ROOT GROWTH OF CONTAINER-GROWN STOCK AFTER PLANTING 1/

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Abstract.--Describes root growth of bullet, tube and plug seedlings planted experimentally throughout British Columbia from 1967-73. Container design of bullets and tubes caused asymetric root development. Root growth of styro-plugs did not show a similar container effect.

INTRODUCTION

The morphology of root systems of planted container-grown stock has long been of interest to foresters concerned with development and application of container seedling planting techniques. Frequently, reluctance to accept this planting method as a viable alternative to bareroot planting stemmed from fears of potential constriction of roots by seedling containers. The "plug" concept, whereby seedlings are container-grown but are removed from the container prior to planting and planted free of any container restraint, has, however, found wide acceptance.

Although our observations indicate that planting seedlings free of any container restraint results in a relatively symmetrical root form, we have also noted that factors other than the presence or absence of the container after planting leave their imprint on root system development. In addition to the effects of planting method, soil and site conditions, and genetic/ecological factors, the ultimate form of the root system of planted container stock is dependent upon the initial shape and size of the root system, as determined by design and size of the container and by nursery practice.

This presentation outlines some of our preliminary observations and impressions of root development for seedlings in Walters' bullets, bullet-plugs, Ontario tubelings, bareroot stock and styro-plugs.

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INFLUENCE OF CONTAINER DESIGN

As discussed elsewhere in this symposium, the design of Walters' bullets and BC/CFS styroblocks permits air-pruning of roots. Thus, roots which have reached the drainage hole, and in the case of Walters' 4½-inch plastic bullets, the side-slit, are dried off and form what we have termed root buds. Therefore, pot-binding of seedlings raised in these containers is essentially prevented and root growth subsequent to planting is initiated from the growing points at the root buds. To date, we have found no evidence to suggest that tap-root development has been impeded as a result of air-root pruning.

The typical pattern of root development of seedlings raised and planted in Walters' bullets shows roots egressing from the side-slit(s) and the drainage hole at the base of the container (fig. 1; Tables 1 and 2). Although removal of bullet-seedlings from their containers and planting the seedlings as bullet-plugs results in more uniform distribution of roots around the entire "root plug" (fig. 2), the original imprint of the bullet container may still result in a relatively asymmetric root form, with much of the developing root system emerging from the line formerly occupied by the vertical slit of the bullet (Table 1).

Observations of root development of Ontario tubes and bareroot stock show roots of the former egressing from the container bottom and lower portion of the vertical slit (fig. 3; Tables 1 and 2), while for the latter, root growth is oriented in the direction of the planting slit (Tables 1 and 2).

Figure 1.--Root development of bullet-planted western hemlock seedling, six years after planting on Southwestern Vancouver Island at 500 feet A.S.L.

Figure 2.--Root development of bullet-plug of western hemlock, six years after planting on Southwestern Vancouver Island at 500 feet A.S.L.

Table 1.--Distribution of main roots[1/] of container and bareroot coastal Douglas-fir seedlings, five years after planting.

Quadrant	Seedling Categories				
	6-cm Bullet	11-cm Bullet	11-cm Bullet-plug	Ontario tube	2-0 Bareroot
	Main Roots (%)				
1[2/]	36	40	33	39	33
2	24	21	20	21	26
3	20	21	28	23	23
4	20	18	19	17	18
No. Seedlings Sampled	37	37	24	30	33

[1/] All roots with a diameter of 3mm or more

[2/] For container stock, the open slit was located in first quadrant while for bareroot seedlings the same quadrant coincided with the direction of the planting slit.

Table 2.--Distribution of main roots[1] of container and bareroot white spruce, lodgepole pine, and interior Douglas-fir seedlings, five years after planting.

Quadrant	Seedling Categories											
	6-cm Bullet			11-cm Bullet			Ontario tube			Bareroot[3]		
	Ws[4]	Lp	Df	Ws	Lp	Df	Ws	Lp	Df	Ws	Lp	Df
	Main Roots (%)											
1[2]	53	40	24	36	41	43	32	40	22	72	55	51
2	15	21	21	16	18	19	24	20	19	12	23	13
3	12	23	22	20	15	16	26	20	34	10	12	20
4	20	16	33	28	26	22	18	20	25	6	10	16
No. Seedlings Sampled	20	20	20	20	20	20	20	20	20	12	12	12

[1]See Table 1.
[2]See Table 1.
[3]White spruce: 2+1+1 Lodgepole Pine: 2+1 Douglas-fir: 2+1
[4]Ws - White spruce Lp - Lodgepole Pine Df - Douglas-fir

Figure 3.--Root development of white spruce in Ontario tube, three years after planting in the North Central Interior of British Columbia at 3,000 feet A.S.L.

Preliminary observations indicate that root growth of styro-plugs after planting is highly symmetrical. Two or three years after planting, the root system of styro-plugs typically shows a large mass of fibrous roots which are evenly distributed around and along the original root plug (fig. 4 and 5).

Figure 4.--Root development of styro-plug 2 of lodgepole pine, three years after planting on South Central Vancouver Island at 2,000 feet A.S.L.