

Day-Length Effects On Pot Crops

Potted helianthus and rudbeckia vary in response to day-length requirements; find out just how much.

By Meriam Karlsson and Jeff Werner



Helianthus 'Pacino Gold' 54 days into the study. The two plants on the left were grown at 68° F and the two plants on the right at 61° F. The two plants with open flowers were grown at long days for three weeks and then moved to short days. The plants yet to flower were at short days for three weeks and then moved to long days. (Photo courtesy of Meriam Karlsson)

Helianthus annuus and Rudbeckia hirta are popular garden plants with many prospects for use in the landscape. Recent selections with compact growth habits are not only excellent choices for conventional gardens but for use in borders, interiorscapes, containers and even as flowering potted plants. Propagated from seed with similar germination requirements at 70-72° F, these recent crop advancements have successfully inspired new marketing, demand and popularity.

Growth, flower formation and overall crop development are usually satisfactory at any

day length for these crops. Growing conditions will, however, affect the expected number of days from seeding to marketing with day length being one of the more significant factors. Shorter days support faster flowering of helianthus, while extending the day will cause earlier flowering of rudbeckia. Although the flower response is opposite in respect to day length, both helianthus and rudbeckia are expected to show less stem growth under shorter days.

The response to day length offers opportunities to manage plant height while monitoring overall crop development. When maintaining a specific climate is difficult,

photoperiod may offer an alternative measure for height control. Results on flower rate and plant appearance under day-length-adjusted conditions are presented here for the cultivar selections helianthus 'Pacino Gold' and rudbeckia 'Toto Gold'.

Experimental Procedures

After seeding and germination at 64-72° F, the plants were transplanted into 4-inch pots filled with Premier Pro-Mix BX (Premier Horticulture). The helianthus were transplanted two weeks after seeding and rudbeckia three weeks. Plants were spaced at four pots per square foot and watered once a day with

Day length (hours)	Temperature (°F)	Flower (days)	Leaf number	Height (inches)	Flower size (inches)
8	60	57	26	9.3	4.7
8	68	54	25	8.7	4.4
16	60	74	33	17.8	5.7
16	68	72	34	20.0	6.5

Figure 1. Results for helianthus 'Pacino Gold'. Treatments were initiated 14 days from seeding.

Day length (hours)	Temperature (°F)	Flower (days)	Height (inches)	Flower size (inches)
8	60	106	5.9	2.6
8	68	88	5.9	2.7
16	60	71	11.3	2.8
16	68	56	11.5	2.8

Figure 2. Results for rudbeckia 'Toto Gold'. Treatments were initiated 35 days from seeding.

fertilizer solutions of 150 ppm nitrogen using Peters' 15-16-17 (The Scotts Company LLC). For the helianthus, treatments were initiated at transplant when plants were about 2 inches tall and had five expanded leaves. The rudbeckia plants were only ½-inch tall but had seven leaves at the start of the experiment, five weeks from seeding.

The helianthus and rudbeckia plants were grown at constant 56-64° F or 64-72° F. The light intensity was adjusted during the eight hours of short day and the 16 hours of long day in order to provide a similar total daily amount of 8 mol d⁻¹.m⁻². The corresponding instantaneous light levels were about 1,050 foot-candles during the 16-hour day and 2,100 foot-candles for the 8-hour day.

In addition to growing plants throughout at short or long days, plants were moved within each temperature to the second day length at weekly intervals for four weeks and left until termination, as illustrated in Figure 3, below. Short day was discontinued after seven weeks, and all plants grew at long days for the remainder of the experiment. Flower rates are reported from start of treatments (14 days from seeding for helianthus and 35 days for rudbeckia).

Results

The helianthus plants flowered more than two weeks earlier at short than long days (see Figure 1, left). The slower development at long

days was accompanied by additional leaves, taller plants and larger flowers. On average, helianthus at long days produced eight more leaves prior to flower initiation than at short days. Although temperature had a limited modifying effect on rate of flowering, 68° F at long days resulted in 6½-inch-large flowers and the tallest plants of 20 inches.

As expected, rudbeckia plants developed very slowly under short days, with up to five weeks quicker flowering at long days (see Figure 2, left). The higher 68° F temperature also enhanced flowering by about two weeks compared to 60° F. While conditions with longer days resulted in almost a doubling of the plant height, flower diameter of rudbeckia remained close to 3 inches independent of temperature and day length.

