

The anatomy of petal drop in sunflowers

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Despite their consumer popularity as cut flowers, some sunflowers are difficult to market because of their tendency to lose petals soon after their flowers open. This characteristic, "petal drop", which in some varieties can occur within a day of the flowers' opening, ruins the appearance of sunflowers and damages their market value. Sunflower growers interested in finding cultivars that are less prone to this condition have had limited information about petal drop, but a new study in the *Journal of the American Society for Horticultural Science* contains findings can inform both sunflower breeding programs and consumers' choices.

Joyous Suiyigheh Tata and Hans Christian Wien from the Department of Horticulture at Cornell University studied the abscission zone, a differentiated region where petal drop initiates, at the base of petals of [sunflower](#) florets in two different [cultivars](#). "We wanted to determine if differences in the abscission zone among sunflower cultivars were correlated with differences in timing of petal drop," the authors said. Two pollen-free hybrid sunflower cultivars were selected for evaluation: Procut Bicolor, which loses its petals easily, and Procut Yellow Lite, which holds its petals much longer.

For the first experiment, the researchers measured separation force for the two sunflower cultivars using a modified soil cone micropenetrometer, an apparatus that measures separation forces in the opposite direction. "The separation force experiments showed that detachment forces switched from an initial high to low in both cultivars because of the maturation of the separation layer. This maturation

occurred earlier in the cultivar that is first to lose its petals (Procut Bicolor)," the authors said. They noted that there were no force readings for the short-lived cultivar on day 9 and day 12 because the flower had already wilted.

"In the second experiment, we studied the changes in the anatomy of the petal-achene juncture of the two cultivars," the scientists explained. Three stages from Procut Bicolor (PBC) and four stages from Procut Yellow Lite (PYL) were studied. These stages represent a time course with physiological relevance; when the flower just opens (anthesis), 8 days (the end of flower life for PBC), and 12 days (the end of flower life for PYL). The study also included analyses of petal anatomy at 4 days after harvest. The "end of flower life" was defined as the time when detachment force equals zero; when simply touching the petals caused them to fall off easily. Results of the analyses showed that cell division at the abscission zone of the short-lived cultivar occurred earlier than in the long-lived cultivar. "These results reveal that there was a difference in timing in the formation and maturation of the separation layer between the two cultivars," the authors said.

Interestingly, analyses showed that the mean "break strength" of cultivars in the yellow group was higher and significantly different from cultivars in the orange and bicolor groups, which were in turn higher than cultivars in the red group. Mean [vase life](#) (12 days) of the sunflowers in the yellow group was longer than cultivars in the orange group (10 days), while the vase life of the orange group was longer than cultivars in the bicolor group (9 days). The vase life of the red cultivars was shortest at 8 days. "We found that vase life has a strong relationship with flower color; the darker cultivars in the study had a shorter vase life compared with the lighter cultivars," the scientists remarked.

"The anatomy of petal drop in sunflower is similar to the majority of established descriptions in other species; the process involves the

separation of four to five rows of smaller transversely oriented cells that lay horizontally across the diameter at the juncture between the petal and the achene, the separation layer," the authors said. "The concept that the timing of the maturation of the separation layer in the abscission zone helps determine the timing of petal drop is strongly supported by both the physical and anatomical investigations."

The authors concluded that the regression equation and results from the petal detachment force experiments can be used to screen sunflower cultivars in order to determine groupings of short-lived vs. long-lived cultivars. They said that the study contains beneficial information for sunflower breeding programs working to improve the breed's longevity, which can ultimately lead to increased sunflower sales.

More information: The complete study and abstract are available on the ASHS *J. Amer. Soc. Hort. Sci.* electronic journal web site: [journal.ashspublications.org/c ... t/139/6/669.abstract](http://journal.ashspublications.org/c...t/139/6/669.abstract)

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