Effect of Various Stresses on First Fruit and Total Yield of Tomato Seedlings

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Producers of tomato transplants often use various cultural techniques to keep seedlings short and stocky. Common height reduction methods include withholding fertilizer, using cool temperatures, limiting water and using growth retardants. All these successfully retard the height of tomato seedlings, but what effect does a producer's growing techniques have on eventual yield?

In the spring of 1982, an experiment was conducted at Michigan State University to determine what effect moisture stress, fertilizer stress, B-Nine (SADH) and cold temperature stress would have on the ultimate yield and earliness of fruit of seedlings grown under these conditions in the greenhouse.

Two cultivars were used in this study: 'Pik Red,' a determinate vine type and 'Jet Star,' a semi-determinate vine type. These cultivars are both fresh market types that are well adapted to Michigan growing conditions.

The seed was sown on May 1, 1982 and transplanted on May 11 to cell packs (32 plants per flat) containing a soil-less medium of peat-perlite-vermiculite. The following treatments were given to the seedlings in the greenhouse.

Treatment 1 - Moisture stress - After transplanting, the plants were allowed to wilt before being watered.

Treatment 2 - Fertilizer stress - These plants were not fertilized after transplanting while in the greenhouse.

Treatment 3 - Use of growth retardant - This group of plants was sprayed with B-Nine (2500 ppm) four days after transplanting.

Treatment 4 - Control - These plants were not stressed or treated with any growth retardants.

Treatment 5 - Cold stress - The plants in this treatment were transplanted, grown at normal greenhouse temperatures for one week, then placed in a cold growth chamber (45-50°F) for two weeks before being planted in the field.

Photo 1. Comparison of stress treatments on tomatoes just prior to field setting: [left to right] control, 2500 ppm B-Nine, moisture stress, low fertilizer, cold temperatures.

The seedlings were planted in the field during the first week of June at three locations: the Sodus Horticulture Experimental Farm, Sodus, MI; a grower's muck field in Kalamazoo, MI; or at the Wayne County Cooperative Extension trial grounds in Wayne, MI.

At each location, 320 plants were placed 5' x 24' in a randomized complete block design with eight plants per plot and four replications. The plant spacing was five feet between rows and three feet between plants.

Data was taken weekly by harvesting all fruit showing any color and included the weight of fruit in four categories: Large No. 1 (2 5/8'' diameter, perfect), Medium No. 1 (2 1/8'' to 2 5/8'' diameter, perfect), No. 2 (slight blemish or smaller than 2 1/8'' diameter) and culls (those unsalable).

The results of the experiment indicate there was no significant difference in total yield by weight of Large No. 1 fruit, Medium No. 1 fruit or culls (Table 1). Additionally, B-Nine-treated plants produced a significantly larger total amount of No. 2 fruit than the cold treatment based on hundred weight per acre (cwt/acre).

Plants treated with B-Nine produced significantly larger early yields of Large No. 1 and No. 2 fruit than the cold treatment (Table 2). However, treatments caused no difference in the amount of Medium No. 1 fruit. The fact

that B-Nine-treated plants produce significantly more early fruit has been well documented in previous literature.

There was little difference between the early yield produced by the two varieties (Table 3). However, 'Jet Star' had significantly larger total yields of Large No. 1, Medium No. 1 and No. 2 fruit than did 'Pik Red' (Table 4).

This research indicates that many of the stress treatments used did not greatly affect yield. However, B-Nine did result in significantly larger yields than the cold temperature treatment.

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Table 1. The total yield in cwt/A of two vegetable varieties in three locations under various seedling stresses.

Treatments	Large No. 1	Medium No. 1	No. 2	Culls
Moisture stress	124.9	37.8	64.2	38.6
Fertilizer Stress	129.8	31.5	65.8	39.8
B-Nine	125.8	35.4	78.4	44.3
Control	116.0	39.1	66.7	35.9
Cold Temperatures	119.6	32.1	53.9	33.0
$LSD_{.05}$	--	--	19.7	--
$LSD_{.01}$	--	--	13.7	--

cwt/A = hundred weight per acre

Table 2. The early yield in cwt/A of two tomato cultivars in three locations under five stress treatments.

Treatments	Large No. 1	Medium No. 1	No. 2	Culls
Moisture Stress	53.9	11.2	18.7	12.8
Fertilizer Stress	59.1	10.9	19.4	12.6
B-Nine	65.2	12.7	25.0	16.2
Control	55.2	11.6	23.3	12.3
Cold Temperatures	49.1	11.1	17.7	12.3
$LSD_{.05}$	13.5	--	6.5	--

Table 3. The early yield in cwt/A of tomatoes in three locations under five stress treatments by cultivar.

Cultivar	Large No. 1	Medium No. 1	No. 2	Culls
Pik-Red	57.4	10.6	21.3	13.0
Jet Star	55.6	12.4	20.3	13.5
$LSD_{.01}$	--	**	--	--

** Significant at the 1% level.

Table 4. The total yield in cwt/A by cultivar of tomato plants under five different stress treatments at three locations.

Cultivar	Large No. 1	Medium No. 1	No. 2	Culls
Pik-Red	107.7	27.8	68.9	38.4
Jet Star	138.6	42.5	62.7	38.2
$LSD_{.01}$	**	**	**	--

** Significant at the 1% level.