

Thaumatin-like protein as a virulence factor of the pine wood nematode, *Bursaphelenchus xylophilus*

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1st screening using model plant, *Nicotiana benthamiana*

Pine wilt disease, which is caused by *Bursaphelenchus xylophilus*, is a serious threat to pine forests worldwide. Pine wilt disease is thought to be initiated by sequential **excessive hypersensitive responses** (e.g. inducing a series of plant cell death, high expression of **pathogenesis-related (PR) genes**) to *B. xylophilus*. However, no molecule has yet been identified as a **pathogenic molecule**.

DISCUSSION

Two-step screening discovered **plant thaumatin-like 2** of *B. xylophilus* as a **strong candidate pathogenic protein**.

(Kirino et al., 2020; 2022; Shinya et al., 2021)

This protein may have a role in **molecular mimicry** and induce hypersensitive responses in host pines because thaumatin-like proteins are important PR proteins for plants usually.

(Kirino et al., 2020)

2nd screening using pine seed embryos is the novel functional analytic method

that uses recombinant pathogenic candidate molecules of *B. xylophilus* in host pines.

(Kirino et al., 2022)

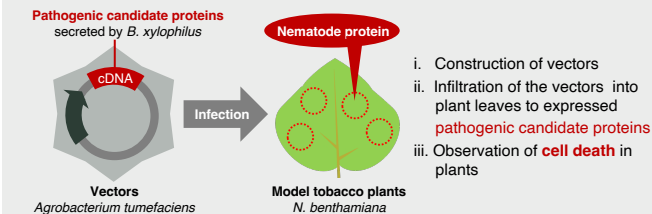
This method has potential as a **powerful tool** for screening pathogenic molecules of *B. xylophilus* in their native host.

(Kirino et al., 2022)

PURPOSE

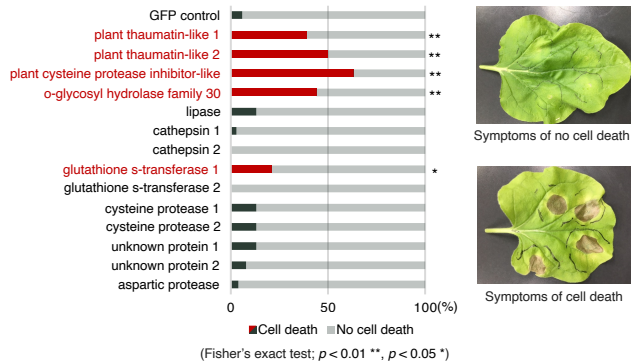
Narrowing the secreted proteins that induce **cell death** in **model tobacco plants** as **pathogenic candidate proteins**

MATERIALS & METHODS



RESULTS

Rates of cell death induced by the pathogenic candidate proteins



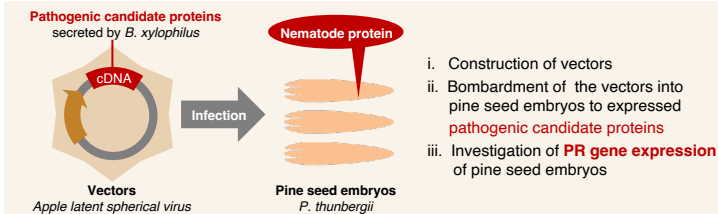
5 proteins induced significant cell death in model plants.

2nd screening using host pines, *Pinus thunbergii*

PURPOSE

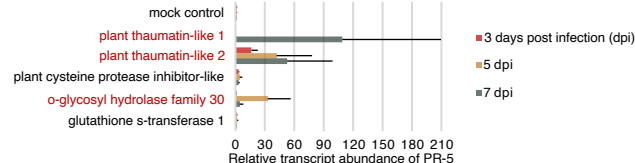
Discovery of the **strong pathogenic candidate proteins** by analyzing functions to induce **PR gene expression** in **host pines**

MATERIALS & METHODS



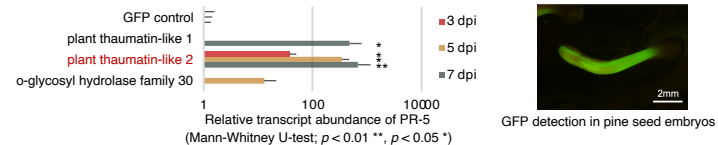
RESULTS

① Expression levels of PR genes following normalization by the **transcript levels of mock control**



PR gene expressions of 3 proteins were more than 5-fold as high as mock control.

② Expression levels of PR genes following normalization by the **amount of virus RNA of GFP control**



Plant thaumatin-like 2 induced high expression of PR genes at all time points.