Forest Research Institute, Warsaw, Poland

PINE TWIST RUST CAUSED BY *MELAMPSORA PINITORQUA* (BRAUN) ROSTR. AND ITS ECONOMIC IMPORTANCE ON THE EXAMPLE OF THE POST-FIRE AREAS REFORESTATION IN POLAND

M. Małecka

Key words: *Melampsora pinitorqua*, *Pinus sylvestris*, post-fire lands, plantation, health status

Twist rust, caused by *Melampsora pinitorqua* (Braun) Rostr. is one of the most common diseases of Scots pine (*Pinus sylvestris* L.) plantations in Poland. According to literature, the disease causes significant damages: shoot deformation, reduction of height growth rate, deterioration of stem quality. Great Scots pine regenerations (20 000 ha) were established on great areas burnt in 1992 in four Forest Districts: Gniewkowo, Potrzebowice, Żagań (central-west Poland) and Rudy Raciborskie (south Poland).

Observations and measurements were carried out in 1993–2002, mainly in Potrzebowice Forest District, in Scots pine plantations, which in 1996–1998 had about 80% of trees infected and damaged by *M. pinitorqua*. Investigations were also conducted in Scots pine plantations established on non-burnt areas, where trees with and without disease symptoms occurred.

The main aim of the work was to determine the relationships between the level of shoot's infection by *M. pinitorqua* and the development of the disease estimated as amount of one-year height growth of trees. Other objectives were i. a. recognizing the level of threat to plantations and the spatial variability of the disease based on the number of aecia on shoots, estimation of biometrical parameters, contents of nutrients and phenolic compounds in needles, phloem and xylem of infected and noninfected shoots. The estimation of protective and curative effectiveness of 0.1% Bayleton 25 WP, used in plane chemical control of pine twisting rust, was also performed.

The relationship between the occurrence of the disease symptoms and the height growth of threatened pines was significant. Symptoms of pine twisting rust were observed on shoots of the highest trees and those with the biggest growth increment. Increased frequency of aecia on shoots had a significant correlation with main shoot elongation as well. Mass and humidity of needles were not connected with the occurrence of disease symptoms, however, significant differences in mass of phloem and xylem of estimated shoots were observed. The lowest value of these parameters was found in the shoots just infected by the pathogen. The infection of shoots by *M. pinitorqua* did not cause significant changes in nitrogen content in the needles, but caused differentiation in other nutrients content. In the infected shoots a higher content of potassium was found, while shoots without symptoms of disease were characterized by lower content of calcium, magnesium, sulfur, zinc

and aluminium. Generally, total content of phenols varied both in phloem and xylem of infected and noninfected shoots. The highest content of phenols (significantly higher than in healthy shoots) was found in the infected shoots' phloem. Similar proportions of phenols was stated in the xylem of these shoots.

Preventive treatment with the systemic fungicide Bayleton 25 WP proved not only ineffective against the disease, but also stimulated its development. Spraying the plantation three times activated the pathogen in plant tissues and stimulated increment of shoots (the first treatment was applied two weeks before *M. pinitorqua* aecia occurred).

Summarizing, mass infection of Scots pine shoots by *M. pinitorqua* could occur under favourable conditions (age, climatic conditions, availability of fungus inoculum and abundance of the *Populus* spp. host plants), causing a severe outbreak of the disease on a large area of forest plantation, lasting for three–four years in sequence. A specific way of the pathogen development in pine shoots was found in the Potrzebowice Forest District. The disease resulted in a higher growth of trees, without their mortality. All observed necroses on shoots had no effect on the growth of trees: after some time they were healed and the plants completely recovered after six years.

*

This doctor dissertation, supervised by Professor Zbigniew Sierota D.Sc. (For.), was presented and accepted on November 22, 2004, at the Forest Research Institute Council meeting.

Author's address: Dr Monika Małecka,
Forest Research Institute,
Sękocin-Las,
05-090 Raszyn,
Poland
e-mail: M.Malecka@ibles.waw.pl