

Tar Spot of Maple in Ontario: A Growing Problem

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Tar Spot - *Rhytisma*



■ a very showy disease on maple leaves ...

Tar Spot - *Rhytisma*



■ ... but considered just an aesthetic nuisance

Tar Spot - *Rhytisma*



Presentation Overview

- 2006 was a banner year for tar spot of Norway maple in the Great Lakes Region
- In May 2006, we received funding from Landscape Ontario for a study of this disease
- This presentation will discuss the results of the first year of study including spore release periods, and DNA sequencing results for this fungus

Research Objectives

- Identity of the tar spot fungus in Ontario (year 1)
 - disagreement on fungal species
- Spore dispersal period (year 1 & 2)
 - when should fungicides be used?
- Inoculation assay & fungicide tests (year 2)
 - which fungicides are most effective?

Tar spot of maple - history

- Most still refer to maple tar spot as caused by *Rhytisma acerinum*, but there are differences from the European *Rhytisma acerinum*
- Dr. Hudler & associates of Cornell Univ. (1998, Mycotaxon 68:405) claimed that *Rhytisma acerinum* was imported from Europe, and affects European maple species such as Norway maple
- They proposed a new species, *Rhytisma americanum*, on native North American maples

Rhytisma americanum on silver maple



Rhytisma americanum on silver maple



Rhytisma punctatum on big-leaf maple



Rhytisma punctatum on mountain maple



Rhytisma acerinum on Norway maple



Rhytisma acerinum on Norway maple



Rhytisma acerinum on maple (Europe)

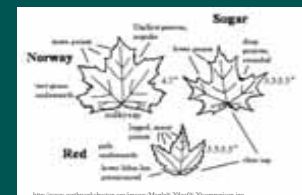


Rhytisma acerinum on maple (Europe)



Maples in Canada

- East: sugar, black, red, Manitoba, mountain, striped
- West: bigleaf, douglas, vine
- Introduced: Norway, sycamore, field



Tar Spot - *Rhytisma*

http://counties.ccc.cornell.edu/Wyoming/agriculture/resources/tpd/diseases_maples.htm

- *Rhytisma acerinum* - Norway, sycamore maple
- *R. punctatum* - red, silver, sugar, black, box, mountain, big-leaf, stripe, vine
- *R. americanum* - red, silver, sugar, mountain

Tar spot of maple (*Rhytisma* species)

R. americanum on silver maple



R. acerinum on Norway maple



R. acerinum on sycamore maple



Tar spot of maple (*Rhytisma* species)

R. punctatum on big leaf maple



R. acerinum on Norway maple



R. punctatum on sugar maple



Rhytisma acerinum on Norway maple early July



Rhytisma acerinum on Norway maple late July - Niagara early August - Guelph

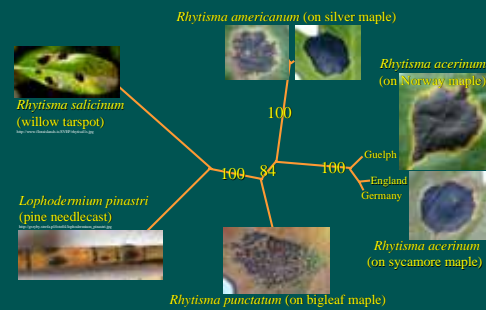


Rhytisma acerinum on Norway maple mid September



Relationships between *Rhytisma* species

Unrooted distance tree based on NJ-bootstrap of ITS sequences



Objective 2

Spore Dispersal Period correlated with climate

Rhytisma acerinum on sycamore maple

2004/12/12 Poland



Rhytisma acerinum apothecia

<http://www.ambmuggia.it/forum/uploads/post-3-1149259507.jpg> 2006/6/2 Italy



Rhytisma acerinum apothecia

<http://www.ambmuggia.it/forum/uploads/post-3-1149259562.jpg> 2006/6/2 Italy



Rhytisma acerinum apothecia

Guelph Norway maple, soaked 24 hrs, 2006/5/18



Rhytisma acerinum apothecia

<http://www.bio-forum.pl/messages/43/10170.jpg> 2005/5/8 Poland



Rhytisma acerinum apothecia

Niagara Falls Norway maple, soaked 24 hrs, 2006/5/8



Rhytisma acerinum apothecia

Guelph Norway maple, soaked 24 hrs, 2006/5/18

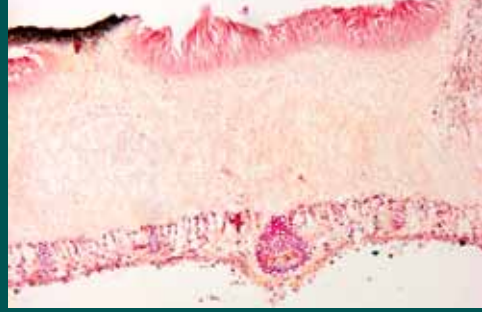


Tar spot cross sections



Tar spot cross section

http://www.sanwoose.co.kr/img/rhytisma_01.JPG



Rhytisma acerinum asci

<http://www.ambmuggia.it/forum/uploads/post-3-1149259612.jpg> 2006/6/2 Italy



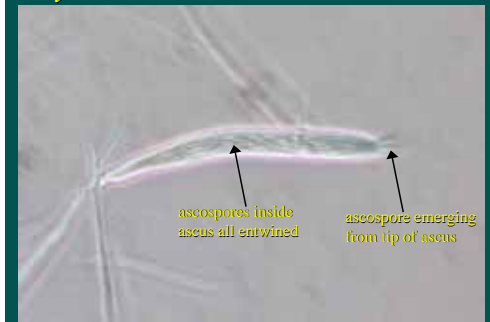
Rhytisma acerinum asci

<http://www.ambmuggia.it/forum/uploads/post-3-1149259629.jpg> 2006/6/2 Italy



Rhytisma acerinum ascus

<http://www.ambmuggia.it/forum/uploads/post-3-1149259629.jpg>



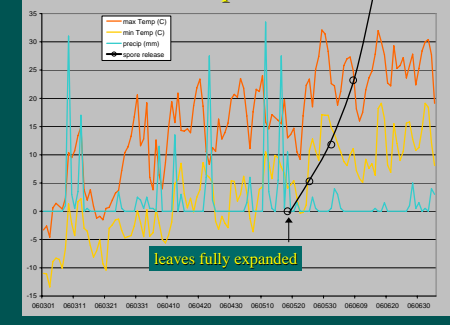
Rhytisma acerinum ascospores

<http://www.ambmuggia.it/forum/uploads/post-3-1149259752.jpg> 2006/6/2 Italy



2006 climate & spore data

100% by June 22



Spore release data

tar spot of Norway maple (*R. acerinum*)

- no more spores after June 25, 1985 in New York
- no more spores after June 22, 2006 in Guelph, ON
 - ascospores first seen in cross sections in early May
 - in early May, apothecia would open after soaking
 - first empty asci observed in late May

Summary of results

- current epidemic of tar spot of Norway maple is caused by *Rhytisma acerinum* (DNA evidence)
- Tar spot of silver maple is caused by *Rhytisma americanum* (DNA evidence)
- Tar spots resembling bigleaf maple multiple black specks on Norway or silver maple were found to be the species above, not *Rhytisma punctatum*

Summary of results

- in 2006, ascospore release of *Rhytisma acerinum* occurred mainly from the end of May through late June
- this spore release study will be repeated in 2007, and at multiple locations in southern Ontario, coupled with a fungicide efficacy study