



- (1) Miracle Tube®,
- (2) Tree-Pro®,
- (3) Protex®,
- (4) Tubex® brown,
- (5) Mesh Guard,
- (6) Blue-X®, and
- (7) Tubex® green

## A Comparison of Seedling Growth and Light Transmission Among Tree Shelters

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**ABSTRACT:** Survival, height, and diameter growth of seedlings were evaluated for three years after planting using five types of tree shelters and seven species: green ash (*Fraxinus pennsylvanica*), northern red oak (*Quercus rubra* L.), pin oak (*Q. palustris*), American sycamore (*Platanus occidentalis*), black walnut (*Juglans nigra* L.) and flowering dogwood (*Cornus florida*), and eastern white pine (*Pinus strobus*). Differences in shelter environments were measured, including: light transmission measured as percent photosynthetic photon flux (PPF), ratio of red:far red (r:f-r) light from the red and far-red wavelengths, and air temperature inside the tubes. The differences seen in seedling survival were not significant ( $p < 0.05$ ) for the presence or type of tree tube, with an average survival of 96% for all but 2 species. For most species, seedlings grown in high light-transmitting tubes with proportional r:f-r ratio light showed superior height growth (e.g., Miracle Tube, Tree-Pro, and Protex). Diameter growth generally decreased in shelters. Sycamore showed no significant benefit from the use of tubes. The lowest diameter increments were seen using Tubex brown and Mesh Guard shelters, which had low light transmission with high r:f-r ratio and mechanical damage respectively. Light transmission in translucent tree tubes was within the ranges found in open canopy forest, but the proportion of growth-promoting far-red wavelength was generally lower. In tubes with higher light transmission, r:f-r ratio is closer to natural ranges for that light level. For tubes with lower light transmissivity, this information suggests that seedling height growth might be improved if red wavelengths were blocked more strongly.

**Key Words:** Tree shelter, light transmission, photosynthetic photon flux, red:farred ratio, air temperature, deer repellent, oak-hickory forest, seedling growth.

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