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By Using Florigen, You Can Control How Much Water You Need

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Editorial

Stomatal water loss during photosynthetic carbon assimilation is a significant issue in modern agriculture. In water-stressed ecosystems, annual plants have developed strategies to synchronize their growth and reproduction with the availability of water. Some flower species or ecotypes bloom early in order to complete their life cycles before the onset of late-season terminal drought. This rapid flowering is linked to inefficient water use. The molecular players and physiological mechanisms that play a role in this coordination are unknown. In florigen deficient (SFT mutant), wild type (Microtome), and florigen overexpressing (SFT) tomato lines, we investigated WUE using gravimetry, gas exchange, and carbon isotope discrimination. Florigen expression was increased, which resulted in a shorter flowering period and lower WUE. Higher stomatal conductance and thinner leaf blades contributed to SFT low WUE.

Agriculture is the world's biggest source of fresh water. Even though only 18% of cultivated land is irrigated, the value of its produce accounts for 45 percent of total annual agricultural output. Population development, dietary changes, and climate change are all projected to increase demand for irrigation water in the coming years, putting a strain on available water sources. As a result, effective irrigation water usage is critical for long-term agricultural development. Given the connection between crop yield and water use, a better understanding of the physiological and developmental relationships between the two could aid crop breeding. That would either increase yield while using less water or decrease yield while using less water. While transgenic WUE improvement has been achieved by moderately lowering gas while also experiencing minor depressions in A, traditional WUE breeding has not been achieved by direct effects on A or gas at the leaf stage.

Long-term WUE and time to flowering have been found to have a clear positive association in Arabidopsis ecotype collections, with early flowering being correlated with low WUE. In the absence of stomatal restriction, the evolved strategy could be to achieve the highest rates of CO_2 assimilation in order to achieve optimum growth prior to an early reproductive transition. As a result of the wasteful use of stored soil water (and low WUE), faster biomass accumulation is possible and improved reproductive health, if it happens before soil water becomes scarce. Due to competition with rapidly - profligate neighbours, plant genotypes with conservative strategies in natural environments that leave soil water for future use will be selected against. In a crop monoculture, conservative behaviour would be advantageous if soil water could be conserved for later growth; the breeder's challenge is to find conservative alleles at key loci that could increase WUE. The possibility that florigen is the molecular connection between flowering time and WUE prompted us to test WUE in tomato genotypes with varying levels of SFT expression in the cv. Microtome genetic history (MT). As monitors, lines with altered abscisic acid (ABA) levels and established high and low WUE were used.

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