Figure 4, below, illustrates the heights of helianthus grown at short days, long days or combinations of alternate day lengths. Moving plants from shorter to longer days resulted in progressively taller plants, while additional weeks of short days reduced plant height. Similar trends in final plant height were observed at 60° F. The response of rudbeckia paralleled that of helianthus with taller plants under long days.

Transferring rudbeckia to extended days progressively enhanced flowering, and the opposite was true for more weeks at short days (see Figure 5, below). Helianthus exhibit-

ed similar flowering trends but with opposite directions, such that long days made for slower flowering. In addition, the flower size was correlated to plant height in helianthus. Reduced flower size in relation to height may be a natural adaptation to certify overall balance and harmony of the plant. Opportunities to produce short helianthus with large flowers are therefore limited using day length as the control method.

Combinations of long days followed by short days appear more suitable for controlling height and growth of rudbeckia than changing short days into long days. To produce compact plants of rudbeckia, at least four initial weeks of short days were required. The disadvantage of an extended initial short-day period is considerably slower flowering. In contrast, rudbeckia was highly responsive to long days for fast flowering. Even a limited number of long days resulted in significantly quicker flowering than continuous short days. Flower appearance was similar for plants grown with four initial weeks of long days to those grown at extended day lengths the entire time. The plants were compact at 7 inches despite exposure to four weeks of long days.

Depending on the intended market for rudbeckia, additional long days beyond the four weeks used here initially may be more appropriate to produce morphologically acceptable plants with fast flowering. ♦

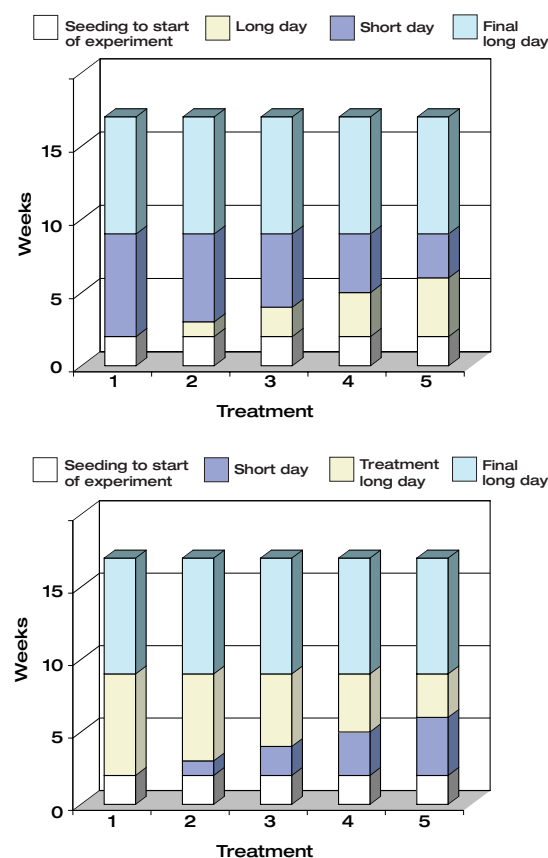


Figure 3. Growing conditions of short- and long-day combinations included in the study. Treatments were maintained at 60° F and repeated at 68° F. Helianthus 'Pacino Gold' or rudbeckia 'Toto Gold' plants were placed at short (eight hours) or long days (16 hours) and moved to the second day length at weekly intervals for four weeks. Afterwards, all plants were kept at long days until flowering.

