

柳蓝叶甲取食诱导杨树中系统和性别差异的防御反应

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摘要: 【目的】雌雄异株植物进化出了有效的防御策略来应对各种生物和非生物胁迫。然而, 关于它们防御植食昆虫的性别差异, 我们知之甚少。【方法】本研究研究了青杨(*Populus cathayana*)雄性和雌性受到柳蓝叶甲(*Plagiodera versicolora* Laicharting)攻击时的系统防御反应机制。【结果】结果表明, 青杨对食叶害虫表现出性别差异的反应。叶片面积受损百分率雄性大于雌性。此外, 观察到的糖类变化表明雄性和雌性对食叶害虫的反应时间不同。黄酮类和花青素含量在两性中均显著升高, 但雌性较高。具体来说, 茉莉酸(jasmonic acid, JA)通路起着重要作用。害虫相关基因的表达进一步揭示了激素诱导下游基因和代谢物的变化, 其中 *JA ZIM-domain (JAZ)* 和 *CORONATINE INSENSITIVE 1 (COI1)* 的上调在雌性中更为显著。在未受损的邻近叶片中, 代谢物和基因的变化与受损的局部叶片相似, 但雌性叶片中 JA、*JAZ1* 和 *COI1* 的水平更高。【结论】因此, 我们的数据证实了植物启动 JA 途径来防御植食昆虫, 存在系统的信号转导, 并且这种能力在雌性中比雄性更强。本研究为研究雌雄异株植物对植食昆虫的抗性提供了新的思路, 并为植物响应生物胁迫的系统信号转导提供了新的理论依据。

关键词: 雌雄异株植物; 杨树; 柳蓝叶甲; 系统的信号转导; 代谢物。

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Plagiodera versicolora feeding induces systemic and sexually differential defense responses in poplars

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Abstract: 【Objective】 Dioecious plants have evolved effective defense strategies to deal with various biotic and abiotic stresses. However, little is known regarding sexual differences in their defense against herbivores.

【Method】 In this study, we investigated the mechanism of systemic defense responses in male and female *Populus cathayana* attacked by *Plagiodera versicolora* Laicharting. 【Result】 The results revealed that *P. cathayana* exhibits sexually differential responses to a defoliator. The percentage of damaged leaf area was greater in males than in females. Furthermore, the observed saccharide changes imply that males and females exhibit different response times to defoliators. The contents of flavonoids and anthocyanins were significantly increased in both sexes but were higher in females. Specifically, the jasmonic acid (JA) pathway plays an important role. Expression of pest-related genes further revealed that hormones induce changes in downstream genes and metabolites, and upregulation of *JA ZIM-domain (JAZ)* and *CORONATINE INSENSITIVE 1 (COI1)* was more significant in females. In the undamaged adjacent leaves, metabolite and gene changes displayed similar patterns to the damaged local leaves, but levels of JA, *JAZ1*, and *COI1* were higher in females. 【Conclusion】 Therefore, our data confirmed that plants initiate the JA pathway to defend against herbivores, that there is systematic signal transduction, and that this ability is stronger in females than in males. This study provides new insights into the resistance of dioecious plants to herbivory and adds a new theoretical basis for the systemic signal transduction of plants in response to biotic stress.

Key words: dioecious plants; poplars; *Plagiodera versicolora*; systematic signal transduction; metabolites