The mechanism of trichome formation in response to stress-induced jasmonic acid signaling in tomatoes

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As a plant stress hormone, jasmonic acid (JA) plays an important role in mediating the resistance of plants against mechanical stress, pest attack,

and pathogenic infection. The biosynthesis of JA and the expression of JA signaling genes are activated upon pest attack. However, JA-Ile signaling can also be hijacked by pathogenic bacteria by means of released effectors that antagonize salicylic acid-mediated plant immunity. JA also plays important roles in a variety of developmental processes, including flowering, root hair development, and trichome formation. Previous studies have shown that JA mediates herbivore resistance traits in tomatoes by promoting trichome formation.

A group of inhibitory proteins called JASMONATE ZIM DOMAIN (JAZ) and the general corepressor TOPLESS physically interact to form a repression complex in JA signaling. In tomato, the loss of function of CORONATINE-INSENSITIVE1 (COI1) impairs JA signaling and can jeopardize the formation of type VI trichomes. In addition, SlJAZ2 can suppress the key transcription factor Woolly to regulate tomato trichome formation. Although evidence supporting the involvement of JA signaling in trichome formation has been accumulating, several downstream elements have not yet been identified, and the underlying mechanism is still not fully resolved.

Recently, scientists from Fujian Agriculture and Forestry University found that two C_2H_2 zinc finger proteins, H and HL, synergistically regulated JA-induced trichome formation in tomatoes. They also found that the spontaneous mutant LA3172 showed severe defects in trichome development. The JA signaling inhibitor SlJAZ2 repressed the activity of H and HL via physical interaction, thereby activating the negative regulator of trichome formation THM1.

"We cloned a homolog of H (Hair), named Hair-like (HL), that positively regulates the formation of long trichomes in tomato. Loss of function of both H and HL resulted in the absence of long trichomes in all tissues. We further found H/HL function is essential for JA-induced trichome formation, in which H/HL activity is usually repressed by

JAZ2. In the presence of JA, high H/HL activity represses the expression of THM1, an R2R3 MYB transcription factor that negatively regulates trichome formation," Prof. Wu said. These results provide novel insight into the mechanism of trichome formation in response to stress-induced JA signaling in tomatoes.

The research was published in *Horticulture Research*.

More information: Bing Hua et al, H and HL synergistically regulate jasmonate-triggered trichome formation in tomato, *Horticulture Research* (2022). DOI: 10.1093/hr/uhab080

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