Pepper Transplant Uniformity, Growth and Yield

J. McGrady, W. Coates, K. Jordan, P. Tilt

INTRODUCTION

Growers in the Yuma area have shown interest in production of bell and chile peppers (Capsicum annuum L.). Processors in other states are also interested to have a reliable, continual supply of product in their "off-season". Potential market windows for Yuma peppers are late spring and winter. To market peppers successfully at either time, it is necessary to use transplants. Soil temperatures are too cold for direct seeding in December (for spring) and too warm for direct seeding in July (for winter). In addition, peppers had been chosen as a test plant for development of digital image selection criteria because of ease of management and rapid response to environmental conditions in the seedling stage.

Our objectives in this project are:

1. To develop pepper transplant production schedules and techniques for Spring and/or Winter peppers.

2. To establish transplant selection criteria to identify tendencies for uniform maturation.

PROCEDURES

Pepper (Capsicum annuum L.) cultivars Shamrock, KRG #3 and New Mexico 6-4 were seeded in Speedling (Todd) planter flats (one per cell) or common polyethylene nursery flats (250 seeds) on July 29, Aug. 8 and Aug. 18. Seeds were placed in a 0.5 cm depression in moist 1:1 peat- vermiculite mix, covered with 0.5 cm coarse vermiculite and watered as needed until emergence. Seedlings were watered with overhead sprinklers twice daily in an open lath-house and fertilized twice weekly with soluble 20 N-20 P-20 K.

Treatments were arranged in a randomized complete block design with four replications. Seedlings were transplanted Sept. 17 into soil with 68 kg N incorporated preplant; 236 ml 9-45-15 starter fertilizer was added with each plant and plots were furrow irrigated the same day. There were 31 cm between plants and 12 plants per plot on standard 0.9 m vegetable beds.

RESULTS

There were insufficient KRG #3 plants for a complete factorial and that cultivar was dropped from the planting date experiment. Shamrock and N.M. 6-4 had larger root systems and higher dry matter content when raised in Speedling trays (Figure 1); Shamrock was more succulent in both containers. Younger transplants of Shamrock and N.M. 6-4 grown in both containers were smaller (Table 1) but grew more rapidly than older larger plants. These early treatment responses persisted and were reflected in decreased numbers of flowers and lower yields from younger transplants (Table 1). Generally, Speedling transplants outyielded "bare root" transplants from flats.

Transplants of the three pepper cultivars grown in small cell Speedling trays were taller and thinner than those from larger cell volumes (Table 2). Cell size treatment effects also persisted and were evident in more flowers and higher early yield for the large cell transplants. Total yield of both bell peppers, but not N.M. 6-4, decreased in response to smaller cell size. Yields were low in all treatments due to early fruit set and resultant small plant size, and to a freeze and low temperatures in December.

Results indicate that production of transplants in modules with small cells may be preferred to bare root nursery-grown plants. Small cell size also enhanced transplant uniformity of stem diameter, height and leaf area. Techniques are being developed for rapid quantification of these criteria through digital image processing.

Table 1. Effect of planting date (PD) and container on pepper (*Capsicum annuum L.*) cultivars Shamrock and New Mexico 6-4 height, stem diameter, flowering and yield.

Cultivar	Container	PD	Height (cm) 9/22	Height (cm) 10/20	Growth Rate	Stem D. (mm) 9/22	Stem D. (mm) 10/20	Flowers 10/8	Yield (T/A) Early	Yield (T/A) Total
Shamrock	Todd flat*	7/29	7.6	12.9	1.7	3.0	5.9	3.5	0.8	3.0
		8/8	6.3	12.6	2.0	2.8	5.9	3.5	0.7	3.1
		8/18	3.8	9.1	2.4	1.8	5.0	1.1	0.1	1.8
	Nursery flat	7/29	15.3	18.7	1.2	3.4	5.8	2.8	0.9	3.2
		8/8	11.1	14.7	1.3	3.1	5.3	2.3	0.6	2.4
		8/10	6.3	10.4	1.7	2.0	4.3	1.4	0.2	1.3
N.M. 6-4	Todd flat	7/29	8.3	21.3	2.5	3.0	6.0	4.0	0.7	2.4
		8/8	8.5	21.6	2.5	2.8	5.9	4.3	0.5	2.4
		8/18	5.7	16.9	2.9	2.0	5.0	1.3	0.6	1.8
	Nursery flat	7/29	16.5	27.0	1.6	3.4	5.7	4.6	0.3	2.1
		8/8	11.8	22.2	1.9	2.7	5.0	3.3	0.2	1.5
		8/18	7.0	17.5	2.5	2.1	4.4	1.2	0.1	1.2

Speedling (Todd) planter flat, model 150.

Table 2. Effect of Speedling (Todd) tray cell size on pepper (*Capsicum annuum L.*) cvs. Shamrock, KRG #3 and NM 6-4 height, stem diameter, flowering and yield; all treatments planted 8/8 and transplanted 9/17.

Cultivar	Cell Volume (cm^3)	Height (cm) 9/22	Height (cm) 10/20	Growth Rate	Stem Diameter (mm) 9/22	Stem Diameter (mm) 10/20	Flowers (buds/plant) 10/9	Yield (T/A) Early	Yield (T/A) Total
Shamrock	40	8.6	14.4	1.7	3.4	6.3	3.5	1.4	3.8
	31	9.5	15.2	1.6	3.2	5.8	3.2	0.6	2.6
	19	9.3	14.6	1.6	3.2	5.6	2.3	0.4	2.6
KRG #3	40	6.5	12.4	1.9	3.5	6.3	2.9	0.5	1.7
	31	6.8	12.8	1.9	3.3	5.8	2.2	0.4	1.5
	19	8.9	14.4	1.6	3.0	5.8	1.5	0.1	1.3
NM 6-4	40	9.4	25.4	2.7	3.2	6.2	5.4	1.1	2.8
	31	9.9	24.5	2.5	3.0	6.0	4.3	0.7	3.1
	19	10.5	23.8	2.3	2.9	5.7	4.0	0.6	3.0

Figure 1. Effect of planting date (PD) and container on pepper (*Capsicum annuum L.*) cultivars Sharmrock and New Mexico 6-4 root-shoot ratio and percent dry matter.