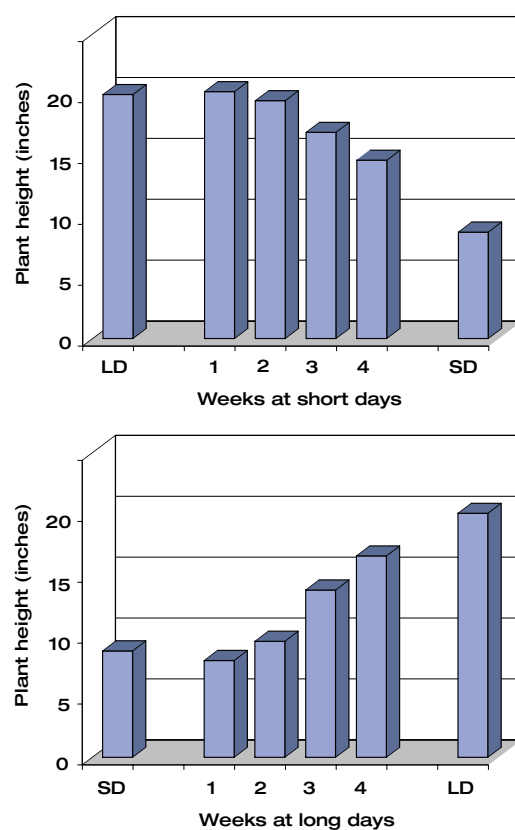


Figure 4. Plant height at flowering. Helianthus 'Pacino Gold' was placed at short (eight hours) or long days (16 hours) and moved to the second day length at weekly intervals for four weeks. Afterwards, all plants were kept at long days until flowering. The temperature was 68° F. Bars noted as SD or LD show results for plants grown throughout at short (SD) or long days (LD).

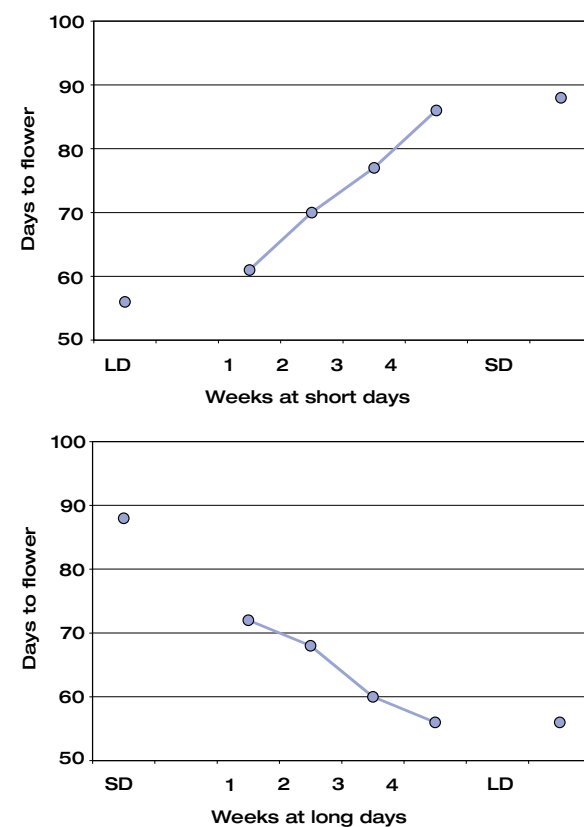


Figure 5. Days from start of treatments to open flower. Rudbeckia 'Toto Gold' plants were placed at short (eight hours) or long days (16 hours) and moved to the second day length at weekly intervals for four weeks. Afterwards, all plants were kept at long days until flowering. The temperature was 68° F. Data points noted as SD or LD show results for plants grown throughout at short (SD) or long days (LD).

crop cultivation

Using The Results


For fast growth and development of helianthus 'Pacino Gold', short days are the most productive, resulting in compact plants well suited for containers. Limited early long-day exposure followed by short days can also be used to produce shorter plants. Despite the short-day flowering response of helianthus, limited initial exposure to long days produced rapid flowering similar to uninterrupted short days. Four initial weeks of short days at 60 or 68° F followed by long days are expected to produce helianthus of intermediate height with acceptably large flowers while only



Helianthus 'Pacino Gold'. (Photo courtesy of Ernst Benary of America)

needing a few more days than continuous short days for flowering.

Contrary to helianthus, rudbeckia flowered faster under long days, and short days noticeably reduced flowering rate. Although shorter days produce compact plants, several weeks were required to significantly reduce overall height using short days. Arrangements with long days followed by a short-day period appear more appropriate for quick flowering and suitable reduction of height for rudbeckia than do initial short days changing into long days.

Careful use of day length based on the results presented here offers opportunities to understand and use day length for monitoring growth and development of helianthus and rudbeckia. Under natural conditions of increasing day length, slower flowering with reduced height can be expected for rudbeckia compared to fall conditions of decreasing day lengths. On the other hand, less time to flower may be predicted for helianthus under spring conditions of initially shorter days compared to a seasonal change from long toward shorter days. 

