through 32 \(\mu\)m mesh) from both AM fungal treatments to control for effects of spore microbial communities (Koide and Li 1989). Transplanted seedlings were grown for 6 mo in a growth chamber at 24 °C, 50% RH, 12-h daylength, and 110 \(\mu\)E m\(^{-2}\) s\(^{-1}\) PAR. They were watered as needed and fertilized twice with half-strength Miracid (30-10-10 with micronutrients, Scotts Miracle-Gro Company, Marysville, Ohio, USA). Their positions in the growth chamber were randomized with respect to inoculum type and seed source, and re-randomized periodically during the experiment.

**Seedling measurements**

At harvest, root samples were collected from three randomly-chosen points in each root system, cleared and stained as above (except times in 10% KOH and 2% HCl were tripled, since tree roots are more difficult than grass roots to clear). Percent root colonization by AM fungi was determined by the grid intersect method (Giovannetti and Mosse 1980) using a stereomicroscope; one seedling per treatment could not be scored, due to insufficient fine roots. Total leaf area per seedling was measured using an LI-3100 area meter (LI-COR Biosciences, Lincoln, Nebraska, USA) for five seedlings chosen at random from each inoculum type. All seedlings were dried at 80 °C for 48 h and weighed. Shoot nitrogen was determined by combustion; other plant macro- and micronutrient concentrations were determined by ICP analysis (Agricultural Analytical Services Laboratory, The Pennsylvania State University, University Park, Pennsylvania, USA). Eight seedlings were examined for nutrients per treatment, since remaining uninoculated seedlings yielded too little material for analysis.
**Statistical analyses**

Effects of the tree from which seed was collected (seed mother) and AM fungal inoculum on seedling biomass, total leaf area, percent root colonization by AM fungi, shoot nutrient concentrations, and shoot nutrient contents were detected by two-factor mixed model ANOVA (SAS Institute 1994). Since no interactions between seed mother and AM fungal inoculum type were detected, only effects of AM fungal inoculum treatment are presented here. To satisfy model assumptions, dependent variables were natural log-transformed prior to analysis; for percent root colonization by AM fungi, data were arcsine-transformed. Differences between AM fungal inocula were detected by linear contrasts or partitioning of sums of squares. For dependent variables not affected by seed mother, differences were detected by single-factor ANOVA and Tukey-Kramer HSD.

**RESULTS**

Seedling biomass at harvest differed among the three inocula \( (F_{2,35} = 21.80, P < 0.0001) \). Mean biomass of seedlings inoculated with forest AM fungi was more than twice that of seedlings inoculated with pasture AM fungi and of seedlings that received no AM fungal inoculum \( (F_{1,35} = 43.16, P < 0.0001; \text{Figure 3.1a; Plate 3.1}) \). Seedlings inoculated with pasture AM fungi did not differ from uninoculated seedlings in biomass \( (F_{1,35} = 0.8184; P = 0.3718) \). Total leaf area also differed among the three inocula types \( (F_{2,12} = 9.85, P = 0.0029) \). Mean total leaf area was higher for seedlings inoculated with forest AM fungi than for seedlings inoculated with pasture AM fungi \( (\text{Figure 3.1b; Plate 3.2}) \). There was no difference in total leaf area between seedlings inoculated with pasture AM fungi and uninoculated seedlings.
Figure 3.1  a) Mean biomass and b) mean total leaf area after six months of growth were higher for *Terminalia amazonia* seedlings inoculated with forest AM fungi (F; $n_{\text{biomass}} = 17$) than for seedlings inoculated with pasture AM fungi (P; $n_{\text{biomass}} = 16$) or no AM fungi (N; $n_{\text{biomass}} = 14$). For total leaf area, $n = 5$. Means labeled with the same letter do not differ $\alpha = 0.05$. Error bars indicate 95% confidence intervals.
Plate 3.1 *Terminalia amazonia* seedlings grouped immediately prior to harvest into each of the three AM fungal inoculum treatments. Forest AM group (left) was inoculated with forest AM fungi, pasture AM group (center) was inoculated with pasture AM fungi, and control group (right) was inoculated with no AM fungi.
Plate 3.2 Representative leaves of *Terminalia amazonia* from the three inoculum types. Thin, light green leaves of seedlings inoculated with forest AM fungi (top row) were typical of those on healthy trees observed in the field (*personal observation*), while leaves of seedlings inoculated with pasture AM fungi (middle row) and leaves of controls (bottom row) were small, dark green and frequently malformed. Scale-bar in lower right-hand corner is 5 cm long.