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Year-round Production of Greenhouse-grown French Tarragon

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Abstract. **Potted tarragon (*Artemesia dracunculus* L.) plants were grown in a greenhouse under short days (8 hr) or long days (16 hr), combined with a pretreatment of gibberellic acid (GA_3) spray, or several weeks of 4°C cold. Long days promoted shoot growth whereas plants grown under short days grew in a basal rosette form most of the time. Cold pretreatment was not necessary to break dormancy; however, it did significantly increase total production. GA_3 pretreatment was not as successful as cold in promoting regrowth. Regular harvest of the foliage stimulated growth under long days.**

There is increased interest in year-round herb production among growers supplying lucrative urban markets in the Northeast. Greenhouse production of the perennial herb tarragon is hampered by its cessation of growth in the autumn and winter. When cultivated outdoors, tarragon dies back to the ground in late autumn and regrows from rhizomatous buds the following spring (3). Consequently, in northern areas, greenhouse-grown plants are placed outside in October and brought back into the greenhouse in January, whereupon production resumes in mid- to late-February. This nonproductive 4– to 5–month period occurs during the height of the market demand for the crop. The objective of these experiments was to overcome dormancy in tarragon and achieve year-round production.

Expt. 1. In late Sept. 1983, 60 tarragon plants were sheared back to leafless 3-cm stems, root–pruned, and potted in 11-cm pots with a 1 soil : 1 peat : 1 perlite medium (by volume) and placed in a 21°C/16° (day/night) greenhouse. They were fertilized with 200 ppm N and K once a week.

On 1 Oct., 6 treatments were initiated with 10 pots/treatment: a) Short days consisted of 8 hr natural plus incandescent light (two 75 W lamps, about 0.6 m above the plants) and 16 hr under black cloth, b) Plants were sprayed to the drip stage 3 times only at the initiation of the treatment, one week apart, with a 250-ppm aqueous solution of GA_3 and grown under an 8 hr short-day environment. The GA_3 was dissolved in pH 11 aqueous KOH, and adjusted to pH 7 with 1.0 N HCl. A half-percent surfactant was added before spraying. c) Plants were exposed to 6 weeks of 4°C cold storage with 8 hr of incandescent lights/day before being placed in the greenhouse under short days (arranged as in treatment a). d) Long days consisted of natural light plus 16 hr of incandescent light (two 75 W lamps) and 8 hr of darkness. e) Gibberellic acid plus long days and, f) 6 weeks cold plus long days were treated identically to treatments b and c, except for the 16-hr photoperiod. Expt. 1 was analyzed as a completely randomized design. After 5 months in the greenhouse, total foliage (stems and leaves) was harvested (on 3 Mar. 1984) from each pot and fresh weights were taken.

Expt. 2. Fifty new tarragon plants were potted on 6 Mar. 1984 as described in the first experiment and pruned down to the pot rim. The following 4 treatments were begun immediately after pruning: a) short days, b) long days, c) GA_3 plus long days, and d) six weeks cold plus long days. All of these were treated identically to those in the first experiment with 10 plants/treatment. A 5th treatment of 3 weeks cold plus long days was also added. The entire foliage of these plants was harvested 7 times periodically over a 1-year period and fresh weights determined. Expt. 2 was analyzed as a completely randomized design.

In both experiments, the long-day treatment clearly stimulated 2 to 3 times more growth than those grown under short days ($P < 0.001$) (Figs. 1 and 2). Plants grown under short days had very short internodes, and during periods of low natural light grew in a rosette form (Fig. 3). This response was also documented in *Salvia silvestris*, where long days also caused internode elongation without prior chilling (1).

Among the 3 short-day treatments of Expt. 1, only the cold pretreatment caused any significant increase in growth over the noncold–treated plants (Fig. 1). There were no significant differences among the long-day treated plants, although there was a trend toward some stimulation from the cold pretreatment. In Expt. 2, where the plants were regularly harvested, cold pretreatment of long-day grown plants (Fig. 2) significantly increased growth. Both the 6 and 3 week cold pretreated long-day plants showed greater cumulative growth than the nonpretreated long-day plants (11% and 33% greater, respectively).

Many other perennials have responded with increased vegetative vigor after chilling or treatment with gibberellic acid (1). Concentrations in the range of 50–1000 ppm active ingredient have been found to be successful in substituting for the cold requirement in *Gypsophila paniculata* (2). Gibberellic acid pretreatment, however, did not increase production significantly over nontreated plants in either experiment.

Interestingly, the cold pretreatment had a stimulating effect on production long after the first harvest was taken. In Fig. 4, cold pretreated long-day plants grew significantly more than untreated plants for a period of about 5 months after the cessation of the cold treatment, suggesting that the site of chilling effectiveness was in the roots or underground vegetative buds and was unaffected by harvesting the shoots.

