Transcriptomics profile reveals the temporal molecular events triggered by cut-wounding in stem-ends of cut ‘Tiber’ lily flowers

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Abstract

Plants are prone to wounding by various means, which mainly occur with exposure to environmental mechanical stimuli or via herbivory. The plant wounding response is believed to be mediated by potential molecular mechanisms. However, the wounding response and its molecular mechanism in cut flowers, which are severely wounded plant tissues, have been poorly studied. To gain insight into the molecular mechanisms in response to cut-wounding, this work presents the transcriptional characterization of the temporal molecular events triggered by cut-wounding in the stem-ends of cut ‘Tiber’ lily flowers. RNA-Seq analysis detected 11887 differentially expressed genes, which could be categorized into four clusters based on response time and expression patterns. The fast response typically includes the up-regulation of reactive oxygen species (ROS) and jasmonic acid (JA) biosynthesis genes within 1–6 h after cut-wounding, followed by the up-regulation of lignin biosynthesis genes. Further analysis revealed complex signal cascades in lily stems following cut-wounding. In the early stage (1–6 h), Ca^{2+} promotes ROS and JA biosynthesis gene expression through calcium signal transmission. In the late stage (6–48 h), the expression of lignin biosynthesis genes was up-regulated by ROS and JA signal transduction. These results provide insight into the temporal molecular events in lily stems triggered by cut-wounding and their potential molecular mechanisms.