Mycosphaerella leaf spot and other fungal diseases in organic black currant production in Norway

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Black currant diseases in Norway

- Black currant reversion virus
- Anthracnose (*Drepanopeziza ribis*)
- Mycosphaerella leaf spot (*Mycosphaerella ribis*)
- White pine blister rust (*Cronartium ribicola*)
- Powdery mildew (*Sphaerotheca mors-uvae*)

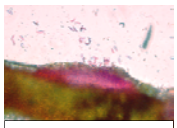
Anthracnose

Drepanopeziza ribis forms apothecia in leaf litter on the ground, ascospores cause primary infections in spring

Gloeosporidiella ribis – the asexual stage of *D. ribis* multiplies on the foliage

Acervuli form in leaf spots

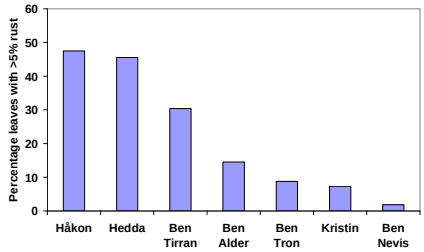
Purple spots that coalesce, leaves become necrotic, early defoliation



Acervulus and conidia

Most susceptible to anthracnose in our investigations: Ben Alder, Ben Nevis, Ben Tirran, Håkon

White pine blister rust, *Cronartium ribicola*



Most susceptible to white pine blister rust in our investigations: Ben Avon, Ben Hope, Ben Tirran, Hedda, Håkon, Sunniva, Varde Viking

Powdery mildew (*Podosphaera mors-uvae*)

Most new cultivars have high degree of resistance

Durable resistance?

Victor Viking is extremely susceptible

Mycosphaerella leaf spot

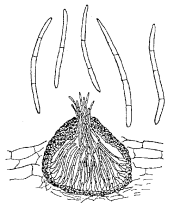
Mycosphaerella ribis – ascigerous stage, ascospores formed in pseudothecia in old leaves on the ground

Pseudothecia on underside of leaves

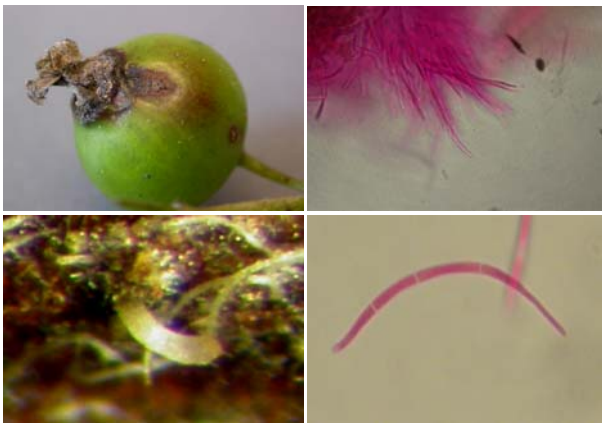
Pseudothecia

Ascospores

Septoria ribis – asexual stage, conidia formed in pycnidia in spots on leaves and fruits during the growing season



Pycnidium with conidia

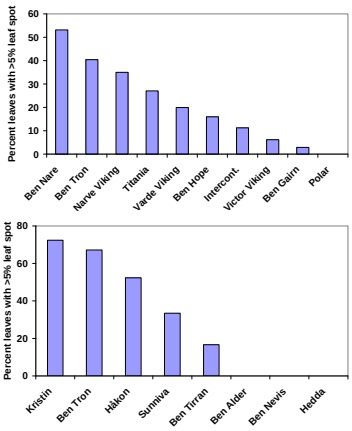


Cultivar susceptibility to *M. ribis*

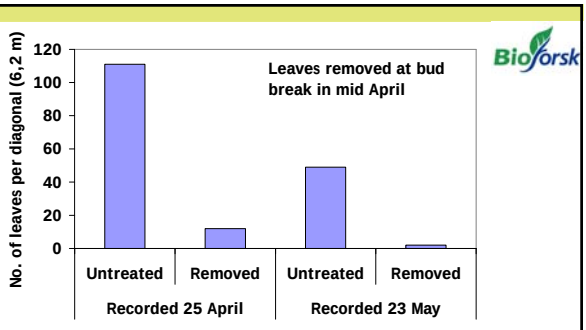
Assessments of leaf spot in several fields in 2005 and 2006

Great differences between cultivars in susceptibility

The ones selected for organic production – with high resistance to anthracnose and powdery mildew (Ben Tron, Ben Nare and Narve Viking) were all highly susceptible to Mycosphaerella leaf spot



