HortScience 36(5):953–954. 2001.

High Production Temperature Increases Postproduction Flower Longevity and Reduces Bud Drop of Potted, Miniature Roses ‘Meirutral’ and ‘Meidanclar’

José A. Monteiro[1], Terril A. Nell, and James E. Barrett
Department of Environmental Horticulture, University of Florida, Gainesville, FL 32611

Additional index words. keeping quality, night interruption, *Rosa* sp.

***Abstract.* The effect of two temperature regimes (29 °C day/24 °C night and 24 °C day/18 °C night) and of a 4-hour night interruption, during production, was studied on postproduction flower longevity and bud drop of ‘Meirutral’ and ‘Meidanclar’ potted, miniature roses (*Rosa* L. sp.). High production temperatures increased postproduction flower longevity and decreased postproduction bud drop. In ‘Meidanclar’, the high production temperature increased incidence of malformed flowers. No effects of night interruption could be shown on either postproduction flower longevity or bud drop.**

Postproduction flower longevity in potted miniature roses (*Rosa* L. sp.) is greater in plants produced in summer than in those produced in winter, spring, or fall (Andersen et al., 1992; Chen, 1990). When ‘Meijikatar’ and ‘Meirutral’ miniature roses were grown in a growth chamber under long days (14 h) and high temperatures (30 °C day/21 °C night), flower longevity was greater than in plants grown under short days (10 h) and low temperatures (21 °C day/16 °C night) (Kyalo et al., 1996). The increased flower longevity could be the result of the high temperature, the increased daylight integral, a phytochrome-mediated response, or a combination of these three factors. The objective of this work was to assess the effect of production temperature and night interruption on postproduction flower longevity and bud drop of ‘Meirutral’ and ‘Meidanclar’ potted, miniature roses. ‘Meidanclar’ was included in the study; its pattern of flower senescence differs from that of ‘Meirutral’ (Monteiro et al., 2001).

Materials and Methods

Rooted cuttings of ‘Meirutral’ and ‘Meidanclar’ roses (Yoder Brothers, Parrish, Fla.) were grown, one cutting per 0.4-L plastic pot, as described by Monteiro (1993). Plants were grown at warm temperature (WT), 24 °C day/18 °C night, or high temperature (HT), 29 °C day/24 °C night, as well as with incandescent lights from 2200 to 0200 HR or without night interruption, in a split-plot experimental design with temperature as a whole plot. All plants were covered with black opaque cloth from 1630 to 0800 HR to supply a uniform 8.5-h photoperiod. The experiment included five repetitions over time: three repetitions in air-conditioned greenhouses (planting dates: 19 June, 25 July, and 21 Aug. 1992) and two in high-irradiance rooms (planting dates: 1 Oct. 1992 and 5 Mar. 1993). Each repetition included at least four plants per treatment. ‘Meirutral’ was included in all five repetitions, ‘Meidanclar’ only in the last three (once in the greenhouses, twice in the high-irradiance rooms). Light levels at plant canopy at noon on sunny days ranged from 900 to 1100 $\mu mol \cdot m^{-2} \cdot s^{-1}$ photosynthetically active radiation (*PAR*) in the greenhouses and 600 ± 80 $\mu mol \cdot m^{-2} \cdot s^{-1}$ *PAR* in the high-irradiance rooms (Sylvania 1000 Metalarc R bulbs; Osram Sylvania, Danvers, Mass.).

To evaluate postproduction longevity, plants were moved to interior rooms when at least two buds showed color, with sepals starting to separate. Conditions in interior rooms were 21 ± 1 °C, 50% ± 5% relative humidity, and a 12-h photoperiod of 12 $\mu mol \cdot m^{-2} \cdot s^{-1}$ *PAR* from cool-white fluorescent bulbs. Buds were divided into two stages: a) showing color with the sepals starting to separate (stage 1) and b) green buds (stage 0). Flower longevity refers to buds that opened in the interior rooms, and was established as the period from anthesis to flower death (flower drop, petal wilt, petal drop, or petal browning, whichever came first). The buds that failed to open because of bud drop, bud yellowing, or bud browning were counted under the general designation of bud drop. Since night interruption effects were nonsignificant, data from the two night interruption treatments were pooled and temperature effect was analyzed performing a two-sample *t* test for the equality of the means (Ttest Procedure, SAS software, SAS Institute, Cary, N.C.). Percentage of bud drop was analyzed with the transformed variable PD = arcsin[square root (% of bud drop)].

