

**Germination of Several Tomato Cultivars
at High Temperatures**

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Introduction

Starting tomato transplants from seed in the Sonoran Desert is sometimes difficult because the high temperatures adversely affect germination. For fall production, seed is sown into trays in greenhouses during August and September when the growing media reaches temperatures over 40°C. If proper precautions are not taken, severe losses are suffered and few usable plants result.

Since many tomato areas start transplants in early spring when temperatures are lower, very little data are available on germination at high temperatures. This study was undertaken to determine at what high temperature germination is reduced and how different cultivars respond to high temperature during germination.

Procedures

Tomato (Lycopersicon esculentum L.) seeds were placed in petri plates lined with filter paper which was moistened with 5-6 ml of distilled water. Plates were sealed in plastic containers and germinated in the dark. In preliminary studies, four tomato cultivars (Chico III, Tamu Saladette, UC-82-L, and Walter) were germinated at constant temperatures of 25, 30, 35 or 40°C, and at alternating temperatures of 30/25, 35/25, 40/25, 41.5/25, 43.5/25, or 45/25°C with twelve hours at each temperature.

In these studies, 50 seeds were used per plate, and each treatment was replicated four times. Germination was recorded after six days. In later studies, 11 tomato cultivars (Carmen, Celebrity, Chico III, Nema 1200, P 28693, P28793, Peto 2, Peto 95, Peto 343, UC-82-L, and Walter) were germinated at constant temperatures of 25, 30, 35 or 40°C, and at alternating temperatures of 40/25, 40/30, 40/35, or 40/40°C with 12 hours at each temperature.

In these later studies 50 seeds were used per plate, and each treatment was replicated four to six times. Germination was recorded every two to three days for 14 days. In all studies

seeds were considered germinated when 1 mm of radicle was emerged from the seed coat. Germination percentages were calculated.

Results and Discussion

In both studies, large decreases in germination occurred at constant temperatures between 30 and 35°C for all cultivars, although the magnitude of this decrease varied with cultivars (see Figure). At 40°C all cultivars showed less than 10% germination. With constant temperature, relative tolerance of cultivars to heat during germination were similar in all studies.

At alternating temperatures, large increases in germination occurred relative to germination at constant temperatures. Preliminary studies considered effects of maintaining a low temperature at an optimum germination temperature for tomato (25°C) while changing the high temperature.

The maximum high temperature for >50% germination was 40°C with the exception of UC-82-L which had 65% germination at 41.5°C and 30% germination even at 43.5°C. Later studies considered effects of maintaining the high temperature at 40°C while changing the low temperature.

When temperatures were lowered by 10-15°C (40/30 and 40/25°C), germination increased greatly compared to a constant 40°C for most cultivars. However, when temperatures were lowered by only 5°C (40/35°C), little increase in germination occurred except for P28693 and UC-82-L which had around 10% germination.

Based on these data, 40°C seems to be a threshold temperature where germination stops. These high temperatures caused the seeds to become dormant rather than killing them because nearly 80% of them germinated when put at optimum temperatures after being at the higher temperatures. Thus some mechanism is acting to control this response to heat. More work is necessary to understand this mechanism.

Results suggest that tomatoes can be germinated under high temperatures (not greater than 40°C) proper care is given to assure that temperatures are lowered to about 25°C during part of the day. In addition, the difference in cultivar response suggests the possibility of selecting more tolerant cultivars.



