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

José A. Monteiro1, Terril A. Nell, and James E. Barrett
Department of Environmental Horticulture, University of Florida, Gainesville, FL 32611

Abstract. The effect of two temperature regimes (29 °C day/24 °C night and 24 °C day/18 °C night) and of a 4-h 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.

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 light levels 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 µmol·m⁻²·s⁻¹ photosynthetically active radiation (PAR) in the greenhouses and 600 ± 80 µmol·m⁻²·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 µmol·m⁻²·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[√(% of bud drop)].

Results and Discussion

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 CO₂ exchange rates, as the optimal temperatures determined for similar cultivars (i.e., ‘Meijikatar’ and ‘Meilarlo’ are 15 to 20 °C (Jiao et al., 1990)). Modified priorities on carbohydrate partitioning seem a better explanation. Low night temperatures (12 °C, 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 (Kyo 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 µmol·m⁻²·s⁻¹ PAR, 21 ± 1 °C, and 50% ± 5% relative humidity).

<table>
<thead>
<tr>
<th>Temp (°C) (day/night)</th>
<th>Flower longevity (d)</th>
<th>Bud drop (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Meirutral</td>
<td>Meidanclar</td>
</tr>
<tr>
<td><strong>Stage 0</strong></td>
<td>Stage 1</td>
<td>Stage 0</td>
</tr>
<tr>
<td>29/24</td>
<td>9.0</td>
<td>11.1</td>
</tr>
<tr>
<td>24/18</td>
<td>9.0</td>
<td>11.1</td>
</tr>
</tbody>
</table>

Significance: *p* = 0.0001, **p** = 0.0001, ***p*** = 0.0001, ****p**** = 0.0001.

*p* values for temperature effect (two-sample *t* test, two-tailed).

To whom reprint requests should be addressed; current address: University of Algarve, UCTA, Gambelas, 8000 Faro, Portugal. E-mail address: jmontei@ualg.pt

1 Received for publication 20 Sept. 2000. Accepted for publication 24 Jan. 2001. Florida Agricultural Experiment Station Journal series No. R-04566. The 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.

2 To whom reprint requests should be addressed; current address: University of Algarve, UCTA, Gambelas, 8000 Faro, Portugal. E-mail address: jmontei@ualg.pt

3 Additional index words. keeping quality, night interruption, Rosa sp.
temperature. Increased production temperature is beneficial for some cultivars, like ‘Meirutral’, but it should be used carefully for cultivars like ‘Meidanclar’.

Literature Cited


