EFFECT OF THE USE OF PLUGS AND OF ROOTING MEDIUM ON GROWTH OF PRIVET

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Abstract. This study examined the effect of four cylindrical-shaped (Multipot series) and two rectangular-shaped (Rootrainer series) plug trays filled with four different rooting media on rooting and subsequent growth of privet (*Ligustrum vulgare*) Cuttings inserted in Multipot #4 (largest capacity) yielded the poorest rooting but subsequently the largest plants. There was a reversed tendency for cuttings inserted in Ferdinand Rootrainer (smallest capacity). Peat/perlite and peat/polystyrene media (1 1 v/v) were better for rooting than sand/peat and sand/polystyrene media There was no apparent residual effect of medium on later growth.

INTRODUCTION

With increasing production of woody ornamental plants in a totally containerized system, more nurseries are starting plants in plug trays. There are many types of plug trays, each with its own advantages or disadvantages, based on design and plug characteristics, but many are not suitable for rooting nursery cuttings (1). This study evaluated various plug trays filled with different media on the rooting and post-rooting effects on privet.

MATERIALS AND METHODS

Rooting. On June 6, 1986, 10 to 12 cm cuttings of privet (*Ligustrum vulgare*) were treated with 0.1% indolebutyric acid (Seradix No. 1 talc) and inserted into six different plug types (Table 1) filled with (1:1 v/v) sand/polystyrene, sand/peat, peat/polystyrene, or peat/perlite. An open tray with a fine mesh bottom served as the control treatment. The 28 treatment combinations were arranged in a factorial randomized complete block design with four replications. Rooting occurred under outdoor lath in intermittent mist (4 to 8 sec/8 min).

Table 1. Comparative description of trays evaluated.

Tray type	Tray		Cavity				Spacing between cuttings (cm^2)
	Length (cm)	Width (cm)	Depth (cm)	Dia. (cm)	Volume (cm^3)	# per tray	
Multipot[z] #1	35.5	22 2	8.8	3.1	57	67	16
Multipot #2	35.5	22.2	12 0	3.1	65	67	16
Multipot #3	60 9	35 5	12.1	3.8	99	96	25
Multipot #4	60 9	35.5	16.7	3.8	149	96	25
Ferdinand Rootrainer[y]	35.6	21 6	10.5	2 0x2.4[w]	40	96	7 5
Sixes Rootrainer	35.6	21.6	14.0	2.0x2.7[w]	90	72	9.0
Open tray (control)	35.6	21.6	10.2[x]	—	109	70	12.5

[z] Source: Rapok Capilano Ltd., Mississauga, Ontario, Canada.
[y] Source. Spencer-Lemaire Industry Ltd., Edmonton, Alberta, Canada
[x] Depth of open tray.
[w] Rectangular-shaped cavity.

On July 3, 10 cuttings per treatment in each replication were harvested to determine percentage rooting, root number per cutting (root number) and mean length of the 3 longest roots per cutting (root length).

Growing-on in Plugs. Trays with all remaining cuttings were removed from the mist, but kept under lath, fertilized weekly with 100, 49 and 83 mg/L of N, P, and K, respectively. On July 23 and October 5, 10 cuttings per treatment for each replication were harvested. Shoots and roots were separated, washed, dried and weighed. Trays with all remaining rooted cuttings were overwintered during 1986-87 in a minimum-heated (-5 °C) polyhouse.

Growing-on in Nursery. In mid-May, 1987, five rooted cuttings (liners) per treatment for each replication were transplanted to #2 nursery pots filled with a bark medium. Liners in the open trays were removed after dividing the matted medium-root mass into plugs measuring ca. 5.0 cm long x 2.5 cm wide x 9.0 cm deep. All liners were cut back to 15 cm to encourage uniform growth and branching.

Nursery pots were spaced 45 x 45 cm in the statistical design described previously. Water was applied by drip irrigation with 200, 87, 166 mg/L of N, P, and K, respectively, supplied 2 or 3 times weekly. In mid-September, plant height and number of lateral shoots were recorded. The plant tops were removed, dried and weighed.

