

Incubation Period for *Tuberculina maxima* Infecting the Western White Pine Blister Rust Cankers

Ed F. Wicker and J. M. Wells

Plant Pathologist and Forest Research Technician, respectively, USDA Forest Service, Intermountain Forest and Range Experiment Station, Ogden, Utah 84401; stationed in Moscow, Idaho, at Forestry Sciences Laboratory, maintained in cooperation with the University of Idaho.

ABSTRACT

The incubation period for *Tuberculina maxima* on western white pine blister rust cankers in a controlled environment was 2-7 weeks. The mode was 3 and 4-5 weeks for pycnial- and aecial-producing cankers, respectively. *Phytopathology* 60:1693.

Tuberculina maxima Rostr. is recognized as a natural enemy of the western white pine blister rust fungus, *Cronartium ribicola* J.C. Fisch. ex Rabenh. The prevalence of this organism in rust-infected western white pine (*Pinus monticola* Dougl.) stands in the western USA (1, 5), together with current knowledge of its attenuating effects on blister rust cankers (1, 2), has stimulated an evaluation of its potential impact on the blister rust disease. The senior author recently reported on aspects of the infection process of *T. maxima* on blister rust cankers (3, 4). This report defines the incubation period for *T. maxima* on western white pine blister rust cankers (6) growing in a controlled 24-hr cyclic environment.

An aqueous spore suspension of *T. maxima* was applied with a camel's-hair brush to the sporulating surfaces of 248 pycnial- and 96 aecial-producing cankers on western white pine seedlings. Ten pycnial- and 18 aecial-producing noninoculated cankers served as controls. The inoculated and control seedlings were incubated in plant growth chambers programmed as follows: 14-hr days at 22 C, 65% relative humidity (RH), and 3,300 ft-c; 10-hr nights at 9 C and 90+% RH.

Rust cankers on all seedlings were examined 2 to 3 times weekly for sporulation of *T. maxima*. When sporulation was observed, the seedling was removed

from the growth chamber to prevent additional inoculation of the remaining seedlings. The experiment was terminated after 10 weeks.

Tuberculina maxima became established on 38% of the pycnial-producing and on 25% of the aecial-producing cankers. Infection of pycnial-producing cankers (1.2%) was first observed 2 weeks after inoculation. The greatest number of infections (17.3%) occurred at 3 weeks; the last ones (1.2%) at 7 weeks. *Tuberculina maxima* was first observed on 1.0% of the aecial-producing cankers 2 weeks after inoculation. The mode was 4-5 weeks (7.2%) and the max was 7 weeks (2.0%). No infections resulted after 7 weeks from any inoculations.

Infection by *T. maxima* was not observed on any of the 28 control cankers during the 10 weeks of the experiment. Thus, we conclude that all infections observed were the result of our artificial inoculation and that no natural or other inoculation occurred.

The range of the incubation period for *T. maxima* on blister rust cankers incubated under these conditions was the same (2-7 weeks) for both pycnial and aecial inoculations. In a previous study (4), field inoculations of western white pine blister rust cankers also showed a short incubation period (4-9 weeks). A short asexual life cycle is an efficient mechanism for population intensification and spread by *T. maxima*; it is considered a beneficial attribute for any potential biological control agent.

LITERATURE CITED

1. KIMMEY, J. W. 1969. Inactivation of lethal-type blister rust cankers on western white pines. *J. Forest.* 67: 296-299.
2. LEAPHART, C. D., & E. F. WICKER. 1968. The ineffectiveness of cycloheximide and phytoactin as chemical controls of the blister rust disease. *Plant Dis. Repr.* 52:6-10.
3. WICKER, E. F. 1968. Toxic effects of cycloheximide and phytoactin on *Tuberculina maxima*. *Phytoprotection* 49:91-98.
4. WICKER, E. F., & J. W. KIMMEY. 1967. Mode and time of infection of western white pine blister rust cankers by *Tuberculina maxima*. *Phytopathology* 57:1010 (Abstr.).
5. WICKER, E. F., & J. M. WELLS. 1968. Overwintering of *Tuberculina maxima* on white pine blister rust cankers. *Phytopathology* 58:391.
6. WICKER, E. F., & J. Y. WOO. 1969. Differential response of invading *Tuberculina maxima* to white pine tissues. *Phytopathology* 59:16 (Abstr.).