

California Tomato Research Institute – Final Report 2005

Project Title: Transplant Density in the Control of Curly Top Virus

Project Leader: Michelle Le Strange, Farm Advisor, Tulare & Kings Counties
UC Cooperative Extension
4437 S. Laspina St., Suite B, Tulare, CA 93274
(559) 685-3309, ext 220; Fax: (559) 685-3319
E-mail: mlestrange@ucdavis.edu

Objectives:

- 1) Evaluate transplant density in relation to incidence and severity of curly top virus in grower production fields.
- 2) Evaluate the effect of plant density (in-row spacing and number of plants in a transplant plug) on yield performance of two varieties.

Summary:

A field trial was established with a grower in Fresno county to investigate in-row spacing and number of plants per transplant plug with two varieties in efforts to minimize effect of curly top virus. Disease incidence in this trial was too low to impact yield. A similar study was conducted in 2004 where closer plant spacing and 2 plants/plug resulted in higher yields for both varieties. In 2005 yields were higher across all treatments, but varieties responded differently to increasing plants per plug, and there was no response to in-row plant spacing.

Background:

Curly Top Virus continues to plague tomato growers on the west side of the San Joaquin Valley, however the unpredictability of its occurrence and severity each year complicates the development of control strategies. There is no genetic resistance in tomatoes to beet curly top virus. A statewide program designed to control the beet leafhopper, *Circulifer tenellus*, (the vector of the virus) is practiced annually by spraying foothill areas where leafhoppers are congregated. When curly top occurs the amount of damage to tomatoes appears to be more extensive in transplant fields compared to direct seeded fields. Growers have been steadily switching to transplants for a number of reasons, and in the process the total number of plants per acre has been reduced. Fewer plants per area create conditions favorable for the beet leafhopper, since it is believed that dense stands of tomatoes discourages visitation by leafhoppers.

Procedures:

A transplant density experiment was established on May 18, 2005 in a commercial field of processing tomatoes grown in the Five Points area in the San Joaquin Valley. Two varieties Halley 3155 (medium vine size) and AB2 (large vine size) were sown at 1, 2, and 3 seeds per transplant plug and grown in a commercial greenhouse and they were machine transplanted in the field at a 14" and 28" spacing. Individual plot size was one 60-inch bed wide x 100' row length. On June 13, 2005 (26 days after transplanting), plant stand counts were taken to be sure that plots were establishing properly. The field was grown under subsurface drip irrigation and was machine harvested on September 23, 2005 (128 DAT). Fruit samples from the mechanical harvester were delivered to PTAB for analysis. Since the incidence of curly top virus was too low in the field to have an effect, the yield results reflect plant density and variety differences.

Results:

Table 1 lists the results of variety and density treatments. Plant stands (number of plants/plot on June 13, 2005) for the two varieties and the two in-row spacings were consistent. The closer plant spacing averaged twice as many plants than the wider spacing and there was uniformity between the varieties. The variety by density treatments had an effect on yield. Although differences in pH and weight per 50 fruit were observed, these were largely due to variety differences and not the impact of density. No differences were observed on °brix or color.

Table 1. Effect of variety, in-row spacing, and plant number in transplant plug on yield and quality of processing tomatoes, Fresno 2005. Sorted by YIELD

