FACTORS AFFECTING THE LONGEVITY OF CUT ARANDA FLOWER

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Abstract

Factors affecting the keeping quality of Aranda flowers were investigated. This included changes in fresh and dry weight, sugar content and water potential of flower before and after harvest; floral stomata; water loss; effect of sucrose, HQS, and STS on flower longevity. Pulsing with Silver thiosulfate, STS (4 mM) for 10 minutes extended the life of cut Aranda flowers.

1. Introduction

Singapore exports million dollars worth of cut tropical orchid flowers annually. Top on the export list is the Aranda flower (Ng, 1984). Because of the effort made over the years in Aranda breeding, Singapore is now the leading exporter of cut Aranda flowers in Asean regions. In contrast to the effort made in breeding, works on postharvest handling of cut tropical orchid flower are very limited indeed. This paper reports our attempt made to understand better the factors affecting the keeping quality of Aranda flowers with the hope of introducing a suitable method for the postharvest handling of this important tropical orchid flower.

2. Materials and methods

Inflorescences of Aranda Christine No. 1 and Aranda Wendy Scott were obtained on the day of harvest from Multco Orchids Pte Ltd, Singapore. Inflorescence with 80% blooms was brought to the laboratory, graded for uniformity and recut under water. The inflorescence was held separately in test tube containing 10 ml of water or holding solution and kept at 23 C and 11 hr daylength of daylength of light intensity 60 UE cm sec

Changes in fresh and dry weight, sugar content and water potential of flowers along an inflorescence before and after harvest were determined. The total sugar content was determined colourimetrically (Dubois et al 1956). A Scholander pressure bomb was used to measure the water potential of each flower.

Stomata distribution in petal was measured microscopically. Transpiration rate was determined by differential pschometer method (Hew et al, 1980). Floral stomata were also examined under scanning electron microscope. Sample for SEM was prepared as described earlier (Hew and Veltkemp, 1985). For postharvest studies, flower was scored as wilted when the petals started to droop. Silver thiosulfate (STS) was prepared fresh as described by Reid et al (1980). Ten inflorescences were used for each determination.

3. Results

3.1. Physiochemical studies of Aranda flower before and after harvest

The fresh and dry weight of Aranda Christine flowers increased with age reaching a constant value in the 4th flower. Water potential also increased following the opening of flower but remained constant from the 3rd flower onwards. The sugar content decreased with age. When the flowers are fully opened i.e. 4th - 6th flowers, they have relatively constant fresh and dry weight, sugar content and water potential.

Following harvest, there was a continuous decline in fresh weight, dry weight and sugar content in the fully opened flower (Fig 1). Drop in sugar content was most apparent after the 4th day.

3.2. Stomata distribution and water loss

Stomata were found on both side of perianth (Table 1), with sepal having a higher number of stomata. Transpiration rate of both Aranda flowers was between 0.15 to 0.17 mg H_2O cm^{-2} hr^{-1}. Stomata were closed as seen under the SEM (Fig 2).

3.3. Extension of vase-life

3.3.1. Treatment with various sucrose concentrations

Sucrose concentration of 0.2 and 2% did not extend the life cut Aranda Christine flower. Wilting of flowers in water and 2% sucrose was 4% and 7.4% on the 8th day after harvest and 14% and 35% on the 18th day respectively. Sucrose solution was topped up to 10 ml in every 4 days.

3.3.2. Treatment with silver thiosulfate complex

Table 2 shows that as short as two minutes at 4 mM, STS significantly extended the life of Aranda flower. Great improvement was obtained when the flower was pulsed for 10 minutes (Table 3). Percentage of wilting was reduced from 100% in the control to 4.2% when scored on the 28th day.

3.3.3. Treatment with 8 hydroxylquinoline sulfate and Silver thiosulfate Complex

Inflorescences were placed separately in test tubes containing water, or 8 HQS (100 ppm). High % of wilting observed in was observed in inflorescences placed in HQS (30%) and those pulsed with STS then held in HQS (50%) on the 18th day. In control there was 10% wilting. No sign of wilting was observed in flowers pulsed with STS and then placed in water. Changes in water potential, sugar content, fresh and dry weight in flowers in the latter was similar to that of the control.

4. Discussion

When flowers are excised from plants, the supply of water, nutrients and possibly, some growth hormone also, will be cut off (Mayak and Halevy, 1980). As a result they deteriorate much faster than those attached to the plants under similar conditions.

In our present studies, the senescence of cut Aranda flower was accompanied by a loss of fresh weight, dry weight, sugar content and an increase in water potential. Supply of sucrose did not seem to arrest the fading. The same has also been observed for Oncidium flower (Ong et al, 1980). This could be attributed to a microbial occlusion developed in the vascular system when the spike was kept for a long time in sucrose solution. (Rasmussen and carpenter, 1974). If the sucrose solution was changed at regular interval, this could be avoided.

Aranda flowers have low frequency of stomata and low transpiration rate as has been observed earlier for other tropical orchid flowers (Hew et al, 1980). As seen under SEM, the Aranda, floral stomata were closed at all times. This support our previous observation that orchid floral stomata are nonfunctional and that cuticular transpiration plays a major role in water loss by orchid flower (Hew et al, 1980). Taking into account of the total surface area, water loss by Aranda was about 0.4 gm water per day per inflorescene. This value is considerably lower than that of roses and and other flowers (Mayak et al 1974). Unlike other flowers, orchid

inflorescence does not have supporting leaves. This may account for its lower rate of water loss. Stripping the leaves of a rose flower stalk caused a ten fold reduction in its transpiration rate (Mayak et al, 1979).

