Water Relations of Cut Bird-of-paradise (*Strelitzia reginae* Ait.) Inflorescences[1]

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ABSTRACT

The influence of periodically recutting at basal stem end on longevity and water status throughout vase life of bird-of-paradise inflorescences was studied. The relative water content of sepals increased rapidly once the stems were stood in water, reaching maximum value at about 10 hours of vase life. However, the relative water content of bracts was constant over the same period of time. Recutting the stem helped to maintain the water status of both flower sepals and bracts, but a significant water loss was observed through vase life of uncut stems. Periodically recutting the stem end increased the number of fully opened florets by 1.7 times and extended the vase life of the flower by 49%.

Key words: relative water content, sepals, bracts, longevity.

RESUMO

Relações hídricas de inflorescências cortadas de ave-do-paraíso (*Strelitzia reginae* Ait.)

A absorção e o transporte de água pelas flores cortadas mantidas em vaso podem ser diminuídos ou interrompidos devido à obstrução do xilema, acarretando murchamento e senescência de pétalas e sépalas. O presente trabalho teve como objetivo avaliar o efeito de cortes a cada dois dias, na base de hastes de inflorescências de ave-do-paraíso, sobre o teor relativo de água de brácteas e sépalas, longevidade e número de floretes abertos. Nas hastes não cortadas, observou-se redução de 3% no teor de água da bráctea e 9,4% nas sépalas após 7 dias em vaso à temperatura de 25°C. O corte periódico da base das hastes manteve estável o teor relativo de água, cerca de 89,1% na bráctea e 93,9% nas sépalas até 9 dias após a colheita em vaso. O corte periódico aumentou em 49% a longevidade pós-colheita da inflorescência e elevou de 1,6 para 2,7 o número de floretes abertos.

Palavras-chave: teor relativo de água, sépala, bráctea, longevidade.

1. INTRODUCTION

Postharvest physiology of a large number of cut flowers has been intensely investigated to lengthen their vase-life. Among many determining factors, water bal-

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ance plays a major role in establishing the longevity of both cut and potted flowers (KAYS, 1991). It is well known that water stress may induce ethylene production and accelerate the senescence of many cut flowers, such as carnation (BOROCHOV et al., 1982) and anthurium (PAULL & GOO, 1985). Several commercial species of cut flowers eventually fail to take up water due to blockage by air of xylem, growth of microorganisms or by physiological obstruction of stem basal end (MUÑOZ et al., 1982; PAULL et al., 1985; NOWAK & RUDNICKI, 1990). Studying the senescence of *Acacia amoena*, WILLIAMSON & MILBURN (1995) observed formation of gas bubbles (cavitation) in the xylem, this being the major cause for the decrease in hydraulic conductance of cut stems.

In addition to its high commercial value as a cut flower, bird-of-paradise inflorescence has attractive and colorful florets, each being composed of two orange sepals and one blue petal. However, without any postharvest treatment, the florets wilt in few days, followed by intense browning and discoloration, starting from the oldest open floret. Such events may suggest possible restriction of water uptake by the cut stem. The objectives of this study were to investigate the water relations in cut inflorescences of bird-of-paradise and the effect of periodic recuts on flower water balance and longevity.

2. MATERIAL AND METHODS

Inflorescences were harvested from plants grown at the Universidade Federal de Viçosa (Brazil) when the first floret was fully opened. The stems were then cut to an uniform 80 cm length and immediately placed into vases containing distilled water. For the recutting treatment, the base of the stems was recut every 2 days at 2 cm from the basal end. At these times, the water in each vase was replaced in both control and recutting treatment. During whole experiment, the inflorescences were kept at 25°C and 60% relative humidity.

For water status determinations, six discs of 12 mm in diameter were excised from opposite sides of the bract and from the youngest fully opened orange sepal at a frequency of 2 hours over a 12 hours period, and then at 2 day intervals, starting after 24 hours from the beginning of the experiment. The discs were immediately used to obtain the Relative Water Contents (RWC) as determined by WEATHERLEY (1950), according to the formula:

$$RWC = \frac{\text{Original fresh weight} - \text{Oven dry weight}}{\text{Saturated weight} - \text{Oven dry weight}} \times 100$$

Inflorescence longevity and the number of open florets were evaluated on a daily basis. The inflorescences were considered unacceptable when at least one floret was wilted and completely browned. The experiment was arranged in a completely randomized design with three replicates each composed of 5 inflorescences for RWC analysis. Thirty inflorescences were used for longevity and determination the number of open florets. Data were subjected to variance analysis and regression analysis, and the means were separated using Tukey's test.

3. RESULTS AND DISCUSSION

Relative water content of sepals increased significantly ($P < 0.01$) from 86.5% at harvest to a maximum of 96.5% within 12 hours of being placed into water (Figure 1). In contrast, the RWC of bracts was constant ($P < 0.01$) from harvest up to 12 hours in water. This difference in behavior between the organs may reflect the greater thickness of bract tissue compared to sepal. Thus, the succulence of bract tissue would allow only minor changes in its water content under stressed conditions. Therefore, sepals are the more appropriate organs to evaluate the magnitude of water deficit condition affecting inflorescences of bird-of-paradise. After 10 hours in water, RWC of sepals showed trends of decrease (Fig. 1), reflecting either apparent lower capacity for water uptake and/or higher rates of transpiration by the inflorescence. PORAT et al. (1994) working with cut pollinated *Phalaenopsis* flowers observed that the rate of water uptake decreased within the first 70 hours after harvest, but the transpiration rate was kept constant during the same period of vase life, thereby resulting in tissue water deficit.