| TRT # | Variety | In-row Spacing | # Plants in Plug | # Plugs/plot 6/13/05 | YIELD Tons/A | °Brix | Color | pH | lbs per 50 fruit |
|------------------------|---------|----------------|------------------|----------------------|-----------------|-------------|-------------|---------------|------------------|
| 9 | AB2 | 14" | 2 | 80 ab | 50.3 a | 5.8 | 21.0 | 4.37 a | 6.3 bcd |
| 11 | AB2 | 14" | 3 | 80 ab | 49.9 a | 5.8 | 21.8 | 4.39 abc | 6.8 abc |
| 10 | AB2 | 28" | 2 | 42 c | 49.4 ab | 5.7 | 21.5 | 4.38 a | 6.6 abc |
| 12 | AB2 | 28" | 3 | 40 c | 48.3 abc | 5.7 | 21.3 | 4.42 abcd | 7.3 a |
| 8 | AB2 | 28" | 1 | 42 c | 45.1 bcd | 5.7 | 21.5 | 4.39 ab | 7.1 ab |
| 1 | Halley | 14" | 1 | 80 ab | 44.3 cde | 5.6 | 21.5 | 4.44 bcd | 6.9 abc |
| 7 | AB2 | 14" | 1 | 77 b | 43.1 def | 5.8 | 20.5 | 4.37 a | 6.7 abc |
| 3 | Halley | 14" | 2 | 84 a | 42.9 def | 5.8 | 21.8 | 4.48 de | 6.0 cd |
| 2 | Halley | 28" | 1 | 42 c | 41.7 def | 5.8 | 21.0 | 4.46 de | 7.5 a |
| 4 | Halley | 28" | 2 | 44 c | 40.8 def | 6.0 | 21.3 | 4.45 bcde | 5.6 d |
| 5 | Halley | 14" | 3 | 79 ab | 40.0 ef | 5.6 | 21.3 | 4.47 de | 6.1 cd |
| 6 | Halley | 28" | 3 | 43 c | 39.4 f | 5.7 | 21.5 | 4.50 e | 6.2 bcd |
| Overall average | | | | 61 | 44.6 | 5.75 | 21.3 | 4.43 | 6.6 |
| LSD 0.05 | | | | 5.4 | 4.8 | NS | NS | 0.06 | 1.0 |
| CV % | | | | 6.2 | 7.5 | 4.3 | 4.2 | 1.0 | 10.0 |
| AB2 average | | | | 60 a | 47.7 a | 5.8 | 21.3 | 4.39 a | 6.8 a |
| Halley average | | | | 62 a | 41.5 b | 5.8 | 21.4 | 4.47 b | 6.4 b |
| LSD 0.05 (var) | | | | NS | 1.9 | NS | NS | 0.03 | 0.4 |

^{NS} no significant difference

Results followed by same letter are not significantly different from each other.

Table 2 summarizes the effects of density treatments on variety yields. Over all treatments the variety AB2 (47.7 T/A) yielded higher than Halley (41.5 T/A). Yields of AB2 increased as the # of plants/plug increased, whereas Halley had the opposite response, i.e. yields declined with increasing # plants/plug. Two and three plants/plug brought significantly higher yields than one plant/plug of AB2, but three was no different from two plants/plug. Yields of Halley were higher with only one plant/plug at each spacing. This is inconsistent with results obtained in 2004, when both varieties responded similarly to increasing # plants/plug and both varieties yielded more at the closer plant spacing (15 versus 30 inches).

Table 2: Effect of in-row plant spacing and #plants/plug on yield of AB2 and Halley

| # plants/plug | AB2 Tons/A | | | Halley Tons/A | | | Both Varieties Average T/A*** |
|--|------------|------|-----------|---------------|------|-----------|----------------------------------|
| | 14" | 28" | Avg. **** | 14" | 28" | Avg. **** | |
| 1 | 43.1 | 45.0 | 44.1 b | 44.2 | 41.7 | 43.0 bc | 43.5 p |
| 2 | 50.3 | 49.4 | 49.8 a | 42.9 | 40.8 | 41.8 bc | 45.8 p |
| 3 | 49.9 | 48.3 | 49.1 a | 40.0 | 39.4 | 39.7 c | 44.4 p |
| Avg. (var x plug #) | 47.7 x* | | | 41.5 y* | | | 44.6 |
| Avg. (spacing) | 47.8 | 47.6 | | 42.4 | 40.6 | 14" avg** | 45.1 s |
| | | | | | | 28" avg** | 44.1 s |
| * LSD .05 (variety) 1.9 T/A (x,y) ** LSD .05 (spacing) NS (s) ***LSD .05 (#plant/plug) NS (p) *** LSD .05 (var x #plant/plug) 3.4 T/A (a,b,c) | | | | | | | |

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