kg \cdot m^3$ (1 lb/yd^3) and dolomitic limestone at 3.5 $kg \cdot m^{-3}$ (6 lbs/yd^3). All substrates were further amended with 7 $kg \cdot m^{-3}$ (12 lbs/yd^3) Osmocote 15-9-12 (15N-3.9K-10P) Northern (The Scotts Co., Marysville, OH). On 29 August, 2008 rooted cuttings from 18 cell liner tray were transplanted into 17.3-cm round (2.8L; 1 gal) plastic containers with the different substrates. Plants were glasshouse grown in Blacksburg, VA and were watered as needed. On 20 November, 2008 the plants were measured to determine growth index value.

Results and Discussion: Shoot dry weight for both marigold and mum increased incrementally with the addition of 25 and 50% peat moss to PTS produced from eastern white pine (Table 1). Plants for both species required the incorporation of at least 50% peatmoss in PTS to equal in size to plant grown in 100% PL. Shoot growth as indicated by a growth index was the same for spirea regardless of the substrate type (Table 2). These results demonstrate the potential of producing greenhouse and woody nursery crops in northern states where eastern white pine is readily accessible. This would offer considerable cost savings compared to producing plants in peat moss and pine bark, since peat moss is considerably more expensive than PTS and the cost of shipping southern pine bark to northern states would be saved.

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Table 1: Mean dry weights (g) of two species grown in peatlite (PL), a pine tree substrates (PTS), or a PTS amended with peat moss.

Species	PL [z]	PTS [y]	PTS w/25% peat	PTS w/50% peat
Tagetes erecta 'Inca Gold'	8.0a[x]	5.5c	7.0b	8.1a
Chrysanthemum ×morifolium 'Mary'	14.5a	6.9c	10.2b	15.7a

[z]PL: [80% peat moss / 20% perlite (v/v)].
[y] PTS: Pine tree substrate produced from 15-year-old *Pinus strobus* trees harvested at ground level, delimbed, chipped, and hammer milled to pass through a 4.76-mm screen.
[x] Mean separated within row by Duncan's multiple range test, $P \leq 0.05$

Table 2: Shoot growth index of Spiraea x bumalda 'Anthony Waterer' when grown in pine bark or pine tree substrates (PTS). [y]

	Substrate		
	Pine bark	Loblolly pine PTS	Eastern white pine PTS
Growth index[z] (cm)	40a	42a	42a

[z]Shoot growth index [(height + widest width + perpendicular width)÷3]
[y]Pine tree substrates produced from 12-year-old *Pinus taeda* and 15-year-old *Pinus strobus* trees harvested at ground level, delimbed, chipped, and hammer milled to pass through a 6.35-mm screen.
[x] Mean separated within row by Duncan's multiple range test, $P \leq 0.05$