When the base of the stem was recut every 2 days, the RWC of sepals and bracts were not significantly (*P* 0.01) reduced. Water contents were maintained at levels of 93.9% and 89.1%, respectively, throughout vase life (Figures 2A and 2B). On the other hand, for control inflorescences, the RWC fell significantly for both sepals (*P* 0.01) and bracts (*P*

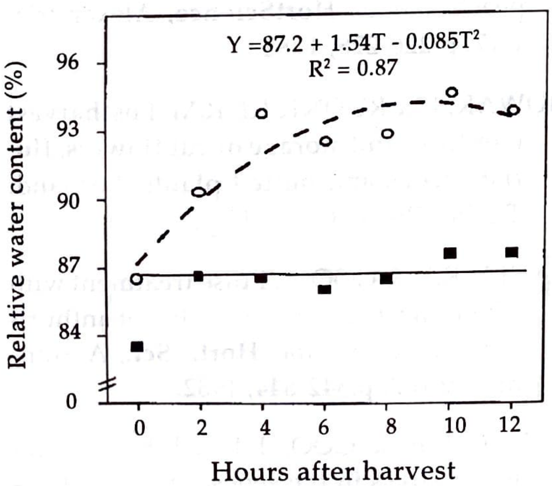

Fig. 1. Changes in the relative water content of sepals (O) and of bracts (■) of cut bird-of paradise inflorescences held at 25°C and 60% relative humidity.

Table 1. Flower longevity and the number of open florets on uncut (control) and periodically recut (2 days) bird-of-paradise inflorescences.

Treatment	Longevity (days)	Number of open florets
Control	7.6 a	1.6 a
Recut	11.3 b	2.7 b

Mean separation in the columns by Tukey's test at $P \leq 0.05$.

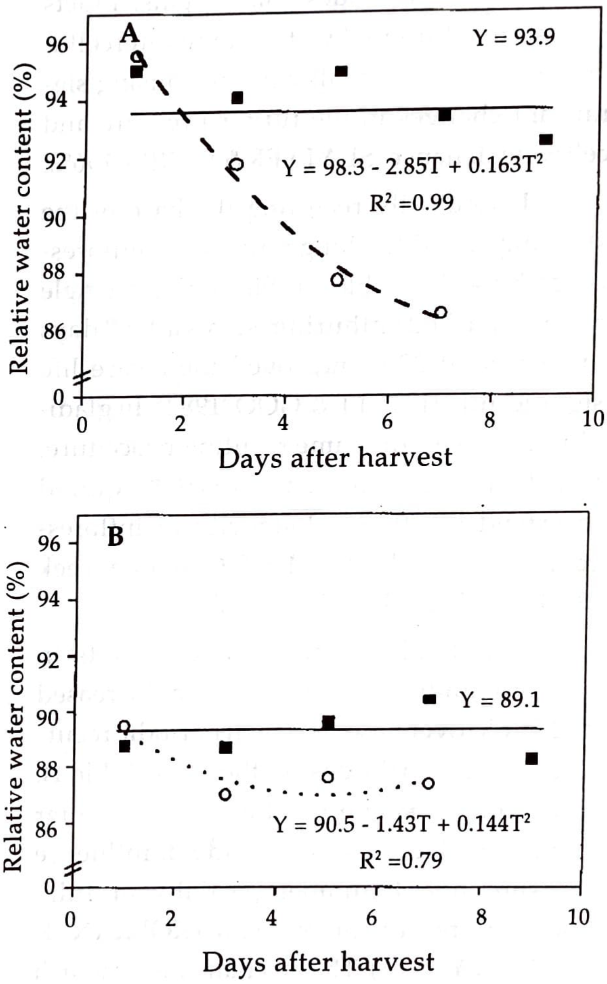

Fig. 2. Changes in the relative water content of sepals (A) and bracts (B) of repeatedly recut (■) and of control (O) cut bird-of-paradise inflorescences held at 25°C and 60% relative humidity.

0.05), during the same period of time (Figures 2A and 2B). Other authors have reported similar trends of persistent tissue dehydration during vase life of flowers like cut carnation and *Limonium* (BOROCHOV et al., 1982; DOI & REID, 1995).

Sepals were more sensitive to water loss than bracts. For instance, while sepals from the inflorescences of the control treatment lost 9.0% of water over 7 days of vase life, bracts showed only a 2.1% reduction of RWC during the same period time (Figures 2A and 2B). Since bracts are composed by more succulent tissues than sepals, bracts may store additional water in the intercellular spaces and cell wall without causing significant changes in the turgor pressure and cell water balance (SLATYER & BARRS, 1965).

Periodically recutting the base of the stem improved the longevity of the inflorescence by 49% (Table 1). Similarly, a single recut on packed anthurium stems after 3 days of storage at 22°C improved their vase life significantly (PAULL & GOO, 1982). In gladiolus, however, the same recuting procedure, tested on anthurium stems, was not required to extend the flower longevity of inflorescences previously stored at 2°C for one week (KOFRANEK & HALEVY, 1976).

The final number of open florets in bird-of-paradise inflorescences was increased by 1.7 fold over vase life when periodic recuts were applied to the base of the stem (Table 1). In contrast, a single recut applied just after storage of gladiolus stems, did not influence the subsequent number partially or fully opened florets during vase life (KOFRANEK & HALEVY, 1976). The mechanisms by which the recut procedure, applied to the stems of bird-of-paradise inflorescences, increased the final number of open florets remain unknown. Furthermore, the nature of water uptake restriction by the stem was not investigated in this experiment, however periodic recutting effectively creates a clean and fresh surface at the stem end.

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