

## H<sub>2</sub>S可能作为H<sub>2</sub>O<sub>2</sub>的下游信号介导茉莉酸诱导的蚕豆气孔关闭

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## H<sub>2</sub>S May Function Downstream of H<sub>2</sub>O<sub>2</sub> in Jasmonic Acid-induced Stomatal Closure in *Vicia faba*

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摘要

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**摘要** 以蚕豆(*Vicia faba*)为材料, 利用激光共聚焦显微技术和分光光度技术, 结合药理学实验, 探讨硫化氢(hydrogen sulphide, H<sub>2</sub>S)和过氧化氢(hydrogen peroxide, H<sub>2</sub>O<sub>2</sub>)在茉莉酸(jasmonic acid, JA)调控气孔运动信号转导中的作用。结果表明, H<sub>2</sub>S合成抑制剂氨基乙酸(aminooxy acetic acid, AOA)、羟胺(hydroxylamine, NH<sub>2</sub>OH)、丙酮酸钾(potassium pyruvate, C<sub>3</sub>H<sub>3</sub>KO<sub>3</sub>)和氨水(ammonia, NH<sub>3</sub>), H<sub>2</sub>O<sub>2</sub>清除剂抗坏血酸(ascorbic acid, AsA), 合成抑制剂水杨羟肟酸(salicylhydroxamic acid, SHAM)、二苯基碘(diphenylene iodonium, DPI)均可逆转JA诱导的气孔关闭效应。JA能够明显提高蚕豆叶片及保卫细胞中的H<sub>2</sub>O<sub>2</sub>水平、H<sub>2</sub>S含量和L-/D-半胱氨酸脱硫基酶活性; H<sub>2</sub>S合成抑制剂可抑制JA引起的叶片H<sub>2</sub>S含量的增加; 而H<sub>2</sub>O<sub>2</sub>清除剂则可减弱JA对H<sub>2</sub>S含量变化和L-/D-半胱氨酸脱硫基酶活性的诱导效应。以上结果表明H<sub>2</sub>S和H<sub>2</sub>O<sub>2</sub>均参与了JA诱导的蚕豆气孔关闭, 且H<sub>2</sub>S(主要由L-/D-半胱氨酸脱硫基酶合成)可能作为H<sub>2</sub>O<sub>2</sub>的下游组分参与调控这一信号转导过程。

**关键词:** 过氧化氢 硫化氢 茉莉酸 气孔运动 蚕豆

**Abstract:** Pharmacological treatments combined with laser scanning confocal microscopy (LSCM) and spectrophotography were used to study the role of H<sub>2</sub>S and H<sub>2</sub>O<sub>2</sub> in the signaling transduction during stomatal movement responding to jasmonic acid (JA) in *Vicia faba*. Inhibitors of H<sub>2</sub>S synthesis (aminooxy acetic acid, hydroxylamine, and potassium pyruvate + ammonia), the scavenger of H<sub>2</sub>O<sub>2</sub> (ascorbic acid), and the inhibitors of H<sub>2</sub>O<sub>2</sub> synthesis (salicylhydroxamic acid, diphenylene iodonium) all reduced JA-induced stomatal closure. Moreover, JA enhanced H<sub>2</sub>O<sub>2</sub> and H<sub>2</sub>S levels and L-/D-cysteine desulfhydrase activity in leaves and guard cells. The inhibitors of L-/D-cysteine desulfhydrase diminished JA-induced H<sub>2</sub>S production in leaves. In addition, H<sub>2</sub>O<sub>2</sub> scavenger decreased H<sub>2</sub>S level and L-/D-cysteine desulfhydrase activity induced by JA. Therefore, H<sub>2</sub>S and H<sub>2</sub>O<sub>2</sub> are involved in the signal transduction pathway of JA-induced stomatal closure. L-/D-cysteine desulfhydrase-derived H<sub>2</sub>S may represent a novel downstream component of the H<sub>2</sub>O<sub>2</sub> signaling cascade during JA-induced stomatal movement in *V. faba*.

**Keywords:** hydrogen peroxide hydrogen sulphide jasmonic acid stomatal movement *Vicia faba*

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