Meriam Karlsson is a professor and Jeff Werner is a research professional at the University of Alaska Fairbanks. They may be reached by phone at (907) 474-7005 or E-mail at ffmgk@uaf.edu.

LearnMore

For more information related to this article, go to www.gpnmag.com/lm.cfm/gp110504

Advertisement



EPA Grants TriStar™ Insecticide New Expanded Insect Label

Dayton, N.J. — Cleary Chemical Corporation announced today that the Environmental Protection Agency (EPA) has granted a new expanded insect label for TriStar™ 70 WSP insecticide.

TriStar, introduced to the ornamental market in 2003, has quickly established itself as the leading neonicotinyl foliar insect spray for the greenhouse, field, nursery and landscape markets. The new expanded label increases its already broad spectrum control to key, economically important insect categories like aphids, mealy bugs, caterpillars, scales, whiteflies, thrips, leaf eating beetles and leaf miners.



“We are extremely pleased with the acceptance that TriStar continues to receive from leading ornamental growers and landscapers. The fact that TriStar is a foliar spray with rapid knockdown that controls a wide variety of insects is a winning combination of benefits for the customer”, says Don Rossi, Director of Sales and Marketing, Cleary Ornamental Products. “At present”, says Rossi, “no other foliar insecticide can deliver the exceptional control of TriStar. The product performance factors of contact, systemic, ovicidal and translaminar activity make TriStar the foliar insecticide that truly works in minutes and lasts for weeks.”

Cleary Chemical Corporation has the exclusive marketing rights from Nippon Soda Co., Ltd., for TriStar™ 70WSP insecticide in the United States for the greenhouse, nursery and ornamental markets.

For 65 years, Cleary Chemical has supplied the turf market and ornamental market with superior, quality plant protection products, utilizing the most up-to-date technology. Cleary markets innovative products such as Cleary 3336™, Endorse™, Spectro™ and new Alude™ fungicides, TriStar insecticide, and Nutri-Grow Magnum foliar nutrient.

Read and follow label directions. The Cleary logo, 3336, Spectro and Alude are trademarks of Cleary Chemical Corporation. Endorse is a trademark of Arvesta Corp. Nutri-Grow Magnum is a trademark of Biagro-Western, Inc. TriStar is a trademark of Nippon Soda Co., Ltd.

THE NATIONAL GREENHOUSE MANUFACTURERS ASSOCIATION (NGMA) IS PLEASED TO OFFER THE FOLLOWING PUBLICATIONS:

Greenhouse Standards & Guidelines:
(\$50 US) This publication includes the technical aspects of guidelines for Design Loads, Environmental Controls, Glazing, Heat Loss, Heating Systems, Insect Screening, Ventilating & Cooling, Electrical Design, and Curtain Systems.

Helpful Hints:
(\$15 US) The eleven brochures include commonly asked questions with standard answers for Purchasing a Greenhouse, Environmental Control Computers, Ventilating & Cooling, Irrigation, Internal & External Greenhouse Curtain Systems, Electrical Systems, Insect Screening, Heating Systems, Glazing, Energy Savings, and Supplemental Lighting.



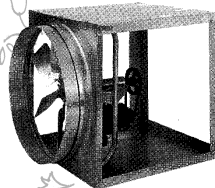
All publications can be downloaded for free at www.NGMA.com
Questions, email the NGMA: ngma@ngma.com

9137 E. Mineral Circle, #250
Centennial, CO 80112 | 800.792.NGMA

Write in 764

Reliable

Ventilation Equipment for over 65 Years!



Quietaire's TVA Tube Vent Fan - Insures a quiet, constant air circulation in your greenhouse. It prevents air stagnation by circulating inside air, heated air or outside air. TVA's design permits use with one or two heaters.



Quietaire's HAF 18 Fan - Efficiently improve conditions in your greenhouse with horizontal air flow fans. The fans push air in greenhouse continuously causing mass air movement.

Rely on Quietaire to manufacture long lasting, low maintenance, durable and dependable ventilation products. The type of products that you can count on for years to come!

Quietaire

Web Site: www.quietaire.com
Email: info@quietaire.com
Call (713) 228-9421 Fax (713) 228-9425
or write Quietaire for details.
505 North Hutcheson Houston, TX 77003



Write in 793