

Review

Recommended temperature and relative humidity for storage of Brazilian tropical flowers

Marcos Ribeiro da Silva Vieira^{1*}, Adriano do Nascimento Simões¹ and Pahlevi Augusto de Souza²

¹Universidade Federal Rural de Pernambuco, Unidade Acadêmica de Serra Talhada, CEP: 59909-460, Serra Talhada, PE, Brasil.

²Instituto Federal de Educação, Ciência e Tecnologia do Ceará, CEP: 62930-000, Limoeiro do Norte, CE, Brasil.

Received 28 October, 2013; Accepted 16 January, 2014

Post-harvest treatment and proper handling is essential so that the flowers can maintain their quality during marketing and exporting. This review aims to give information on the storage temperature used in postharvest handling of tropical flowers of Brazil. This review provides detailed specifications and recommendations for storing the six main Brazilian tropical flowers.

Key words: Floriculture, refrigeration, quality assurance, conservation.

INTRODUCTION

Cut flowers slowly deteriorate and lose quality after harvest. Good postharvest treatment slows the loss of quality. Quick handling makes the flowers get to customers while they still look fresh. The stem of flowers need clean water and the leaves need humid and cool air in order to prevent wilting. Re-cutting of the base of the stem or addition of hydrating treatments to the water, or both often improve water uptake. Cold handling dramatically delays quality loss, water loss and death; postharvest solutions can improve water uptake, delay ageing and deterioration and improve flower opening; ethylene protection for sensitive flowers will reduce flower drop and ageing. Exposure to ethylene should sometimes be avoided, and the action of ethylene can be slowed or stopped by anti-ethylene treatments. Pest control kills insects that would otherwise lead to rejection of flowers in the market place or fumigation at the growers' or exporters' expense. Fungicide treatment may be needed to control fungal growth on some flowers; packaging enables efficient transport, protects flowers physically, and keeps flowers cool and humid (Faragher et al., 2010). In summary, we will only cover recommended

temperatures for some species of tropical flowers in Brazil.

ANTHURIUM (*Anthurium andraeanum* Lindl)

The ideal storage temperature for anthurium is 15-18°C and RH is 90 to 95%; below 10 to 12°C, damage occurs, and the sheaths are bluish or wilted. High humidity favors the extension of vase life, and conserves water loss through transpiration (Figure 1). The flowers must be transported, for ease of packing in refrigerated trucks (isothermal) to the airport. In all cases, care should be taken regarding contact with wind, sun and rain (Paull, 1987; Lamas, 2004).

HELICONIA (*Heliconia* spp)

Arriving at the packing house, the stems should be placed in clean water. This practice increases durability by helping to reduce the temperature of the same, and

*Corresponding author. E-mail: m.r.s.v@hotmail.com.



Figure 1. Anthurium yellow.



Figure 2. *Heliconia psittacorum*.

wipe away dirt and remove the bad smell of some species. Heliconia flowers may be intended for different uses (Figure 2). Because this classification is important, care should be taken to select them by the number of bracts opened; usually a pointer and a five bracts open. It is recommended that before packaging, the stem should be cut and submerged in water containing chlorine solution of 0.02%; this acts as bactericidal. In the handling and packaging of inflorescences of heliconia, just as other flowers, special care is required to avoid injuries and damage to the same. The ideal temperature for handling heliconia is between 17 and 19°C and



Figure 3. *Strelitzia reginae*.

storage is above 14°C. In practice, given the susceptibility to low temperature is to write in the boxes, "not refrigerated" (Castro, 1998; Lamas, 2000; 2004).

STRELITZIA (*Strelitzia reginae* Banks ex Aiton)

In *Strelitzia reginae* (Figure 3), the biggest problem in the post-harvest is incomplete opening of the flowers and an apparent susceptibility to chilling injury (Macnish et al., 2009) besides the development of spots on the inflorescences few days before harvest (Pizano, 2005; Hassan, 2009). The ideal temperature for handling the inflorescences of *Strelitzia* is above 7°C with closed button: 1 month to 7°C; 85-90% RH. Vieira (2011) studying two temperatures of cold storage to *Strelitzia* noted the temperature of 7.5 showed symptoms of necrosis in the inflorescences being recommended temperature of 10 °C. This author also noted that 10 °C is not recommended for cut chrysanthemum FAROE (Vieira and Lima, 2009).

RED GINGER (*Alpinia purpurata* (Vieill.) Schum)

Upon arrival at the treatment shed (packing house), the stems should be placed in clean water; this practice increases durability by helping to reduce the temperature of the same and facilitate cleaning. The remaining leaves should be removed. The leaves of the stems should be removed and flushed to the pseudostem; the two sheets terminals can be left. This facilitates packaging, as it protects the leaves from injury. As for the procedures, after cutting in the field, the stems are always immersed in water; these inflorescences present a durability of at least 15 days or so. The pH of the water during post-harvest handling should be in the range of 4.5. The sizes



Figure 4. *Alpinia purpurata*.



Figure 5. *Etlingera elatior*.

of rods for sale range from 0.60 to 1.10 m, including the inflorescence. The classification of alpinias takes the size of inflorescences in the following classes: the transport and storage of *Alpinia* need special care, depending on their sensitivity to cold and dehydration. The ideal storage



Figure 6. *Zingiber spectabile*.

temperature for red ginger and transport in refrigerated environment is 15-18°C and high relative humidity (Figure 4) (Atehortua, 1998; Castro, 1998; Lamas, 2000; 2004).

TORCH GINGER (*Etlingera elatior* R.M. Smith)

Since harvest is in the field, stems should be immersed in water. At the packing house, the rods must be immersed in pure water, preferably lying without the need for immersing the inflorescence. The inflorescences have a durability of approximately 15 days. The transport and storage of torch ginger need special care due to their sensitivity to cold and dehydration (Figure 5). The ideal temperature for handling the inflorescence is between 17 and 19°C and storage is above 14°C (15 - 18° C). High relative humidity needs to be maintained (90-95%). In practice, given the susceptibility at low temperature is to write in the boxes, "not refrigerated" (Castro, 1998; Lamas, 2004).

BEEHIVE GINGER (*Zingiber spectabile*, Griff)

At the packing house, the stems should be placed in clean water. This practice increases durability by helping to reduce the temperature of the same, and clean the soil. After cleaning and drying, they must be individually wrapped, protected by mesh or plastic bags. The boxes, with unit packets, must be lined with polyethylene film. When properly handled and prepared, the inflorescences of beehive ginger have a shelf life of up to three weeks (Figure 6). It is recommended that before packaging, the stem should be cut and submerged in water containing

bactericidal solution. The ideal storage temperature for beehive ginger and transport in refrigerated environment is 15-18°C and high relative humidity. When exposure occurs at low temperatures, the inflorescences present early wilting and browning of the bracts, besides favoring dehydration (Leitão, 2000; Lamas, 2004).

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