Integration of metabolome, histochemistry and transcriptome analysis provides insights into lignin accumulation in oleocellosis-damaged flavedo of citrus fruit

Xianyan Zhou, Jianqiang Yue, Hongbin Yang, Chunhua Zhu, Feng Zhu, Jinxue Li, Rangwei Xu, Junyan Gao, Dongguo Zhou, Xiuxin Deng and Yunjiang Cheng

Postharvest Biology and Technology, Volume 172, February 2021, 111362

Abstract

Oleocellosis, a physiological disorder that affects the appearance quality of citrus fruit, is usually accompanied by the lignification of fruit flavedo. However, the mechanism of lignin accumulation in citrus flavedo in response to oleocellosis remains largely unknown. Here, the molecular mechanism of flavedo lignification caused by oleocellosis in citrus was dissected by metabolome, histochemistry and transcriptome analysis of healthy and oleocellosis disorder green lemon *(Citrus limon* Burm. f. Eureka) fruit. The metabolome analysis showed a remarkable decrease in primary metabolite content while an increase in secondary metabolite content in oleocellosis-damaged flavedo. The histochemical analysis revealed that oleocellosis disorder accelerated flavedo lignification and resulted in lignin accumulation. The transcriptomic analysis showed that in oleocellosis-damaged flavedo, phenylpropanoid biosynthesis was significantly activated, and 79 differentially expressed genes (DEGs) related to lignin accumulation were identified, among which 65 (82.3 % of the total DEGs) were significantly up-regulated, particularly the *PAL*, *C4H, CCR*, *F5H, POD* and *UGT72E* genes. The results of *penicillium* inoculation showed that oleocellosis disorder could enhance fruit pathogen resistance. In conclusion, the occurrence of oleocellosis may enhance the pathogen resistance of citrus fruit by lignin accumulation.