Germination of Several Pepper Cultivars at High Temperature

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Introduction

Starting pepper 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 higher than 40°C. If proper precautions are not taken, severe losses are suffered and few usable plants result.

Since many pepper production 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

Pepper (Capsicum annuum L.) seeds were placed in petri plates lined with filter paper was moistened with 5 to 6 ml of distilled water. Plates were sealed in plastic containers and germinated in the dark.

In preliminary studies, four pepper cultivars (College 64L, Jalapeno, Mercury, and Yolo Wonder) 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 12 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, seven pepper cultivars (Anaheim, California Wonder, Coronado, Jalapeno, Ma Belle, Mercury, and Yolo Wonder) 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.

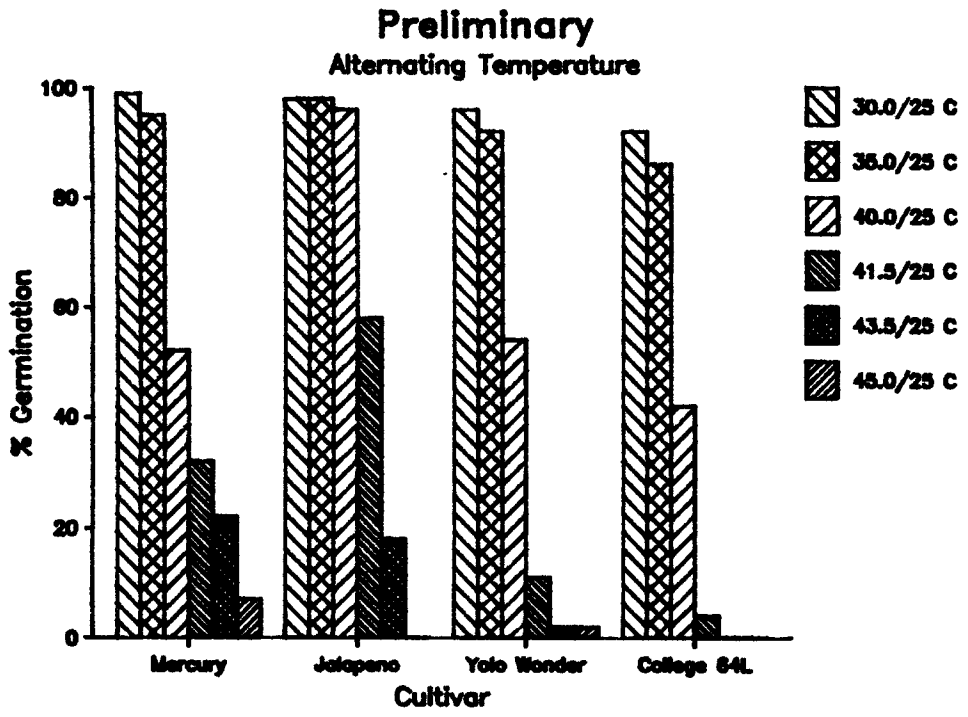
