Temperature and Light Affect Seed Germination of *Begonia semperflorens-cultorum*

Candice A. Shoemaker¹ and William H. Carlson²

Department of Horticulture, Michigan State University, East Lansing, MI 48824

Additional index words. fibrous-rooted begonia, irradiance

The popularity of *Begonia semperflorens-cultorum* Hort. (fibrous-rooted begonia) requires an understanding of its physiological responses to the environment so that management of germination can be improved. We found no detailed studies of responses of fibrous-rooted begonia to temperature and irradiance during germination. Current recommendations for germination vary. Those for the medium range from 21 to 27C (Ewart, 1985; Styer and Laffe, 1989), those for air from 18 to 29C (Ewart, 1985; Larson, 1980; Nau, 1990) and for supplemental irradiance, range from 230 to 240 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ (reported as 150 to 1200 fc) (Ewart, 1985; Styer and Laffe, 1989).

The objectives of this research were to determine the effects of temperature and irradiance on seed germination of fibrous-rooted begonia.

'Scarlanda' begonia seeds (50 per treatment) were germinated in 100 $\times$ 15 mm petri dishes with two layers of Whatman filter paper moistened with 2 ml deionized water. One milliliter of deionized water was applied daily to keep the filter paper and seed moist during the experiments. The treatments were replicated twice, over time, with three samples per treatment each time it was conducted.

Received for publication 22 Jan. 1991. Accepted for publication 20 Sept. 1991. Acknowledgement is made to the Michigan Agricultural Experiment Station for its support of this research. This study was partially funded with grants from the Bedding Plant Foundation and Western Michigan Bedding Plant Growers Assn. We express our appreciation to the Ball Seed Co. (Chicago) for the donation of seed. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

¹Currently, Assistant Professor, Dept. of Agriculture, Berry College, Rome, GA 30149-5003.

²Professor, Dept. of Horticulture.

The effect of irradiance on germination was investigated by subjecting the seeds to continuous irradiance, continuous darkness, and ambient (lat. 42°N, E. Lansing, Mich., Oct. 1988 and Jan. 1989) irradiance. Continuous irradiance was tested in a controlled-environment growth chamber. Continuous darkness and ambient h-radiance were tested in a controlled-environment glass greenhouse. Petri dishes were covered with two layers of aluminum foil to provide continuous darkness. Photosynthetic photon flux (PPF) was 50 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ for the continuous irradiance treatment, as provided by cool-white fluorescent (GE, F48T12, CW 1500) lamps. The PPF was measured with a LI-COR LI-185B meter and LI-190SB quantum sensor (LI-COR, Lincoln, Neb.). The growth chamber and the greenhouse were kept at 24C (day and night) throughout the germination period. Mean temperatures in the greenhouse during the experiment were within $\pm 1.6\text{C}$ from the setpoint.

Seeds were also germinated at a constant 18, 21, 24, 27, 29, or 32C. These experiments were conducted in controlled-environment growth chambers with continuous PPF of 50 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$.

The number of seeds germinated was recorded 21 days after sowing. Data were transformed using arcsin transformation and then subjected to analysis of variance and trend analysis. A *t* test was conducted to compare means between continuous and ambient irradiance treatments.

Rate of germination was not affected by temperatures of 24 to 32C. Observation of daily counts of germinated seeds in preliminary work indicated that germination was

delayed slightly (2 days) at 24C compared to 27 and 32C. At 9 days after sowing, 72%-83% of the seeds had germinated. From 15 to 21 days after sowing, the percent germination did not increase. These data suggest that the germination environment should be maintained for 2 weeks. Current recommendations for the germination period vary from 15 days (Cathey, 1969) to 21 days (Carlson and Crankshaw, 1981; Larson, 1980).

At least 90% of the seeds germinated at 18 to 24C and $\approx 80\%$ at 27 to 32C (Table 1). In general, final percentage germination decreased linearly with increasing temperature (Table 1). No minimum or optimum temperature can be determined from our data, but, on the average, 80% to 90% of the seeds will germinate within the temperature range evaluated.

Light was necessary for germination. However, there was no difference in the percentage of germination between seeds exposed to continuous irradiance and ambient conditions (87% and 91%, respectively; *t* = 0.956, *df* = 3). At 5 days after sowing, seeds in one petri dish from the dark treatment were exposed to ambient irradiance in the greenhouse for <10 sec then refoiled. Seeds that were in darkness for the entire 21 days did not germinate while those in the petri dish that had been briefly exposed to light did germinate (radicles emerged), thus indicating a very low total irradiance requirement for germination.

Literature Cited

- Carlson, W.H. and C.L. Crankshaw. 1981. Growing fibrous begonias for profit. Michigan State Univ. Coop. Ext. Serv. Bul. E-1579:1-4.
- Cathey, M.C. 1969. Guidelines for the germination of annual pot plant and ornamental herb seeds-III. Florists' Rev. 144(3744):26-31.
- Ewart, L.C. 1985. Shade plants, p. 416-417. In: J.W. Mastalerz and E.J. Holcomb, (eds.). Bedding plants III. Pennsylvania Flower Growers, University Park, Pa.
- Larson, R.A. 1980. Begonias, p. 395-408. In: R.A. Larson (ed.). Introduction to floriculture. Academic, New York.
- Nau, J. 1990. Fibrous begonias. Grower Talks December: 14.
- Styer, R.C. and S. Laffe. 1989. How to get your germination rates on the rise. Grower Talks December: 55-58.

Table 1. Final percentage germination of *Begonia semperflorens-cultorum* 'Scarlanda' as affected by various constant temperatures.

Temp (°C)						Significance ¹
18	21	24	27	29	32	
93	90	93	79	83	83	L

¹L, linear effect of temperature significant at *P* = 0.05.