Streaks on the Flowers of the Morning Glory, Pharbitis nil, Promote Water Absorption by the Flower and Play a Critical Role in Flower Blooming

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Two critical factors are involved in blooming of the morning glory, Pharbitis nil, a popular summer-flowering plant in Japan: (i) light/dark stimulus the evening before the day of flowering, and (ii) the absorption of water by petals during blooming. Previous studies have shown that the white parts of the petal, referred to as the tube and midribs, detect darkness and absorb water during darkness. This study examined the boundaries between the midrib and purple tissues, called streaks, to clarify whether streaks are involved in blooming at the cellular level and the role(s) of the streaks during blooming. Peeling all 10 streaks off the flower inhibited blooming, while water-soaked flowers bloomed without the streaks. After discovering several vessels and stomata in the streaked layers under a microscope, water-based ink was applied to the surface of the streaks to assess their function. Blooming was inhibited when the surface of the streaks were immersed and plugged with the ink, indicating that the vessels and the stomata function water absorption for flower opening. The flower buds were then incubated at 25-28oC under light and dark conditions overnight. Under dark conditions, all of the buds bloomed successfully and nearly 90% of the stomata opened. However, under light conditions, blooming was inhibited and more than 60% of the stomata remained closed. Thus, the mechanism of blooming in morning glory plants is dependent upon the stomata on the streaks opening at night, which facilitates the transfer of water from the stem to the vessels in the streaks.

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