

Vase Life and Sepal Anatomy Characteristics of Cut Hydrangea Cultivars

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INTRODUCTION & AIMS

Hydrangea macrophylla is the most popular and extensively cultivated among *Hydrangea* species, such as *H. paniculata*, *H. serrata*, and *H. arborescens*. Cut hydrangea flowers are available in two distinct forms: fresh-stage flowers, harvested just before or during flowering when the ornamental sepals are fully coloured, and antique-stage flowers, collected post-flowering when the decorative sepals change to green and/or red hues. In hydrangea, vase life varies widely among cultivars due to inherent physiological and anatomical differences that influence water balance, senescence processes, and overall postharvest performance.

This study aimed to: (1) Assess the vase life of eight hydrangea cultivars at both fresh and antique/classic stages; (2) Quantify key sepal physiological and anatomical traits, including total soluble sugars, reducing sugars, stomatal and epidermal cell densities, stomatal area, and stomatal index; (3) Determine the relationships between these parameters and postharvest longevity to identify traits associated with superior vase performance.

METHODS

8 Hydrangea Cultivars with two different stages

1. Fresh Stages



2. Antique/Classic Stage



- Sugars content (Dubois et al. 1956)
- Anatomical assessment: ImageJ

RESULTS

Table 1. Vase life of cut hydrangea flowers at fresh and antique/classic stages

Cultivars	Vase life (days)		Means for cultivar
	Fresh stage	Antique/classic stage	
Royal Anastasia	16.9 c	20.8 b	18.9 bc
Royal Benefit	9.8 ef	11.8 de	10.6 e
Royal King	7.3 f	28.7 a	16.1 d
Royal Opera	9.6 ef	22.6 b	16.5 cd
Royal Palace	10.9 ef	27.0 a	18.9 bc
Royal Parade	14.4 cd	29.3 a	20.9 ab
Royal Princess	15.0 cd	29.4 a	22.7 a
Royal Surprise	14.8 cd	29.3 a	21.7 a
Means for stages	12.3 b	24.9 a	

Table 2. Comparison of total soluble sugar and reducing sugar of cut hydrangea flowers at different stages

Cultivars	Total Soluble Sugar			Reducing Sugar		
	Fresh stage	Antique/classic stage	Means for cultivar	Fresh stage	Antique/classic stage	Means for cultivar
Royal Anastasia	173.31 c	125.27 f	149.29 d	141.21 g	117.73 jk	129.47 ef
Royal Benefit	162.40 c	167.32 c	164.86 c	124.58 ij	113.56 k	119.07 g
Royal King	130.06 f	172.74 c	151.40 d	102.98 l	147.79 ef	125.38 f
Royal Opera	132.55 de	166.63 c	149.59 d	146.07 ef	177.26 c	161.67 b
Royal Palace	260.90 a	211.12 b	236.01 a	197.99 b	208.25 a	203.12 a
Royal Parade	199.97 b	207.01 b	203.49 b	138.53 f	151.20 e	144.86 d
Royal Princess	138.64 de	145.69 d	142.16 d	142.81 ef	166.72 d	154.76 c
Royal Surprise	171.39 c	168.37 c	169.88 c	130.74 hi	133.12 ghi	131.93 e

Table 3 Stomata and epidermal cells for hydrangea cultivars

Cultivars	Area (µm²)			Number of stomata per mm²			Number of epidermis per mm²			Stomatal index (%)		
	Fresh stage	Antique/classic stage	Means for cultivar	Fresh stage	Antique/classic stage	Means for cultivar	Fresh stage	Antique/classic stage	Means for cultivar	Fresh stage	Antique/classic stage	Means for cultivar
Royal Anastasia	379.68 de	440.391ab	410.04 b	47.56 a	26.98 def	37.27 a	771.10 a	609.39 c	690.24 a	5.83 c	4.20 de	5.02 c
Royal Benefit	400.17 cd	367.63 e	383.90 c	35.53 bc	19.80 f	27.66 bc	529.40 de	530.37 de	529.89 bc	6.33 abc	3.52 e	4.93 c
Royal King	420.02 c	463.11 a	441.56 a	34.17 cd	27.18 cdef	30.67 bc	536.20 de	492.13 ef	514.16 c	5.96 bc	5.41 cd	5.69 bc
Royal Opera	313.37 gh	352.05 ef	332.71 e	35.72 bc	21.16 ef	28.44 bc	631.52 b	498.92 ef	565.22	5.45 cd	4.17 de	4.81 c
Royal Palace	375.01 de	347.99 ef	361.50 d	42.13 ab	25.24 def	33.68 ab	514.06 e	576.77 cd	545.42 bc	7.51 ab	4.15 de	5.83 bc
Royal Parade	325.773fgh	294.86 h	310.31 f	30.09 cde	25.82 def	27.96 bc	454.47 fg	456.41 fg	455.44 d	6.27 abc	5.57 cd	5.92 bc
Royal Princess	421.55 bc	469.06 a	445.31 a	31.84 cd	22.33 ef	27.08 c	427.09 gh	384.77 hi	405.93 e	6.99 abc	5.57 cd	6.28 ab
Royal Surprise	324.99 fgh	331.03 fg	328.01 ef	35.53 bc	29.51 cde	32.52 abc	482.03 efg	361.86 i	421.95 de	6.87 abc	7.60 a	7.24 a
Means for stages	370.07 b	383.26 a		36.57 a	24.75 b		543.23 a	488.83 b		6.40 a	5.02 b	

CONCLUSIONS

- Vase life of cut hydrangea flowers varies significantly among cultivars due to differences in physiological and anatomical traits.
- ‘Royal Princess’, ‘Royal Surprise’, and ‘Royal Parade’ demonstrated the longest vase life, while ‘Royal Benefit’ had the shortest.
- Higher total soluble sugar and reducing sugar contents were strongly associated with longer vase longevity, with ‘Royal Palace’ showing the highest sugar levels.
- Sepal anatomical traits—such as stomatal density, epidermal cell density, stomatal area, and stomatal index—also varied significantly across cultivars.
- Favorable anatomical characteristics, including larger stomatal areas and optimal stomatal index, contributed to better postharvest performance.

REFERENCE

Dubois M., Gilles K.A., Hamilton J.K., 1956. Colorimetric Method for Determination of Sugars and Related Substances. *Anal. Chem.*, 28, 350–356.