Structure and Function of the White Leaves of the Silvervine (Actinidia polygama)

Meguro, Ai

Sasaki, Madoka

Silvervine is a deciduous vine that is native to the continent of Asia and the islands of Japan. This plant has two unique characteristics: (1) leaves on the end part of the shoot turn white in early summer, and (2) it stimulates erratic behavior in cats. We examined (1) What gives white leaves their appearance, (2) the physiological feature of white leaves, and (3) the ecological significance of white leaves. White leaves were located approximately 30 cm from the base of shoots, and only the new leaves turned white. The epidermal cells of the white leaves were transparent, with a triangular pyramid structure. This structure diffusely reflected incidental light from the leaf surface, producing a white leaf that is not affected by chlorosis. The cell membrane and/or cell wall of the epidermal cells contained flavonoids that absorbed ultraviolet rays and emitted fluorescence. The ultraviolet irradiance varied in the silvervine canopy, and may signal pollinators. The chlorophyll content of the white leaves was similar to that of green leaves. Therefore, photosynthesis of the two leaf types is expected to be similar. Silervine produces small, white 2-cm flowers with a life span of 2-3 days in the downward axil on the middle of the current shoot in early summer. Consequently, the flowers must be pollinated in a relatively short time. Therefore, the white leaves in the canopy may have adapted to indicate the flower position to pollinators, such as bees, for efficient pollination.

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