

Melampsora Rust in Poplar Plantations Across Southern Ontario

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ABSTRACT

Hubbes, M., Jeng, R. S., and Zsuffa, L. 1983. Melampsora rust in poplar plantations across southern Ontario. *Plant Disease* 67:217-218.

Investigations conducted during 1980 found only one rust species, *Melampsora medusae*, in poplar plantations across southern Ontario, Canada. The poplar clones examined belonged to *Populus deltoides* and hybrids *Populus deltoides* × *nigra*, *Populus deltoides* × *trichocarpa*, *Populus* × *jackii*, and *Populus* × *jackii* × *nigra*.

Poplar leaf rust caused by species of the genus *Melampsora* Cast. is one of the most damaging leaf diseases of hybrid poplar plantations. Damage varies according to climatic fluctuations, microclimate of the plantations, proximity of alternate hosts, metabolic state of poplar hosts, and susceptibility of the poplar clones planted (7). Heavy rust infections, particularly those early in the growing season, weaken the poplar host and predispose it to other biotic or abiotic diseases such as Cytospora canker, Dothichiza canker, and cold injury. In addition, shoot growth and development of the root system are reduced (7).

In his study on poplar rust in France, Pinon (3) described eight species of *Melampsora* based on the characteristic features of urediniospores and associated paraphyses. Ziller (9) reported two species in Canada: *M. medusae* Theum. and *M. occidentalis* Jacks. The latter

seems to be more restricted to the western part of North America, whereas the former also occurs in eastern Canada. Our survey was undertaken to determine which species of *Melampsora* occurs on hybrid poplars in the plantations in southern Ontario.

MATERIALS AND METHODS

Poplar leaves naturally infected with rust from plantations across the southern part of Ontario in locations near Augusta, Elizabethtown, Gloucester, Haldimand, Malahide, and Vespra were collected during the growing season of 1980. Rust-infected leaves of poplar clones from nurseries near the towns of Maple and Orono were also included in these investigations. Species determinations were carried out by comparing morphological characteristics of urediniospores and paraphyses in crush mounts. Teliospores were obtained by freehand section cut through the middle part of telia. All spore measurements were performed in distilled water, using a light microscope.

RESULTS

Forty poplar clones planted at eight plantations across southern Ontario were

examined. *M. medusae* was the only species found in these plantations. The hybrid poplars from which this fungus was recovered are shown in Table 1.

Many species of rust fungi in various stages of their life cycles have been reported to be the hosts for the hyperparasitic fungus *Darluca filum* (Biv.-Bern. ex Fr.) Cast. (2). In our study, pycnidia of *D. filum* were frequently observed within the uredinia of *M. medusae*.

DISCUSSION

Our investigations show that only one rust species, *M. medusae*, occurs in poplar plantations of southern Ontario. This fungus is characterized by urediniospores with light echinulation at the middle region and teliospores with uniform cell wall thickness. *M. occidentalis*, the other species found in Canada, differs from *M. medusae* in having urediniospores with spines all over the surface (10). In the former species, teliospores are large with cell walls much more thickened at the apex.

M. medusae is well established in native populations of *Populus deltoides* Marsh. in Illinois (1) and the lower Mississippi Valley (8). It has been recorded in South America, Europe, Japan, Australia, and New Zealand (9). The poplar hosts are members of the sections Aigeiros, Tacamahaca, and Leuce. Variation in urediniospore size has been reported by Schipper and Dawson (4) and Sharma and Heather (6), showing the variability of the fungus. Therefore, epidemic outbreaks attributed to new races could be expected.

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Table 1. A list of poplar clones examined and found susceptible to leaf rust caused by *Melampsora medusae* in plantations across southern Ontario, Canada

| Clone and origin | Clone numbers |
|---|--|
| <i>P. deltoides</i> (Ohio, USA) | D69, D72 |
| <i>P. deltoides</i> (Manitoba, Canada) | D52 |
| <i>P. deltoides</i> 'Virginia Nancy' (Loiret, France) | DN33 |
| <i>P. deltoides</i> var. <i>occidentalis</i> (Montana, USA) | D162, D165, D169 |
| <i>P. deltoides</i> (Ontario, Canada) × <i>P. nigra</i> (Hungary) | DN55, DN106, DN121, DN138, DN144, DN160 |
| <i>P. deltoides</i> (Ontario, Canada) × <i>P. trichocarpa</i> (Washington, USA) | DTac4 |
| <i>P. deltoides</i> var. <i>virginia</i> × <i>P. nigra</i> var. <i>caudina</i> (Wisconsin, USA) | DN37 |
| <i>P. × euramericana</i> (Quebec, Canada) | DN47 |
| <i>P. × euramericana</i> (Italy) | I65A, 178B |
| <i>P. × euramericana</i> (Casale Monferrato, Italy) | I45/51, I262, I455 |
| <i>P. × euramericana</i> 'B-56' (Casale Monferrato, Italy) | DN26 |
| <i>P. × euramericana</i> 'I-132/56' (Casale Monferrato, Italy) | DN24 |
| <i>P. × euramericana</i> 'Negrito de Granda' (Spain) | DN31 |
| <i>P. × euramericana</i> 'Dolomiten' (Hann. Munden, West Germany) | DN3 |
| <i>P. × euramericana</i> 'Harff' (Hann. Munden, West Germany) | DN14 |
| <i>P. × euramericana</i> 'Ostia' (Hann. Munden, West Germany) | DN28 |
| <i>P. × euramericana</i> 'Vert de Garonne' (Hann. Munden, West Germany) | DN12 |
| <i>P. × euramericana</i> 'Regenerata Aube' (Loiret, France) | DN15 |
| <i>P. × euramericana</i> 'Regenerata Batard d'Hauterive' (Loiret, France) | DN16 |
| <i>P. × euramericana</i> 'Robusta' (Loiret, France) | DN17 |
| <i>P. × jackii</i> (Ontario, Canada) | Jac7 |
| <i>P. × jackii</i> (Newfoundland, Canada) | Jac15, Jac16 |
| <i>P. × jackii</i> (Quebec, Canada) | Jac27 |
| <i>P. × jackii</i> (Ontario, Canada) × <i>P. nigra</i> (Hungary) | JacN5, JacN11, JacN12, JacN15, JacN18 |

Occurrence of *M. medusae* on numerous poplar clones shows that the fungus either has a relatively low degree of specialization or it is composed of many biological races that cannot be separated morphologically. It appears that great diversity in the species of *M. medusae* exists in respect to the poplar hosts.

Doubts about the uniformity of the species *M. medusae* have been expressed by Schreiner (5).

The alternative hosts of *M. medusae* are *Larix*, *Pinus*, and *Pseudotsuga*. The proximity of these hosts to poplar plantations will certainly influence the rust occurrence on the poplar hosts.

However, Toole (8) and Walker et al (9) report the survival of urediniospores from one growing season to another on the poplar hosts for the lower Mississippi Valley and Australia, respectively. In addition, the last authors also discuss the spread of windborne urediniospores from Australia to New Zealand. Such a spread might be possible from southern United States to Canada.

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