Root Volume and Planting Date Effects on Cauliflower Transplant Uniformity

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INTRODUCTION

Erratic cauliflower seed germination and poor seedling emergence in the field result in poor stands and non-uniform maturity. The use of transplants can enhance stand, improve uniformity and reduce the amount of expensive hybrid seed required. Growers in the Yuma area are increasing their use of cauliflower transplants, and several growers produce their own transplants in field nurseries.

Commercially available mechanical transplanters are not selective; every module cell is planted, regardless of the quality or presence of a transplant. Skips are filled manually by field workers, but poor quality transplants are not replaced.

If growers could develop appropriate selection criteria and then use them to cull transplants prior to field setting, a nearly perfect and more uniform stand could be achieved. This would increase the opportunity for uniform maturity, facilitate less in-field harvest time and possibly lead to a once-over harvest and successful use of mechanical harvesters.

This study was undertaken to establish criteria for cauliflower transplant selection and to identify transplant production methods which enhance uniform maturity under field conditions. Subsequently we will develop a digital image system to detect transplants which do not meet the establish selection criteria.

PROCEDURES

Cauliflower (Brassica oleracea Botrytis Group) cultivars Matra and Snowball D were planted singly into Speedling (Todd) planter flats (Table 1) or a common polyethylene nursery flats (250 seeds) on Oct. 14 and Oct. 28. Seeds were placed in a 0.5 cm depression in moist 1:1 peat-vermiculite mix, covered with coarse vermiculite and watered in. The flats were watered overhead twice daily in an open lath-house. One week after emergence plants were fertilized twice weekly with soluble 20 N-20 P-20 K.

Seedlings were transplanted on Nov. 25, 4 or 6 weeks after planting, into a randomized complete block design with four replications. All plants in the Speedling modules were transplanted with the roots and media intact; however, most of the roots and media were lost when removing plants from the nursery flats. Plots were irrigated immediately after transplanting. Leaf area, fresh and dry weights of roots and tops were determined on an 8-plant subsample. Stem diameter was measured in the field four days later and three times after at weekly intervals. Plots were harvested once-over as they matured and individual head weights and diameter recorded.

RESULTS

Both cultivars responded similarly to root volume treatments with respect to dry weight and root-shoot ratio (Figure 1) and values are combined for simplicity. Dry weight decreased with decreasing cell size for both planting dates but the effect was more pronounced for the older plants (10/14 PD). The root-shoot ratio did not differ greatly for planting dates or root volumes but declined sharply for plants grown in undivided nursery flats.

Leaf area, stem diameter, head weight and head diameter decreased linearly with decreasing root volume for both PDs of Matra. The response is more curvilinear for Snowball D, with a trend for a slight increase in all parameters in response to the "bare root" (nursery flat) treatment.

Large PD differences in dry weight, root-shoot ratio, leaf area and stem diameter were not evident at maturity for either cultivar. Effects of root volume persisted Matra but not Snowball D. Uniformity was enhanced for Matra but not Snowball D by the smaller cell sizes.