RESULTS AND DISCUSSION

Analysis of variance showed no significant interaction of plug tray and medium effects; therefore only results of main effects are presented.

Plug Effects. Among the six plug trays (Figure 1) percentage rooting was best (95 to 96%) in Multipot #1 and Sixes Rootrainer, lowest in Multipot #4 (79%), and intermediate in the other plugs (84 to 87%). Roots were longest in Ferdinand Rootrainer (2.1 cm) and shortest in Multipot #4 (1.2 cm) (Figure 1). Corresponding data for percentage rooting and root length in the open tray were 90% and 2.0 cm, respectively (Figure 1). A similar trend was observed for root number but data (not shown) were not statistically significant.

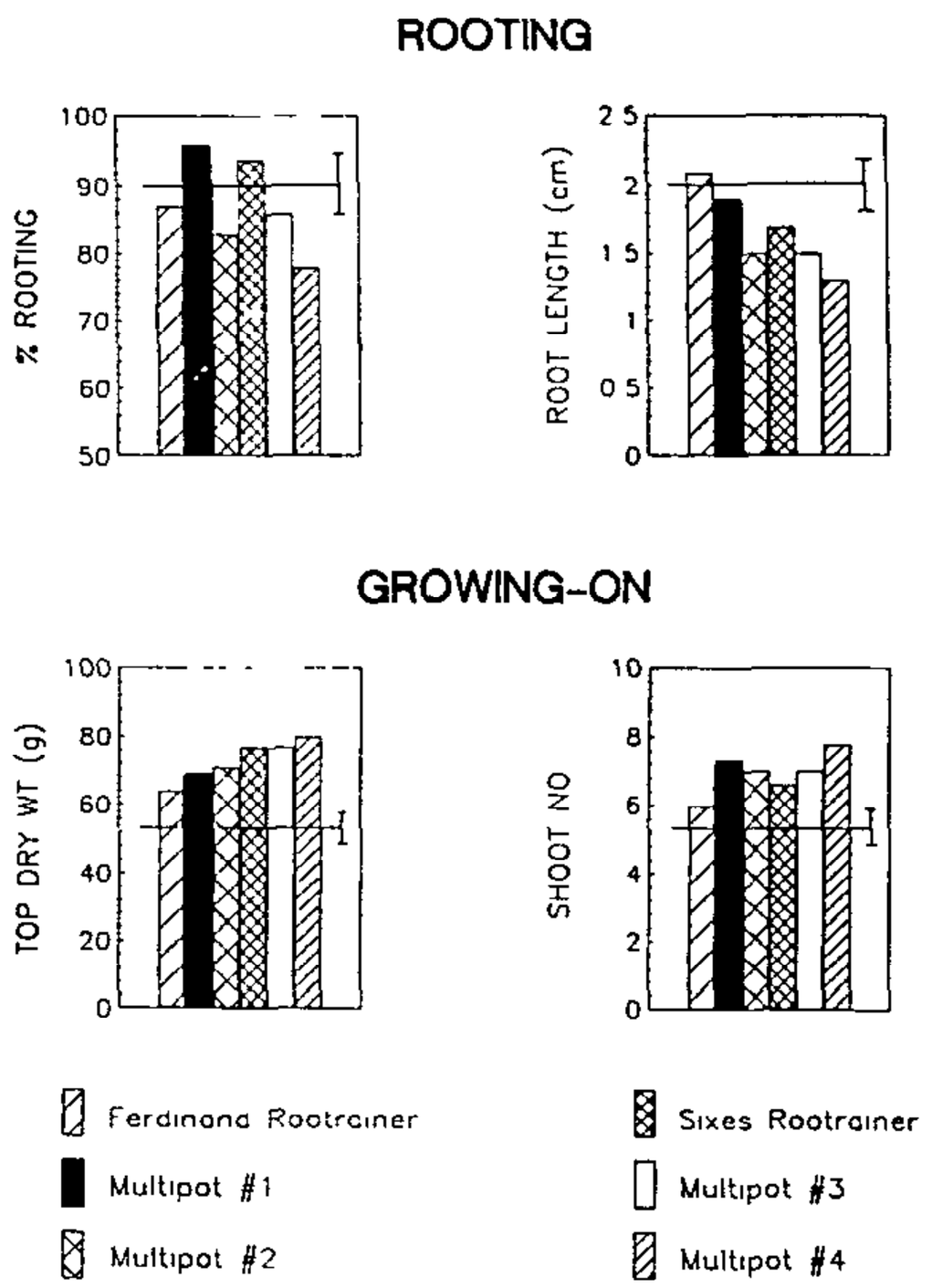

Figure 1. Rooting performance of privet cuttings in plug trays (presented in order of increasing volume, *left to right*) and subsequent growth of plants after one season in nursery pots. Horizontal lines represent data in open tray. Vertical bars represent LSD values at 5% level.

The rooting data as presented in order of increasing plug volume (Table 1) suggest an inverse relationship between rooting and plug volume Figure 1). In contrast, after one growing season in nursery pots, there was an apparent direct relationship of top dry weight

and shoot number per plant with plug volume (Figure 1). Poorest growth occurred in plants previously rooted in the Ferdinand Rootrainer and best growth in plants rooted in Multipot #4 (Figure 1). There was no effect of the plug trays on plant height.

Comparative data (not shown) collected soon after root evaluation (July 3) showed a similar trend in shoot and root dry weights. This trend was more accentuated by the end of the first growing season (Oct. 5), suggesting that plug effects are manifested quite early in the post-rooting phase while rooted cuttings are still in the plugs.

