

Production

F1 Hybrid Geranium Seed

Effect of Temperature on Germination

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Temperature has been described as the single most important environmental factor in seed germination. Kotowski (5) stated temperature affected both the germination percent and rate. According to Koller (4) the rate of germination usually increases as the temperature rises. It was indicated by Gulliver and Heydecker (2) that there is an optimum temperature for germination to occur and that as the temperature increases above this optimum, the germination rate declines due to seed injury. Day/night fluctuating temperatures in seed germination have sometimes produced better results than constant temperatures.

Most sources suggest that F1 hybrid geranium seed be germinated at high constant temperatures such as 21° to 24°C (70° to 75°F), but little data can be found to substantiate these instructions. Trials were conducted in order to determine the 'ideal' temperature for the germination of F1 hybrid geranium seed.

Ten cultivars were tested at 3 constant temperatures, 14.5°, 20° and 25.5°C (58°, 68° and 78°F), and a day/night fluctuating 29.4° to 17.2°C (85° to 63°F) temperature. The 10 cultivars were: Ringo Scarlet, Rosita, Snowdon, Sprinter Scarlet, Bright Eyes, Cherry Glow, Sprinter Deep Red, Sprinter Salmon, Tiffany and an open pollinated line - Geranium Mixed. Three samples of 20 seed each of the cultivars Bright Eyes, Cherry Glow, Sprinter Deep Red and Sprinter Salmon were used, except in 25.5°C where 2 samples of 20 seed each were used for Sprinter Deep Red and Sprinter Salmon. Four samples of 20 seed each of the cultivars Geranium Mixed, Ringo Scarlet, Snowdon and Sprinter Scarlet were used. The total number of seed available was the determining factor for the sample size and number.

The seed was placed in 10 cm pyrex petri dishes on 4 sheets of No. 1 Whatman filter paper, to which 6 ml of distilled, deionized water were added. The seed was distributed on the filter paper to avoid any possible interference between one seed and another. The petri dishes were placed in plastic bags to retain moisture and then wrapped in Aluminum foil to exclude light. The seeds were placed to germinate at the temperatures indicated above.

Germination was considered to have occurred if the radicles were protruding approximately 5 mm (1/5 inch). Germinated seeds were counted daily from day 2 to day 12, inclusive. As the germination trials were conducted on 3 different dates, controls were set up using samples of each cultivar in 20°C. There were no statistical differences in the dates in either the germination percent or germination resistance value (rate).

The daily counts were recorded, giving up to 11 figures for rate. As this was awkward and cumbersome in analysis, the germination resistance value was determined. In simple terms, the germination resistance test combines both the number of seeds germinating and the time required for those seeds to germinate, producing a value in hours for 50% of the final germination to be achieved. The germination resistance value (GRV) allows cultivar differences, environmental effects and

seed lot differences to be readily distinguished.

There were no significant differences in the germination percents for the 4 temperature regimes used. However, among the cultivars, Snowdon differed from Rosita and this difference was highly significant (Table 1).

The observed germination response to temperature on the basis of germination resistance values, in decreasing order, was:

1. 20°C
2. day/night fluctuating temperatures 29.4° to 17.2°C and 25.5°C
3. 14.5°C (Table 2)

Temperature has been reported as being very critical in the germination of F1 hybrid geranium seed. A constant high temperature of 20° to 25°C has been recommended. The geranium seed germination rate increased with an increase in temperature to an optimum temperature of 20°C. Above 25°C the rate decreased. This may have been attributable to an inhibition of germination due to the temperature. Moreover, these observations seem to be in agreement with those of Koller (1972), Gulliver and Heydecker (1973), respectively. The seed germinated at a slower rate in

Table 1: Mean germination percent for a 12 day period for 4 temperature regimes.

Cultivar	Mean Germination percent
Rosita	96.9 a ^{ZY}
Cherry Glow	96.3 ab
Sprinter Deep Red	95.9 ab
Sprinter Scarlet	95.6 ab
Bright Eyes	95.0 ab
Geranium Mixed	93.4 ab
Sprinter Salmon	90.0 ab
Tiffany	88.3 ab
Ringo Scarlet	87.5 ab
Snowdon	85.9 b

^Z values are a mean of 3 or 4 samples of 20 seed at each temperature, 14.5°, 20° and 25.5° and a fluctuating temperature regime (29.4° to 17.2°C) except where previously stated.

^Y mean germination percents for cultivars followed by the same letter do not differ significantly as determined by the unpaired t test (0.01).

Table 2: Mean germination resistance value in hours for a 5^z day period for 4 temperature regimes.

Cultivar	Mean time to 50% germination (hours)				Mean
	14.5°C	20°C	Temperature 25.5°C	Fluctuating day/night	
Bright Eyes	70.1	36.3	50.3	51.0	51.9 ab ^y
Cherry Glow	67.0	37.5	38.4	33.1	44.0 a
Ringo Scarlet	63.4	41.6	52.9	35.3	48.3 a
Rosita	62.7	34.6	49.4	44.0	47.7 a
Snowdon	85.1	66.8	67.8	70.8	72.6 c
Sprinter Scarlet	57.9	49.1	94.3	74.8	69.0 c
Sprinter Deep Red	62.5	28.6	61.6	57.3	51.7 ab
Sprinter Salmon	69.8	45.1	47.5	46.5	52.7 ab
Tiffany	63.5	25.2	33.0	54.2	44.0 a
Geranium Mixed	71.8	58.6	59.1	65.5	63.7 bc
Mean	67.5 c ^x	43.4 a	56.9 b	53.9 b	

^y mean germination resistance values for cultivars followed by the same letter do not differ significantly as determined by the unpaired t test (0.01).

^x mean germination resistance values for temperatures followed by the same letter do not differ significantly as determined by the unpaired t test (0.01).

^z germination resistance values were determined to 5 day period as several observations beyond this were missing.

14.5°C, a lower temperature. Seed in lower temperatures may have had a decreased metabolism and thus a decreased germination rate.

For the GRV's, there was a significant difference (Table 2) as to which temperature was used, but is this of practical value? The GRV in this experiment varied by less than 24 hours and would not be a major concern for most growers. The maximum germination occurred on day 2 for the day/night fluctuating temperatures and for 20°C. Maximum germination occurred on day 3 for 14.5° and 25.5°C.

Geranium seed germinated with high percents over a wide range of temperatures. There were differences between cultivars in both the germination percents and the GRV's.

Although these trials were not repeated, there was sufficient information generated to indicate that perhaps high temperatures (high energy consumption) may not be required for the germination of F1 hybrid geranium seed and that no great care in relation to temperature is necessary unless there is a particular need for a high rate of germination. More

research should be done on this subject in light of current and future energy costs.

REFERENCES

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