

The resistance factors of Japanese red pines to pine wilt disease

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INTRODUCTION

The goal of this study

To know the factors of resistance in Japanese red pines (*Pinus densiflora*) to pine wilt disease.

Backgrounds

- ▶ Pine wilt disease severely has been damaging pine forests in Japan.
- ▶ Most Japanese red pines are susceptible to pine wilt disease but some of them are resistant.
- ▶ Mechanisms of the resistance have been little clarified.
- ▶ To know the mechanisms will enable efficient breeding of resistant pines.

CONCLUSION

- ▶ Inhibition of pine wood nematodes migration is a key factor for resistance to pine wilt disease.
- ▶ Suggestion: The migration was inhibited by the integration of the feature of cortical resin canals, cell responses and chemical components in resistant pines.

MATERIALS & METHODS

Field

Kamogawa, Chiba, Japan

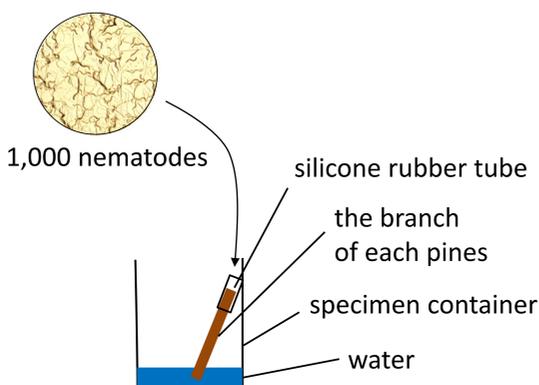


P. densiflora (3-yr-old)

- ▶ susceptible
- ▶ resistant lines no.8, no.22

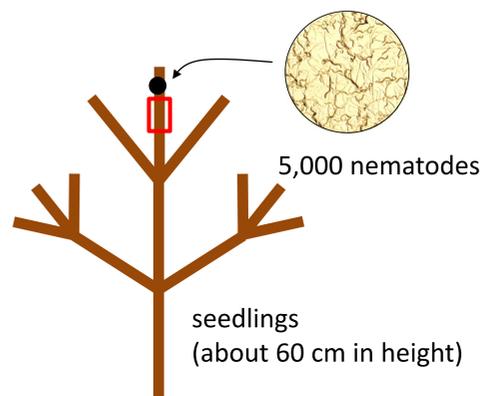


I. Nematodes migration in the pines



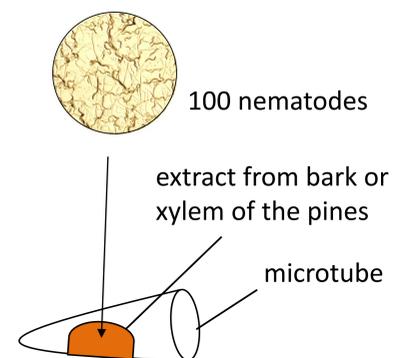
Number of nematodes which had come to water was counted every 6 hours.

II. Anatomical analysis



Anatomical observation was conducted 2, 4 and 6 weeks after inoculation.

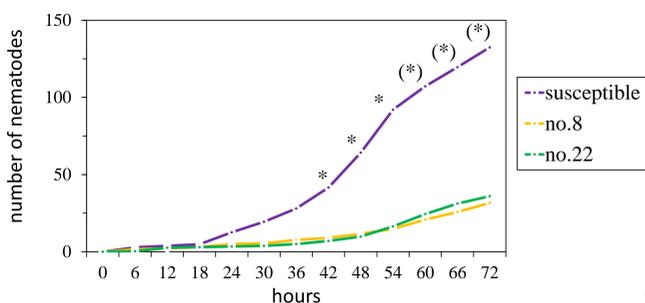
III. Extract from the pines



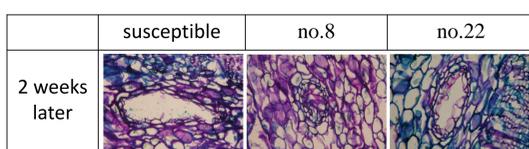
Nematodes were inoculated into extract from the pines. Percentage of immobilized nematodes was calculated 3 days later.

RESULTS

I. Nematodes migration in the pines



Number of nematodes passed through the branches was higher on the susceptible seedlings than on the resistant ones.

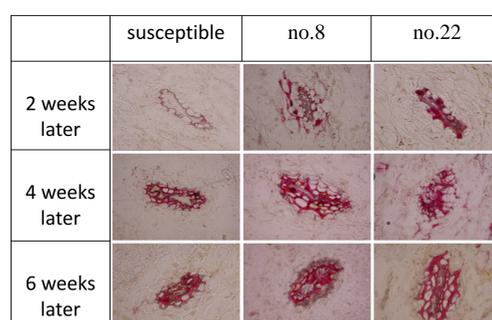


Cortical resin canals of the susceptible seedlings were damaged by the nematodes in two weeks, on the other hand, those of the resistant seedlings were not only damaged but obstructed.

II. Anatomical analysis

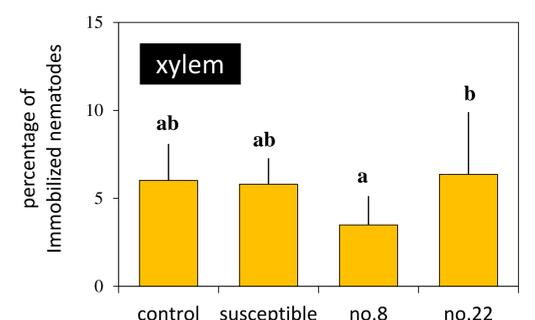
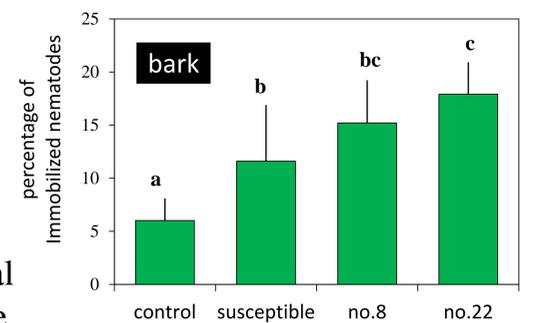
	susceptible	no.8	no.22
cortical section area (mm ²)	7.9	13.6	11.8
number of cortical resin canals	16.4	8.8	10
cortical resin canals area (mm ²)	0.0638	0.0657	0.0601
ratio of cortical resin canals area to cortical section area	0.0081	0.0048	0.0051

“Number of cortical resin canals” and “ratio of cortical resin canals area to cortical section area” in susceptible seedlings were higher than those in resistant ones.



Strong lignification was observed on cortical resin canals except for those of susceptible seedlings in two weeks.

III. Extract from the pines



Extract from the resistant seedlings showed high percentage of immobilized nematodes. Bark extracts had greater effect on immobilization of the nematodes than xylem extracts.