



Extending Postharvest Vase Life of Dahlia: the Struggle Continues

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The inspiration for this research came when my graduate student, Leslie Peck, attended the ASCFG Grower Intensive at Greenstone Fields in September of 2015. The workshop included tours to Don's Dahlias and Wollam Gardens, where Leslie learned much about dahlia production, including their notoriously short vase life. She came back inspired to look at several postharvest aspects, in addition to her work on *Delphinium* and *Helianthus*.

We grew two dahlia cultivars, 'Park Princess' and 'Karma Yin Yang' (it is *really* fun to say "yin yang" in a scientific presentation) in drip-irrigated, mulched rows at our Urban Horticulture Center (Blacksburg, Virginia, USDA Hardiness Zone 6B, elevation 2,100 ft). Stems were harvested beginning 13 weeks from planting. For all studies, vase life was defined as number of days until at least 50% of the flower petals had wilted.

Benzyladenine and vase life extension. Previous research has shown that cytokinins such as benzyladenine (BA) can be an option for delaying senescence of several species of cut flowers. One mechanism proposed is the regulation of ethylene biosynthesis by BA, but other factors may be at work. Researchers found applications of BA (dip or spray) significantly extended the vase life of dahlia 'Kokucho.' Our work was done on the two dahlia cultivars mentioned above. After harvest, stems of each cultivar received one of three treatments: 5-second dip of flower heads into BA at $300 \text{ mg}\cdot\text{L}^{-1}$, a water dip (BA at $0 \text{ mg}\cdot\text{L}^{-1}$), or no dip treatment (dry). Vase life was not significantly impacted for either 'Park Princess' (ranged from 7 to 9 days) or 'Karma Yin Yang' (7 days) as measured among these treatments. So scratch that, at least for these cultivars.

Ethylene. Dahlia is not usually included on lists of ethylene-sensitive flowers, but some research and anecdotal evidence exists to the contrary. The cultivar 'Kokucho' was found to be sensitive to ethylene, the same researchers found application (dip or spray) of the endogenous plant hormone benzyladine (BA) significantly extended vase life. However, Dr. John Dole and crew had worked on extending the postharvest life of dahlia 'Karma Thalia' and found that particular culti-



Ethylene treatment chamber.

var to NOT be sensitive to ethylene at $1.0 \mu\text{L}\cdot\text{L}^{-1}$. The active threshold level for ethylene to have physiological impacts on plants is generally cited as $0.1 \mu\text{L}\cdot\text{L}^{-1}$.

To administer the ethylene treatments ($0.9 \mu\text{L}\cdot\text{L}^{-1}$ or $0 \mu\text{L}\cdot\text{L}^{-1}$ for 18 hours), we built an airtight Plexiglas chamber. Seam integrity was tested with a disco fog machine (science!). Air samples were taken at termination of treatment to verify concentration via gas chromatography. Vase life for both cultivars was similar to that in the BA experiment, and not impacted by ethylene exposure. These studies together suggest the effectiveness of BA in extending vase life of dahlia is tied to ethylene sensitivity and is cultivar-dependent.

What about ethylene sensitivity in other cultivars? We worked with a local grower to obtain stems of dahlia 'Amber Queen,' 'Bodacious,' 'Bride to Be,' 'Cherish,' 'Ginger Willow,' 'Lollipop,' 'Park Princess,' and 'White Fawn.' All were exposed to ethylene levels of $0.8\text{-}0.9 \mu\text{L}\cdot\text{L}^{-1}$ for 18 hours each. Ethylene exposure did not alter vase life in any of the cultivars studied when compared to control ($0 \mu\text{L}\cdot\text{L}^{-1}$). Vase life was, however, widely/wildly variable among cultivars, ranging from 3.8 days for 'Amber Queen' to 9.5 days for 'Bodacious.'

Water temperature. Some sources suggest that placing freshly cut dahlias into hot water will encourage water uptake and extend vase life. In a replicated experiment, flowers were harvested when 50% to 75% of the petals had expanded. Stems were rapidly recut and placed immediately into water that was either ambient temperature (20 to 23°C) or heated to $36\text{-}43^\circ\text{C}$. The hot water treatment significantly increase water uptake for both cultivars and increased vase life for 'Park Princess' from 4.0 to 6.0 days, though the difference between temperature treatments was not significant for 'Karma Yin Yang' (5.5 to 6.3 days). When the experiment was repeated the following week, water temperature had no impact on either water uptake OR vase life, for either cultivar! We did note the weather during the second harvest was cooler and drier with lower relative humidity. Alas, frost came before we could run a third "tiebreaker" experiment. Our results were inconclusive: the hot water treatment is probably not worth the trouble, though growers might want to give it a try for some cultivars with very short vase life.

Harvest stage. Dahlia for local markets are cut mostly to fully open. But some can be cut quite early; performance seems to be cultivar-dependent. For this study, our field-grown dahlia 'Park Princess' and 'Karma Yin Yang' were harvested at the following stages:

- Budbreak: flower head showing color with at least one petal lifted from the bud but less than 5% of flower petals expanded.
- Half open: intermediate stage of opening.
- Open: flower head almost completely open. 80% to 95% of petals expanded.

Vase life of 'Karma Yin Yang' was not altered by flower stage. Waiting to harvest 'Karma Yin Yang' until flowers have fully opened will ensure flowers are open for the consumer but is not detrimental to postharvest longevity. Things got a bit more complicated with 'Park Princess': flowers harvested when half open or earlier had significantly longer vase life than flowers harvested fully open. However, these flowers failed to open completely in the vase. At five days after harvest, flowers harvested at budbreak were significantly less opened than flowers harvested when open, but flowers harvested when open or half open were not significantly different. For 'Park Princess', it may be preferable to harvest flowers when they are half open due to improvements in vase life with minimal impact on postharvest flower opening.

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