At the end of the first growing season, growth of cuttings propagated in open trays was similar in magnitude to or greater than those in plug trays. Thus, poorer growth of open tray plants in nursery pots a year later (Figure 1). was likely related to reduction in the root system during removal of rooted cuttings from the trays at transplanting and (or) to transplanting shock.

Media Effects. Percentage rooting and root length measured at the end of the rooting phase were lower in the sand/polystyrene and sand/peat media than in peat/polystyrene and peat/perlite media (Figure 2). There was no significant effect of media treatments on root number. Small or inconsistent differences in top dry weight, shoot number, and plant height at the end of the nursery growing-on phase suggest that propagating medium had no clear residual effect on later growth of privet.

Lower rooting in sand-amended media (Figure 2) may be related to physical properties such as lower porosity and oxygen supply in these media, and (or) to the high bulk density of sand (3). At the time of root evaluation, the media-root masses of sand/peat and especially sand/polystyrene were fragile and fell apart quite easily in comparison with generally intact and lighter root masses of the two peat-amended media.

The present study indicated that plugs influenced rooting performance of privet cuttings and had a residual influence on later growth. Cuttings inserted in trays with the largest plug capacity (Multipot #4) yielded the poorest rooting, but subsequently these plants had the best growth. There was a reversed tendency for cuttings inserted in the smaller capacity plugs, irrespective of the plug design.

This result may appear to be anomalous, but Threadgill, et al. (5) reported a similar occurrence in various broadleaf and evergreen nursery species. Of several media, 100% peat yielded the poorest root grades after propagation, but growth of plants in the same medium was greatest after a full growing season. This evidence indicated that the medium most suitable for propagation may not enhance post-rooting growth (5).

