Special Research Report 524: Production Technology

Methods of Constructing a Pine Tree Substrate Potting Medium from Various Wood Particle Sizes and Organic Amendments

Robert Wright and Brian Jackson
Department of Horticulture, Virginia Tech, Blacksburg, VA 24061

Funding Industry Solutions Through Research and Education

Phone: 703/838-5211
Fax: 703/838-5212
E-mail: afe@endowment.org
Website: www.endowment.org

BACKGROUND

Research showing the successful use of pine tree substrates (PTS) produced by grinding loblolly pine trees (*Pinus taeda*) has gained considerable interest from growers and substrate manufacturers. This research has shown that a PTS can be used to produce a wide variety of nursery and greenhouse crops. Some advantages to PTS are:(1) that PTS can be produced in close proximity to growers where pine trees are available and (2) physical properties such as container capacity (CC) and air space (AS) can be easily altered to meet the needs of particular plants and container sizes by the degree of grinding of the pine wood chips in a hammermill.

However, producing a PTS with a particle size fine enough to possess adequate water holding capacity, similar to peat moss or aged pine bark (PB) may be too costly as result of expenses associated with grinding. Another approach would be to amend a larger particle PTS, ground in a hammermill fitted with a large screen, with peat moss, aged PB, or other organic or inorganic materials possessing a high percentage of fine particles to increase CC. The additions of peat moss or aged PB would also increase the cation exchange capacity (CEC) of PTS, and our research has shown that peat moss added to PTS could lower the microbial immobilization of N. In support of this approach, we have shown that adding 25% peat moss (v/v) to a PTS ground to pass through a 4.4-mm hammermill screen increased CC and growth of poinsettia and marigold. The objective of this study was to evaluate the influence of adding peat moss, and PB, to PTSs with different particle sizes on substrate physical properties and plant growth.

MATERIALS AND METHODS

Fifteen-year-old loblolly pine trees were harvested and de-limbed on 27 Feb. 2008, immediately chipped, and ground on 26 March in a hammermill fitted with different screen sizes: 4.76, 6.35, 9.54, and 15.8-mm as well as one PTS hammered without a screen (NS) in place to produce a coarser PTS. Each of the five PTSs was then amended (mixed) by volume with 25% peat moss (PTS-MP), or left un-amended for a total of 10 substrates. Additional substrates were produced by grinding (hammering) coarse pine wood chips with 25% PB (PTS-HPB) with each of the hammermill screens

mentioned above. Control treatments included PL [80% peat moss/20% perlite (v/v)] and 100% aged PB for a total of 17 substrates evaluated in this study. On 15 April, marigold seedlings from144-units plug trays were transplanted into 10-cm square (l-L) plastic containers with the 17 different substrates. Plants were fertilized at each watering with 250 mls (beaker applied) 300 $mg \cdot L^{-1}$ N from a Peters 20N-4.4P-16.6K Peat-Lite Special. On 15 May, the shoot growth index [(height + widest width + perpendicular width/3); GI] was recorded. Physical properties of each substrate were determined pre-plant.

RESULTS

For each substrate, the percent fines (<0.5 mm) increased as the hammermill screen size decreased, and with the additions of peat moss or PB. Container capacity increased as screen size decreased except for PTS-MP, where there was no change. Reflective of the substrate CC, plant dry weight increased as screen size decreased regardless of PTS amendment. Amending with peat moss, and hammering with 25% PB with 4.76-mm PTS resulted in plant dry weight equal or better than with PL and PB. The 6.35-mm PTS hammering with PB resulted in growth equal to PB but not PL. Plant dry weight for all other treatments was less than for PL and PB. However, CC for all substrates amended with peat or PB was within the acceptable range or 45 – 65% for container substrates. This indicates that with adequate irrigation, coarsely ground PTS amended with peat or PB would be acceptable substrates. Additions of peat moss and hammering with PB resulted in plants with GI equal to that of peat or PB. All plants, regardless of substrate in which they were grown, were of high quality with no deficiency symptoms.

CONCLUSIONS

The research showed that amending coarsely ground PTS with other materials (peat moss and aged pine bark) can produce a substrate with comparable physical properties (CC and AS) and plant growth as with 100% PB or PL.

IMPACT TO THE INDUSTRY

Grinding pine trees more coarsely and amending with peat or PB may result in a cost advantage in producing PTS. Our research has shown the output of a hammermill with no screen in place (PTS-NS; our coarsest PTS used above) would be about 76 kg/hp-hr compared to only 16 kg/hp-hr for a hammermill fitted with a 4.76-mm screen. Other advantages of manufacturing and utilizing the coarser PTS amended with peat or PB are: (1) coarsely ground PTS was comparable to finely ground PTS with reduced microbial activity and N immobilization, and (2) additions of peat and PB to PTS reduced substrate microbial activity and N immobilization. This should reduce the extra N required for producing plants in PTS.

For additional information contact Robert D. Wright at wrightr@vt.edu.