Results and Discussion

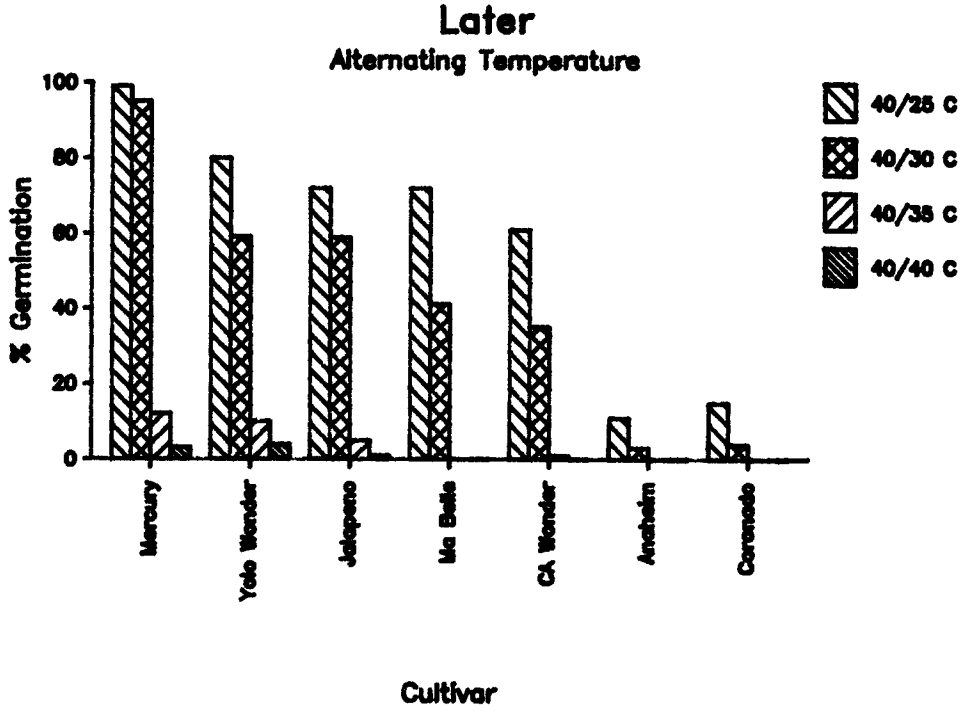
At constant temperatures, pepper percentage germination decreased greatly between 30-35°C for all cultivars except Mercury which still germinated well at 35°C (see Figure). Differences in the magnitude of these decreases occurred between cultivars. At 40°C, very little germination occurred in any cultivars. A threshold temperature around 35°C is possible. Relative tolerance of different cultivars to heat during germination was similar for preliminary and later studies.

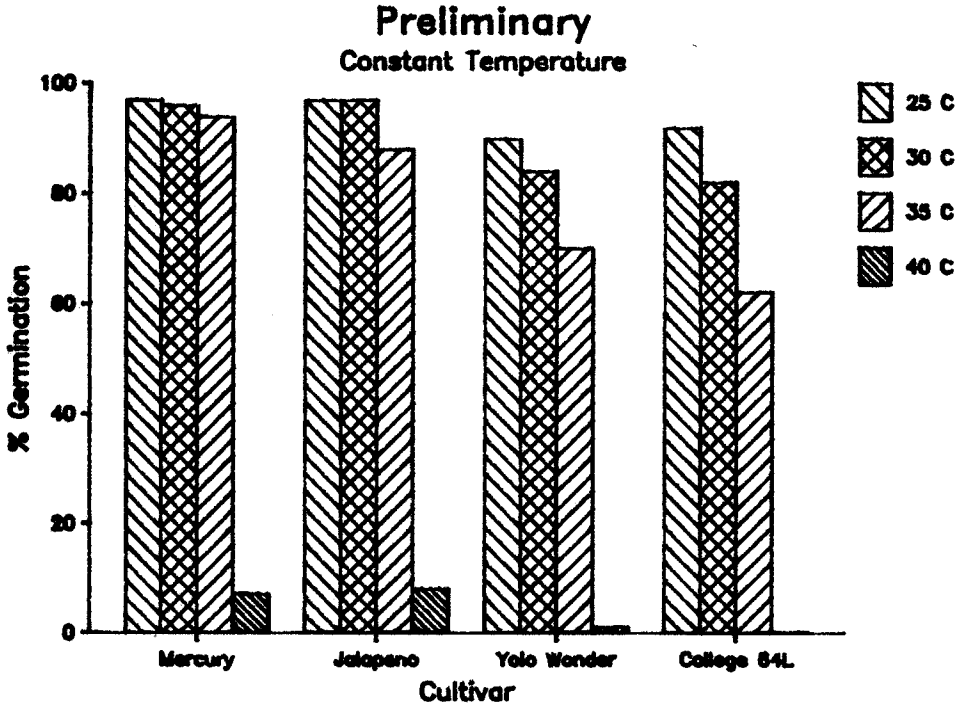
In preliminary studies with alternating temperatures, low temperatures remained near optimum while high temperatures were varied (see Figure). With a high temperature of 40°C, 50% or greater germination occurred in most cultivars, with greater than 95% for Jalapeno. As the high temperature was increased to 41.5°C and higher, large decreases in germination occurred, suggesting a threshold around 40 to 42°C.