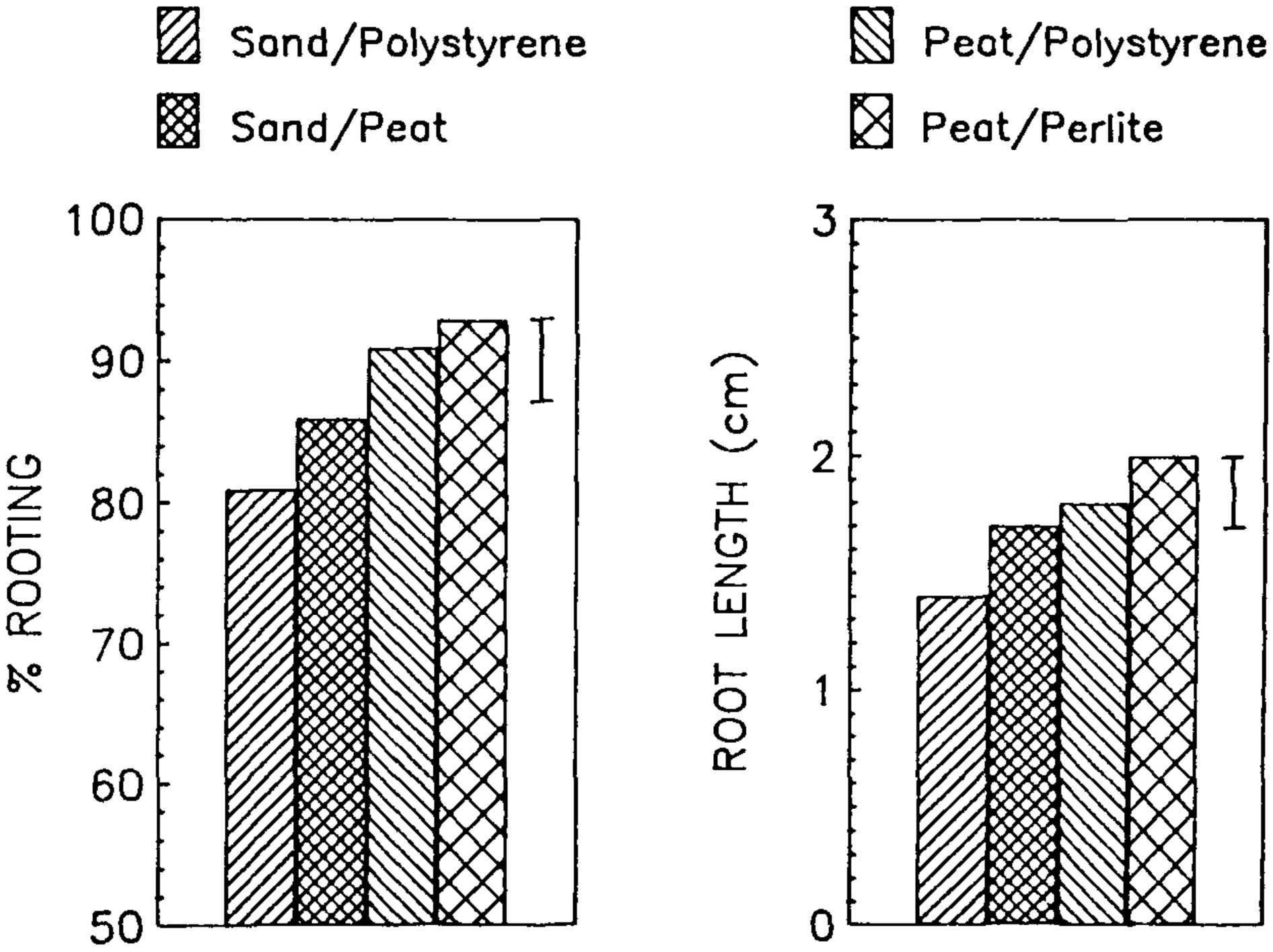

Figure 2. Rooting performance of privet cuttings in various rooting media Vertical bars represent LSD values at 5% level

Although the present study was not designed to examine plant response to individual plug tray dimensions, others have shown that dimensions of the propagating container can have a profound influence on plant responses during rooting and subsequent growth (2,3,5,7). Container dimensions also influence the interrelationship of media aeration and water relations (4).

Among various commercially available containers with different dimensions and varying degree of taper to the side, volume had a

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striking effect on the growth of woody tree seedlings, with height and stem calliper generally increasing as container volume increased (7). Small differences in container volume during propagation provided substantial subsequent increases in plant size and quality, both with depth and diameter, not just volume, influencing this response (6).

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MIKE ANDERSON: I did not see any statistics for your control.

CALVIN CHONG: In the post-rooting effects, all the plants grew better than the control. In the rooting phase the control was as good as some of the better ones that had rooted.

DOUGLAS HEVENER: How did the depth of the container affect the root system?

CALVIN CHONG: Pot size did not influence the results and small pots give as good results for field planting.