Short-day grown plants in Expt. 2 grew less than half as much as plants grown under long-day treatments; however, during the

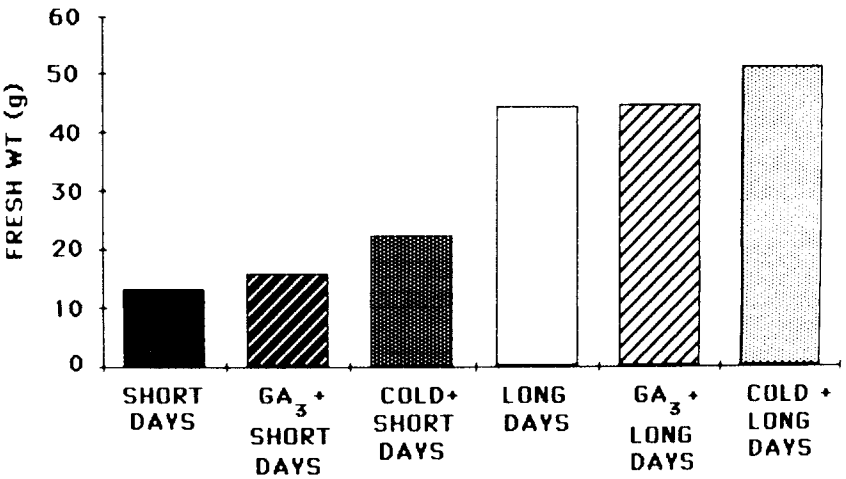

Fig. 1. The effect of short-day and long-day photoperiods with and without cold pretreatment or gibberellic acid spray on the fresh weight per pot of tarragon grown for 5 months. 1 Oct. 1983 to 2 Mar. 1984 (N = 10). LSD 5% = 8.0 g. LSD 0.1% = 13.9 g.

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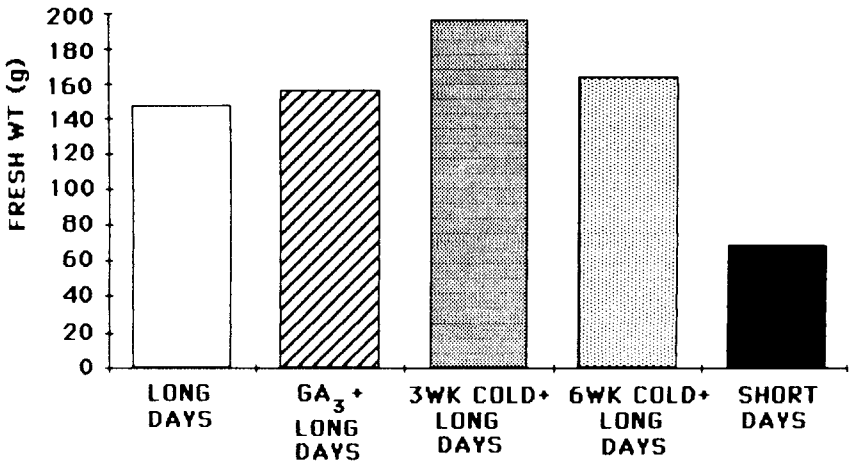

Fig. 2. Fresh weight per pot of tarragon harvested 7 times over a one–year period in response to long-day and short-day photoperiods, 3- and 6-week cold pretreatments, and gibberellic acid spay. (N = 10). LSD 5% = 13.72. LSD 0.1% = 23.03 g.

Fig. 3. Tarragon grown under long days (right) and short days (left). Picture taken in April during Expt. 2.

period from mid-June to mid-July, these plants accumulated fresh weight (FWT) at a rate of 512 mg·day^{-1}, whereas during the previous period (late April to mid-June) they grew at a rate of 193 mg FWT/per day. After the September harvest, there was again a sharp decrease in all treatment production rates that paralleled decreasing natural light levels. Plants grown under long days never went dormant, but continued to grow for the entire year's sampling period. During the period of lowest light, short-day plants ceased growth entirely, so there was nothing to harvest on 19 Dec.

Tarragon can be grown for year-round harvest under long-day photoperiods. Cold pretreatment of the plants for 3 or 6 weeks at 4°C significantly increased overall cut shoot production for several months. A seasonal variation in productivity corresponded to the fluctuation in natural light intensity. Increased light intensity during periods of low natural light as well as long day photoperiods may be necessary to maintain production at a sustained yield.

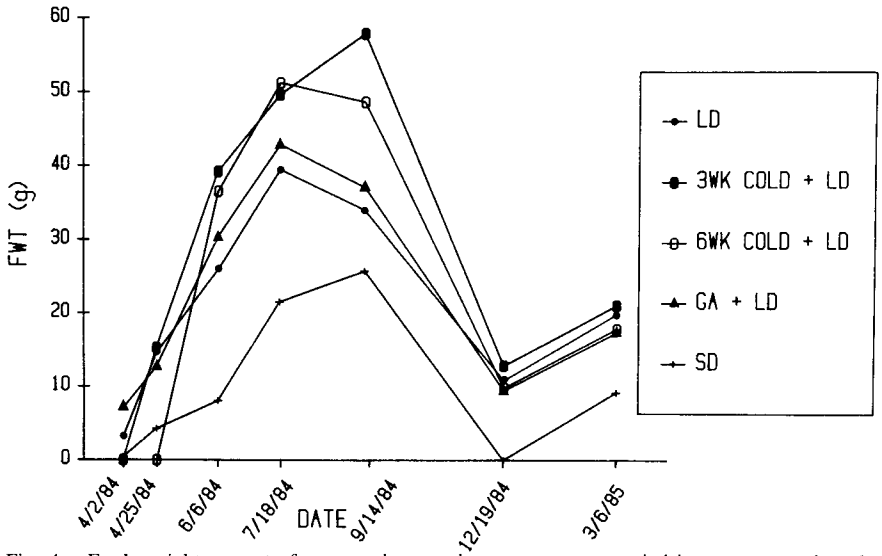

Fig. 4. Fresh weight per pot of tarragon harvested over a one-year period in response to short-day and long-day photoperiods, cold pretreatments, and gibberellic acid spray. N = 10. LSD 5% = 5.19 g. LSD 0.1% = 8.72 g.

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