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Scientia Horticulturae 104 (2005) 305–323
SCIENTIA HORTICULTURAE
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Flowering and inflorescence development of *Lachenalia aloides* 'Pearsonii' as influenced by bulb storage and forcing temperature

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Received 17 February 2004; received in revised form 29 September 2004; accepted 13 October 2004

Abstract

The effect of bulb storage and forcing temperatures on growth, flowering, and inflorescence development and blast of *Lachenalia aloides* Engl. 'Pearsonii' was investigated. Bulb temperature treatments began when about five florets were developed. Bulbs were stored at 10 °C, 12.5 °C, 15 °C, 20 °C, and 25 °C for 15, 30, or 45 days and forced in greenhouses at 17/15 °C and 21/19 °C, day (D)/night (N) temperature. Flowering was accelerated, and leaf length and floret number were reduced, when bulbs were stored at 10 °C, 12.5 °C, or 15 °C for 45 days compared with storing at 20 °C or 25 °C. Flowering was further accelerated by forcing at 17/15 °C compared with 21/19 °C (Experiments 1 and 2). When bulbs were stored at 10 °C, 15 °C, 20 °C, or 25 °C for 4 weeks and grown in greenhouses at 17/15 °C, 21/19 °C, 25/23 °C, and 29/27 °C, D/N temperature, the incidence of inflorescence blast was increased when bulbs were stored at 10° and 15 °C and forced at 25/23 °C compared with low temperatures (Experiment 3). Bulbs were stored at 10 °C, 15 °C, 20 °C, or 25 °C for 4 weeks and forced in greenhouses maintained at 18/16 °C, 22/20 °C, or 26/24 °C, D/N temperature, for 12 weeks. During forcing, plants were subjected to a constant 18/16 °C or temperatures were changed after 4 and 8 weeks (e.g., 18/16 °C–22/20 °C–18/16 °C) (Experiment 4). Inflorescence blast occurred when the temperature was 26/24 °C during the first 4 weeks after potting of bulbs that were stored at 15 °C (83%) and 10 °C (50%). Plants from bulbs stored at higher temperatures did not show inflorescence blast. To produce quality plants with short leaves, many

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0304-4238/$ – see front matter
doi:10.1016/j.scienta.2004.10.004

florets, and short floral stems (scape plus inflorescence), it is recommended to store bulbs at 10–15 °C before potting for 30 days and to force at 17/15 °C to accelerate flowering. Inflorescence development during bulb storage at 10 °C and inflorescence blast that occurred after only 3 days of 30 °C was demonstrated using scanning electron microscopy and magnetic resonance imaging techniques.

Keywords: New floral crop; Potted plant; Bulb; Physiological disorder; Scanning electron microscopy; Magnetic resonance imaging

1. Introduction

Lachenalia is a bulbous geophyte belonging to the Liliaceae, and is native primarily to the southwestern Cape and Namaqualand in South Africa (Duncan, 1988). *Lachenalia aloides* (L.f.) Engl. 'Pearsonii' has been cultivated for nearly two centuries as a garden plant (Jansen van Vuuren et al., 1993). Several cultivars with flower colors ranging from red to yellow have been developed in the last 15 years at the Roodeplaat Vegetable and Ornamental Plant Institute of the Agricultural Research Center (Lubbinge et al., 1983; Hancke and Coertze, 1988). However, bulbs were not readily available for commercialization until 1997 (Kleynhans et al., 2002) and *Lachenalia* is still considered a new crop due to the limited availability of new hybrids to the industry and lack of information on controlled flowering.

Inflorescence initiation in *Lachenalia* hybrid 'Romelia' occurs at 15°–25 °C (Louw, 1991) or 10 weeks at 20 °C (Louw, 1993). Roh et al. (1995), however, reported that the shoot apex of *Lachenalia* 'Ronina' and 'Pearsonii' remained vegetative for more than 6 months when bulbs were stored at 15 °C. Inflorescence initiation is influenced by growing temperature before bulb harvest and is accelerated by growing plants at 23–27 °C after flowering and storing bulbs at 25 °C after harvest (Roh et al., 1995). Previously recommended greenhouse forcing temperatures were 30/15 °C for 4 weeks followed by 25/8 °C until flowering (Louw, 1991). Flowering was delayed or plants did not even flower, and the incidence of abnormal development of inflorescence and florets (Fig. 1) increased when *L.* 'Pearsonii' and *L. aloides* var. *quadricolor* (Jacq.) Engl. were forced at temperatures exceeding 23 °C during summer or when bulbs stored at 10–15 °C were forced (Roh, unpublished data).

Failure to flower, low flowering percentage, and a lack of uniformity and periodicity of flowering in many geophytes depends on many factors, such as bulb size and periodicity of inflorescence initiation. Failure of scape elongation due to a death of florets (inflorescence blast) is caused by unfavorable external factors, such as temperature during bulb production, storage, and forcing (Rees, 1992; Roh et al., 1998) or the internal source-sink relationship between inflorescence and other organs (Theron and Jacobs, 1996). In *Lachenalia*, failure of flowering after inflorescence initiation and development is observed that are similar to a physiological disorder observed in *Tulipa* (Rees, 1992). Typical disorders caused after initiation of the inflorescence include a near-normal extension of scape with dead florets, malformation of some florets formed at the base of the inflorescence, cessation of scape elongation above the center of the plant, and dried and