Hydroxylquinoline sulfate, a bacteriocide, often included in various holding solution for other flowers (Rogers, 1973) was found to have an adverse effect on Aranda flower when the inflorescence was placed in HQS solution for a long period of time. The effect of HQS on vase life of other tropical orchids have been examined and found to range from beneficial to no effect or harmful (Nowak and Vacharotyan, 1980).

Treatment with STS extended the vase-life of Aranda flower. This is in agreement with the findings reported for some other flowers (Veen, 1983). Our results would therefore indicate that controlling the ethylene production and action is critical in extending the vase-life of Aranda flower. Orchid blossoms are sensitive to ethylene and senescing flowers produce their own ethylene (Arditt, 1979).

5. References

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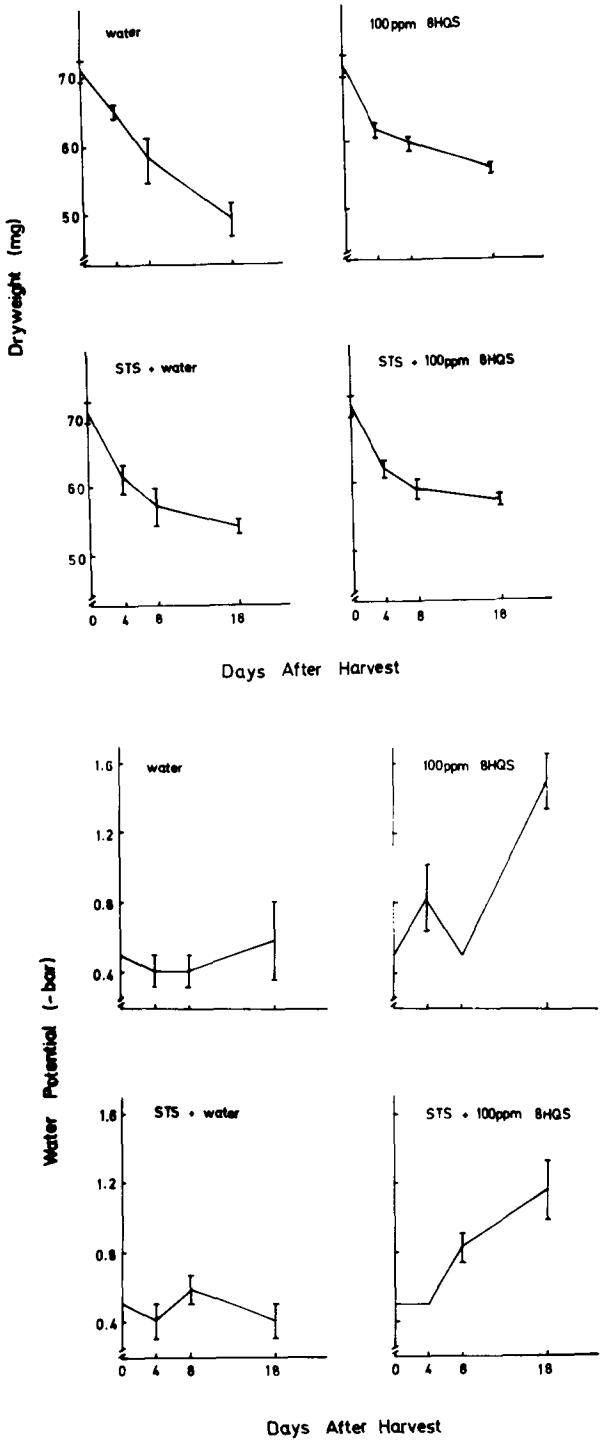

Fig. 1.

Changes in dry weight and water potential of Aranda flower after various treatments.

Table 1 - Stomata distribution and transpiration rate of *Aranda* flowers

	Stomata distribution (No of stomata cm^{-2})				Transpiration ($mg\ H_2O\ cm^{-2}\ hr^{-2}$)
	Upper sepal	Lower sepal	Upper petal	Lower petal	
Aranda Christine 1	198	50	38	40	0.18
Aranda Wendy Scott	124	67	45	45	0.14

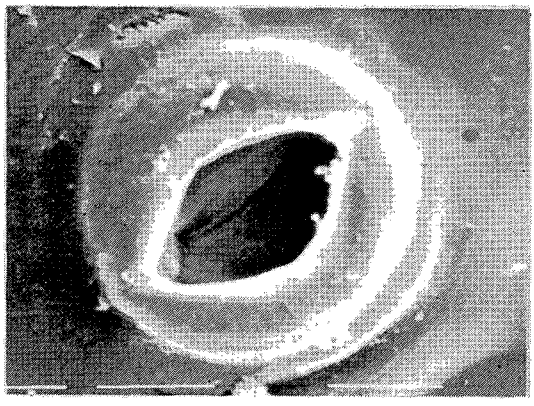

Fig 2 Stomata of *Aranda* petal bar = 10 u

Table 2 - Effect of various treatment times of STS on longevity Aranda flowers. Flowers were pulsed with 4 mM STS Wilting was scored on 28th day.

Time of treatment (min)	% wilting
0	100±0*
2	31.8±5.3
10	5.4±0.6
30	6.7±0.7

± S.E.

Table 3 - Effect of various concentrations of STS on longevity of Aranda flowers. Flowers were pulsed with STS for 10 minutes. Wilting was scored on 28th day.

Treatment concentration	% of wilting
Distilled water	100±0
0.5 mM STS	63.6±9.5
1 mM STS	47.8±8.0
2 mM STS	16.7±4.3
4 mM STS	4.2±1.2

± S.E.