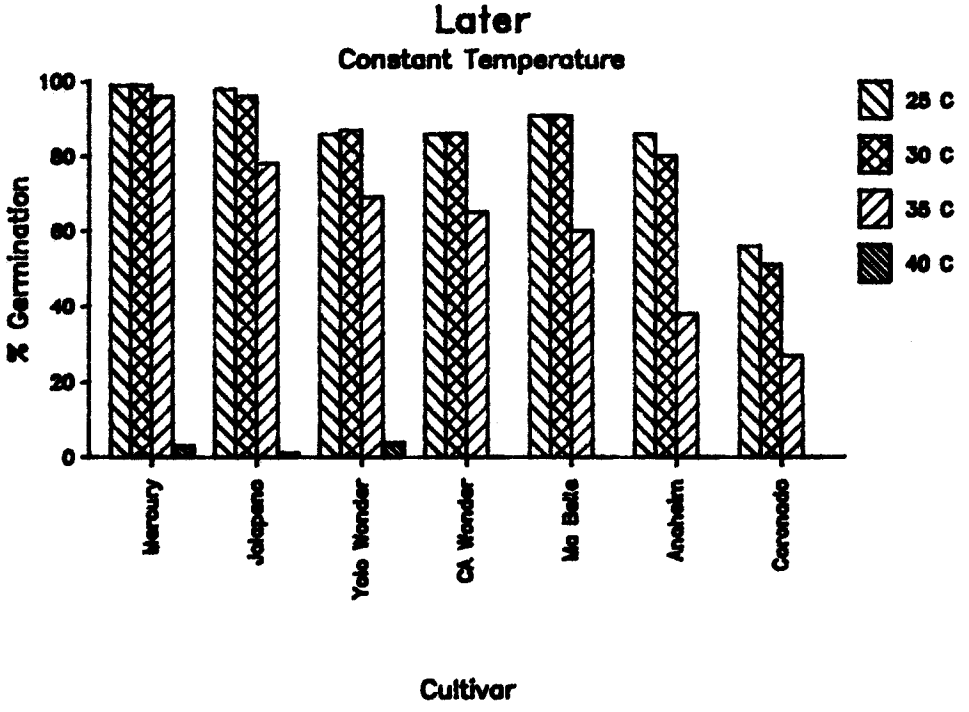
In later studies with alternating temperatures, high temperatures remained at 40°C while low temperatures were varied (see Figure). Most cultivars germinated better than 50% when temperatures were lowered by 10 to 15°C (40/25 and 40/30°C). A lowering of only 5°C (40/35°C) was not sufficient to greatly increase germination.

Results suggest that peppers will germinate at maximum temperatures of 40°C if proper conditions are provided to lower temperatures during part of the day. Results also suggest genetic differences that may allow for selection of cultivars better adapted to high temperatures during germination.


Preliminary
Alternating Temperature
% Germination
100
80
60
40
20
0
30.0/25 C
35.0/25 C
40.0/25 C
41.5/25 C
43.5/25 C
45.0/25 C
Mercury
Jalapeno
Yolo Wonder
College 64L
Cultivar


Later
Alternating Temperature
% Germination
100
80
60
40
20
0
40/25 C
40/30 C
40/35 C
40/40 C
Mercury
Yolo Wonder
Jalapeno
Ma Belle
CA Wonder
Anaheim
Coronado
Cultivar


Preliminary
Constant Temperature
% Germination
100
80
60
40
20
0
25 C
30 C
35 C
40 C
Mercury
Jalapeno
Yolo Wonder
College 64L
Cultivar


Later
Constant Temperature
% Germination
100
80
60
40
20
0
25 C
30 C
35 C
40 C
Mercury
Jalapeno
Yolo Wonder
CA Wonder
Ma Bell
Anaheim
Coronado
Cultivar