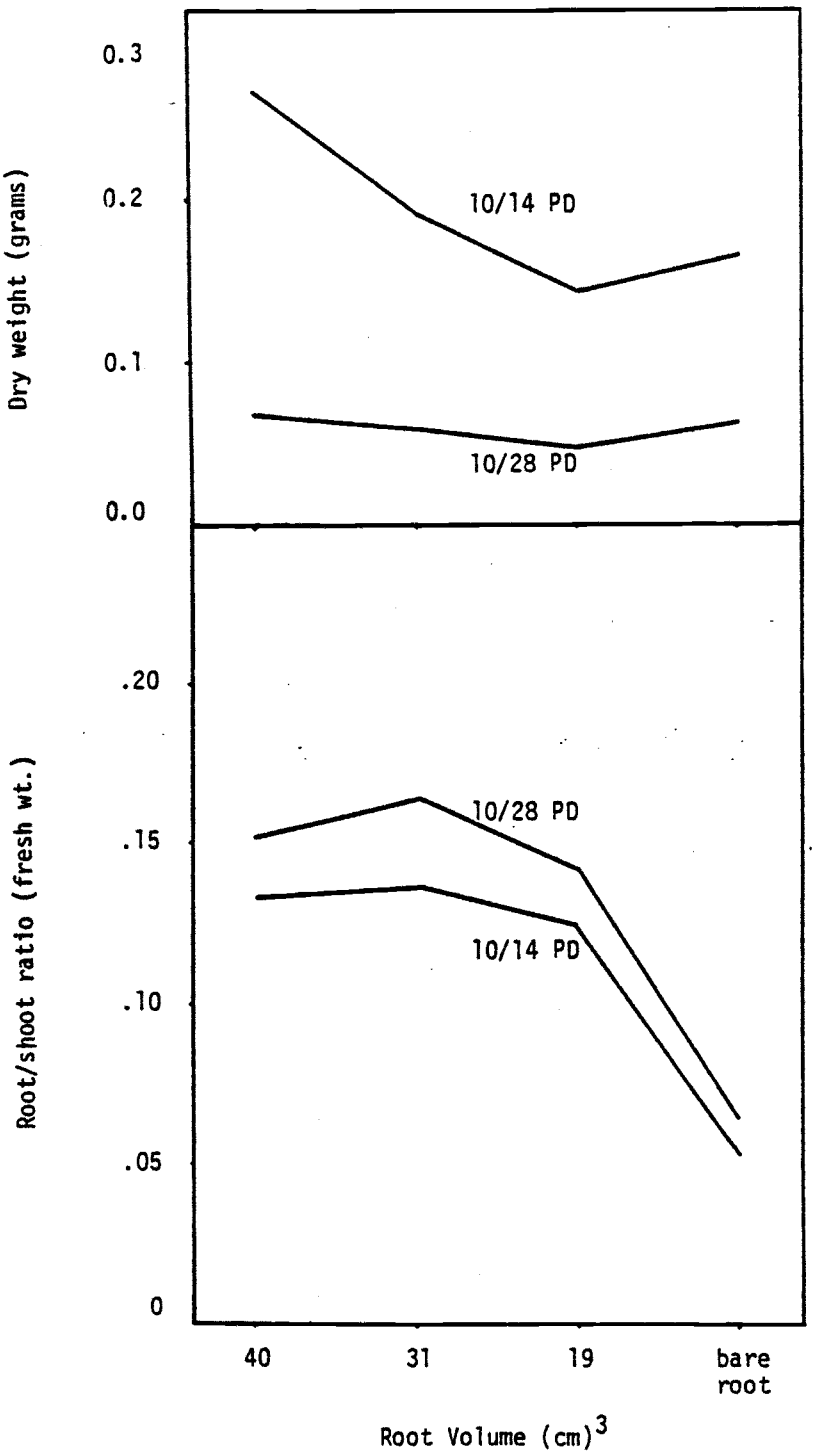

Table 1. Container Specifications

CODE NO.	TYPE	NO. CELLS	DEPTH	VOLUME
1	Speedling 175	78	7.6 cm	39.5 cm^3
2	Speedling 150	128	6.4 cm	30.7 cm^3
3	Speedling 100 A	200	7.6 cm	18.8 cm^3
4	Nursery Flat	-	6.4 cm	34.5 cm^3

Table 2. Effects of planting date (PD) and root volume on leaf area, stem diameter, head weight and head diameter of cauliflower cultivars Matra and Snowball D.

Cultivar	PD	Root Volume Code[z]	Leaf area (cm^2)	Stem diameter (mm)	Head weight (Kg)	Head diameter (mm)
Matra	10/14	1	62.9 ± 4.3[y]	3.07 ± .11	.90 ± .03	20.3 ± .2
		2	46.2 ± 1.4	2.43 ± .12	.81 ± .02	18.8 ± .4
		3	38.7 ± 0.7	2.45 ± .04	.73 ± .03	18.2 ± .3
		4	44.4 ± 1.5	2.33 ± .14	.71 ± .06	17.6 ± .6
	10/28	1	16.4 ± 0.7	2.40 ± .11	.96 ± .08	21.5 ± .8
		2	15.7 ± 0.6	2.03 ± .05	.82 ± .03	18.8 ± .2
		3	14.1 ± 0.9	1.87 ± .08	.78 ± .03	18.6 ± .5
		4	18.8 ± 1.3	2.08 ± .10	.73 ± .06	18.3 ± .8
Snowball D	10/14	1	62.1 ± 2.2	3.29 ± .19	.74 ± .09	18.3 ± 1.5
		2	48.4 ± 1.7	2.84 ± .09	.45 ± .06	14.5 ± 1.1
		3	33.6 ± 2.7	2.58 ± .05	.45 ± .07	14.8 ± 0.9
		4	45.9 ± 4.1	2.54 ± .12	.57 ± .07	15.4 ± 1.1
	10/28	1	16.8 ± 0.5	2.24 ± .19	.72 ± .05	17.9 ± 0.4
		2	15.6 ± 1.1	2.04 ± .13	.65 ± .04	16.6 ± 0.4
		3	13.1 ± 0.9	2.04 ± .16	.55 ± .04	15.9 ± 0.6
		4	19.9 ± 1.1	2.24 ± .06	.56 ± .10	16.1 ± 1.2

[z]See Table 1 and text for details

[y]± SE