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Differential Cultivar Responses of Tomato Transplants to Ethephon[1]

C. A. Jaworski
U. S. Department of Agriculture, Science and Education Administration, Agricultural Research, Tifton, GA 31793
S. C. Phatak
University of Georgia, Coastal Plain Station, Tifton, GA 31793
A. Liptay
Agriculture Canada, Harrow, Ontario, Canada N0R 1G0

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Abstract. **Cultivars of tomato (*Lycopersicon esculentum* Mill.) responded differently when (2-chloroethyl)phosphonic acid (ethephon) was applied at 300 ppm in the transplant stage. The amount of stem root proliferation and the length of these roots were the largest on 'Ohio 7663' transplants. 'Heinz 2653', 'Libby 2981', 'Heinz 414', 'Knox' and 'Campbell 28' showed major stem root proliferation from ethephon, whereas 'Peto 80', 'Campbell 37', 'Hunt 62', and 'Hunt 208 F' had a very small amount of stem root proliferation. The average stem diameter for the 18 cultivars treated with ethephon increased from 0.50 to 0.63 cm in 21 days.**

Southern Georgia is the major source of field-grown tomato transplants for eastern and midwestern U. S. and southern Canada (2). Transplant clipping is a standard cultural practice to improve size uniformity for once-over harvest and to field-hold transplants while unfavorable soil and weather conditions prevail in northern tomato-production areas. Many tomato transplants often have flowers and/or small fruit present, even with the clipping practice. Ethephon treatment of transplants has been reported to reduce flowers and fruit set, reduce stem elongation, and increase adventitious stem roots (1, 3, 4, 5, 6). Campbell (1) reported that fruit yields were not adversely affected when 'Campbell 28' transplants were sprayed with ethephon. Taha et al. (5) reported improved transplant recovery after transplanting and generally an increase in early fruit yield, even without ethephon treatment for fruit ripening, when 'Chico III' transplants were sprayed with ethephon. Phatak et al. (3) found differences in fruit maturity response of cultivars when transplants were treated with ethephon. This paper reports cultivar differences in stem root proliferation and stem diameter when transplants were sprayed with ethephon.

Eighteen tomato cultivars were hand seeded on Dothan loamy sand on April 26, 1979 (Table 1). The seeding pattern was 4 rows 36 cm apart on a raised bed with a seeding rate of 1 seed per cm of row. Standard practices of fertilization and pest control were used.

All ethephon-treated and nontreated transplants were clipped on May 25, 27, 29, and June 1. Ethephon[2] was applied as a foliar spray with a hand sprayer on May 25, prior to the opening of the first flower buds. One outside row of each plot was sprayed with 300 ppm ethephon at 935 liters per ha.

The amount and length of stem roots and the stem diameter were measured on June 15. Stem root growth was visually rated on 5 transplants in 4 plot locations of the ethephon-treated transplants using a scale of 1 (only an occasional plant with few small roots) to 10 (massive stem roots). The average length of the stem roots was measured on a similar number of ethephon-treated transplants. Stem diameter was measured on 20 randomly selected transplants, each with and without ethephon, on the 18 cultivars.

The amount of stem root proliferation from the ethephon treatment varied with cultivars (Fig. 1 & 2, Table 1). The largest amount of stem roots

Table 1. Effect of ethephon on transplant stem root growth of tomato cultivars 21 days after treatment.

Cultivar	Stem root growth rating[z]	Maximum length of stem roots (cm)
Ohio 7663	9.3 a[y]	5.0 a
Heinz 2653	8.0 b	2.0 b-d
Libby 2981	6.0 c	2.5 bc
Heinz 414	5.8 c	2.0 b-d
Knox	5.5 cd	2.4 bc
Campbell 28	5.3 cd	1.8 cd
Pacesetter 490	4.8 de	1.8 cd
Libby 68	4.3 ef	2.0 b-d
Red Rock	4.0 e-g	2.6 b
US 28	3.8 f-h	2.1 bc
US 141	3.3 g-i	1.3 de
Heinz 1706	3.0 h-j	0.9 e
UC 134-1-2	2.5 ij	0.8 e
Purdue 73-28	2.5 ij	0.8 e
Hunt 208 F	2.3 jk	0.8 e
Hunt 62	2.3 jk	0.9 e
Campbell 37	1.5 k	0.5 e
Peto 80	1.5 k	0.5 e

[z]Based on a scale of 1 (no stem roots) to 10 (massive stem roots).
[y]Mean separation in columns by Duncan's multiple range test, 5% level.

CHECK ETHEPHON

Fig. 1. Effect of ethephon on stem root growth on 'Ohio 7663' transplants.

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[2]Ethephon was provided by Union Carbide Agricultural Products Company, Inc., Ambler, PA 19002.

OHIO 7663 C-28 PETO 80

Fig. 2. Differences in stem root proliferation in ethephon-treated 'Ohio 7663', 'C-28', and 'Peto 80' tomato transplants.

Table 2. Effect of ethephon on tomato transplant stem diameter 21 days after treatment.

Cultivar	Stem diameter (cm) Without ethephon	With ethephon
Ohio 7663	0.49	0.72**
Heinz 2653	0.54	0.70**
Libby 2981	0.49	0.62
Heinz 414	0.52	0.65
Knox	0.51	0.62
Campbell 28	0.50	0.65**
Pacesetter 490	0.43	0.53
Libby 68	0.48	0.54
Red Rock	0.50	0.68**
US 28	0.49	0.68**
US 141	0.53	0.61
Heinz 1706	0.56	0.65
UC 134-1-2	0.43	0.61**
Purdue 73-28	0.44	0.56
Hunt 208 F	0.53	0.62
Hunt 62	0.51	0.57
Campbell 37	0.54	0.64
Peto 80	0.55	0.63
Mean	0.50	0.63**

**Significantly different from "without ethephon" treatment at 1% level.

was with 'Ohio 7663', followed by 'Heinz 2653', 'Libby 2981' and 'Heinz 414' while 'Peto 80', 'Campbell 37', 'Hunt 62', and 'Hunt 208 F' had very few stem roots. Since the evaluations were made 21 days after ethephon application, the amount of stem roots in this test was generally very high. Commercial transplants usually have fewer stem roots since they are generally harvested 8 to 12 days after ethephon application. The average length of the stem roots ranged from 5.0 cm for 'Ohio 7663' to 0.5 cm for 'Campbell 37' and 'Peto 80' (Table 1). This stem root proliferation may be the reason ethephon-treated transplants generally grow much faster when compared to nontreated transplants as reported by Taha et al. (5). They reported that the large growth response was present even though ethephon-treated transplants had small fruit present at transplanting.

The average stem diameter was 0.50 cm for nontreated transplants and 0.63 cm for the ethephon-treated transplants (Table 2). Cultivar and ethephon treatment interactions were highly significant with 'Ohio 7663' followed by 'UC 134-1-2', 'US 28', 'Red Rock', 'Heinz 2653' and 'Campbell 28' giving the greatest increase. This increase in stem diameter from ethephon would mean that a higher percentage of the total transplants would be of marketable size in a once-over transplant harvest.

These results indicate that tomato cultivars respond differently to ethephon treatment in the transplant stage. We were unable to evaluate differences in flower abscission between the cultivars in detail because clipping was used as a standard cultural practice on all transplants. However, visual observations indicated differential responses of tomato cultivar to ethephon application.

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