Phytotoxins produced by *Pectobacterium atrosepticum* impact multiple defense hormone pathways in potato

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The potato pathogen *Pectobacterium atrosepticum* (*Pba*) causes disease through the prolific production of a wide variety of plant cell wall degrading enzymes (PCWDEs) regulated by the quorum sensing (QS) regulatory system. Through sequencing and annotation of the complete genome of *Pba* strain SCRI1043 (Pba1043), a new virulence factor has been identified. This factor is similar to the phytotoxin coronatine that has been well characterized in *Pseudomonas syringae*, where it appears to suppress host resistance during the infection process. *Pba* strains containing mutations within the phytotoxin biosynthetic genes (*cfl* and *cfa*) have been isolated and assayed for virulence on Estima potato stems. Gene expression studies have determined the transcriptional profiles of these genes throughout the course of tuber infection. LC/MS analysis has identified the phytotoxins isolated from the supernatant of *Pba* cell cultures. Microarray and qPCR analysis have revealed that these phytotoxins impact multiple defense pathways in potato.

Results

Figure 1

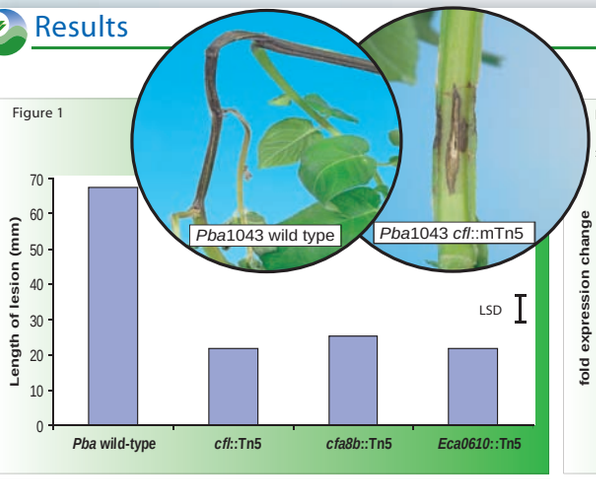

Figure 2

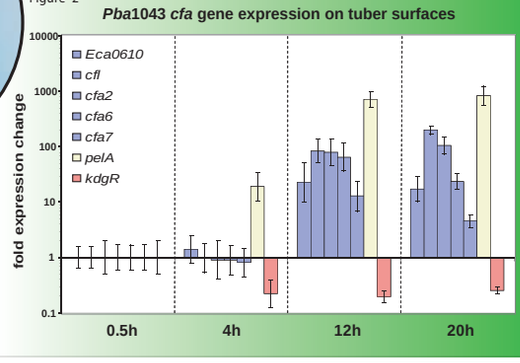

Figure 1. *Pba* strains with mutations in the *cfl/cfa* cluster are significantly reduced in virulence on Estima potato stems

Figure 2. *cfl/cfa* genes are expressed during the late stages of infection in a QS dependent manner

Figure 3

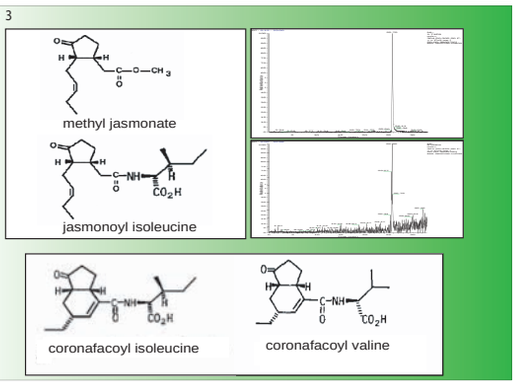

Figure 4

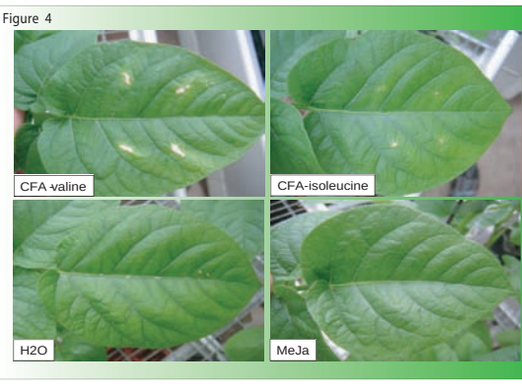

Figure 3. LC/MS identifies CFA-Valine and CFA-Isoleucine, both of which are molecular mimics of jasmonyl-amides, in *Pba* culture supernatants

Figure 4. Purified CFA-V and CFA-Ile cause chlorosis and necrosis on potato leaves

Figure 5

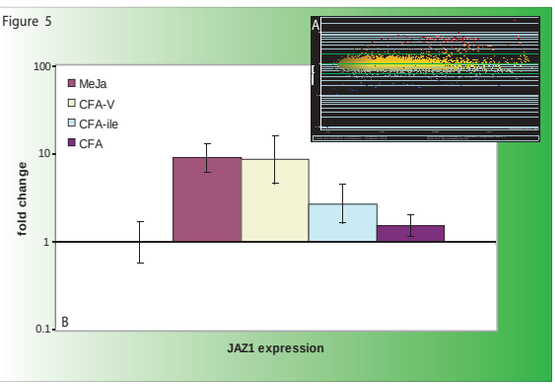

Figure 6

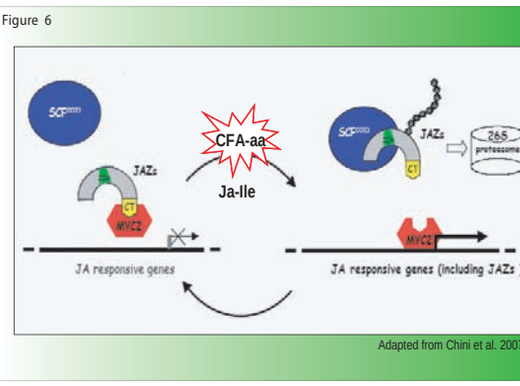

Figure 5. Microarray (A) and qPCR (B) analysis reveals that CFA-amides impacts multiple hormone pathways in potato, specifically JAZ1

Figure 6. A model of a how CFA-amides can up-regulate JA signaling via JAZ1 interactions

Conclusions

CFA-amides are important virulence factors in *Pba*

cfa biosynthetic genes are significantly up-regulated during the later stages of tuber infection, are QS dependent and are influenced by pectin catabolism

The two main coronafacoyl conjugates produced by Pba1043 are CFA-valine and CFA- isoleucine; these compounds are structurally analogous to jasmonyl amide conjugates and induce JA signaling in potato