Results and Discusssion

Growing the plants at HT increased flower longevity and decreased bud drop (Table 1). In ‘Meidanclar’, temperature did not affect bud drop of stage 0 buds (Table 1). Nevertheless, under HT conditions ‘Meidanclar’ plants tended to have malformed flowers (overgrown, leafy ovaries); thus, the high temperature used in this experiment is unsuitable for commercial production of this cultivar. Possibly, temperatures in-between the ones used in this experiment would maintain the beneficial effects on flower longevity and bud drop, without the detrimental effects on ‘Meidanclar’ flower morphology.

Growing at high temperatures would not be expected to improve overall net CO_2 exchange rates, as the optimal temperatures determined for similar cultivars (i.e., ‘Meijikatar’ and ‘Meilarco’) are ≈15 to 20 °C (Jiao et al., 1990). Modified priorities on carbohydrate partitioning seem a better explanation. Low night temperatures (12 ºC, as opposed to 18 °C) promote carbon translocation to the basal parts of rose plants, reducing the levels of reducing sugars in flower petals (Khayat and Zieslin, 1989). Also, since high temperature induces smaller flowers (Kyalo et al., 1996), reduced flower size may reduce the flower’s need for carbohydrates to achieve normal opening and development, thus increasing postproduction performance for the same amount of available carbohydrates.

Summer production–increased longevities are, at least, partly due to the increase in

Table 1. Effects of production temperature regime on flower longevity and bud drop, under interior conditions, of ‘Meirutral’ and ‘Meidanclar’ miniature roses. (Interior rooms provided a 12-h photoperiod of 12 $\mu mol \cdot m^{-2} \cdot s^{-1}$ *PAR*, 21 ± 1 ºC, and 50 ± 5% relative humidity).

	Flower longevity (d)				Bud drop (%)			
Temp (ºC)	Meirutral		Meidanclar		Meirutral		Meidanclar	
(day/night)	Stage 0[z]	Stage 1	Stage 0	Stage 1	Stage 0	Stage 1	Stage 0	Stage 1
29/24	9.0	11.1	10.2	12.0	58.8	4.8	66.3	0.8
24/18	2.2	5.3	7.7	8.9	98.3	61.4	73.8	48.3
Significance[y]	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.3894	0.0001

[z]Stage 0 = green buds; Stage 1 = buds showing color with sepals starting to separate.
[y]*P* values for temperature effect (two-sample *t*- test, two tailed).

Received for publication 20 Sept. 2000. Accepted for publication 24 Jan. 2001. Florida Agricultural Experiment Station Journal series No. R-04566. This research was supported in part by grants from the American Flower Endowment and Junta de Investigação Científica e Tecnológica (Programa Ciência, Portugal). We thank Yoder Brothers (Parrish, Fla.) for supplying the plants. 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.
[1]To whom reprint requests should be addressed; current address: University of Algarve, UCTA, Gambelas, 8000 Faro, Portugal. E-mail address: jmontei@ualg.pt

temperature. Increased production temperature is beneficial for some cultivars, like 'Meirutral', but it should be used carefully for cultivars like 'Meidanclar'.

Literature Cited

Andersen, A.S., M. Serek, and P. Johansen. 1992. Holdbarhet af potteroser (Durability of potted roses). Nordisk Jordbruksforskning 74:83.

Chen, L.L. 1990. Growth regulator reversal of simulated high temperature shipping effects on flower senescence and leaf abscission in miniature potted rose plants. MS Thesis, Texas A&M Univ., College Station.

Jiao, J., X. Wang, and M.J. Tsujita. 1990. Whole plant net photosynthesis of miniature roses influenced by light, CO_2 and temperature. Acta Hort. 272:261–265.

Khayat, E. and N. Zieslin. 1989. Translocation of ^{14}C, carbohydrate content and activity of the enzymes of sucrose metabolism in rose petals at different night temperatures. Physiol. Plant. 76:581–585.

Kyalo, T.M., H.B. Pemberton, and J.M. Zajicek. 1996. Seasonal growing environment affects quality characteristics and postproduction longevity of potted miniature roses. HortScience 31:120–122.

Monteiro, J.A. 1993. Postproduction longevity of potted miniature rose: Flower respiration, exogenous sugar and environmental factors during production. PhD Diss., Univ. of Florida, Gainesville.

Monteiro, J.A., T.A. Nell, and J.E. Barrett. 2001. Postproduction of potted miniature rose: Flower respiration and single flower longevity. J. Amer. Soc. Hort. Sci. 126:134–139.

o