Mechanical removal of old leaves



Removed more than 90% of the old leaves (i.e. > 90% of the inoculum)

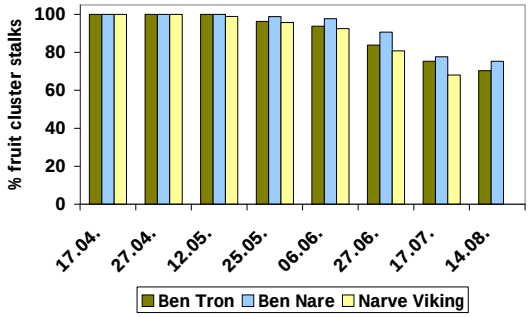
Even with effective removal of leaves, *M. ribis* was problematic - other inoculum sources?

Fruit cluster stalks not removed at harvest

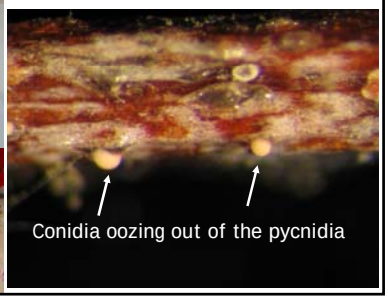
Can overwintering stalks be a source of inoculum the following season?

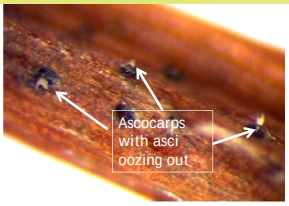
Fruit cluster stalks during the season

- Tagged 3 shoots on each of 3 bushes in cultivars Ben Tron, Ben Nare, Narve Viking
- Recorded how long the fruit cluster stalks were attached to the shoots between bud break and harvest
- Collected stalks each 2-4 weeks between bud break and harvest and examined them for conidial production



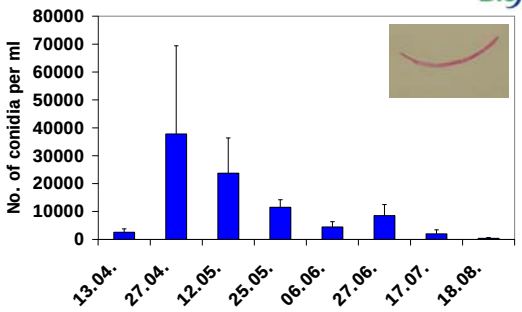
- Incubation of fruit cluster stalks at 20ºC and 100% RH for 4 d
- Shaken 30 min in water, recorded number of conidia





Ascocarps (pseudothecia) on a fruit cluster stalk containing asci (spore sacks)

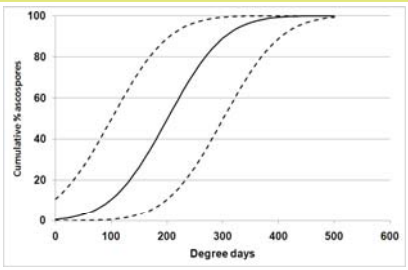
One pseudothecium with numerous asci from a fruit cluster stalk crushed on a microscope slide, each ascus contains 8 ascospores



Number of conidia from 20 fruit cluster stalks in 25 ml water, mean of 3 replicates

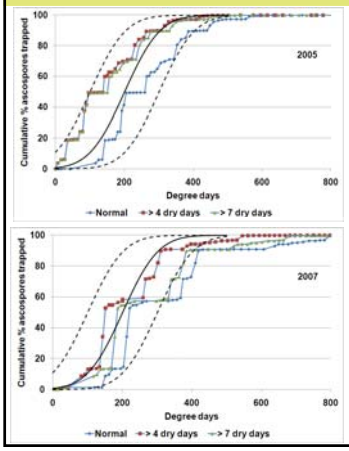
Spore trapping to study ascospore release

Ascospore release recorded from bud break to mid/late July



A model based upon ascospore release data from leaves collected at bud break, then exposed to a simulated season in the laboratory (leaves kept moist at 20°C, ascospores released in water twice weekly)

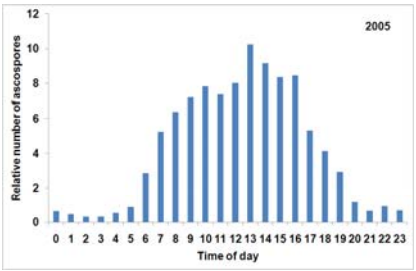
Ascospore release over after approximately 400 degree days (= 20 days at 20°C, with base temp. 0°C)



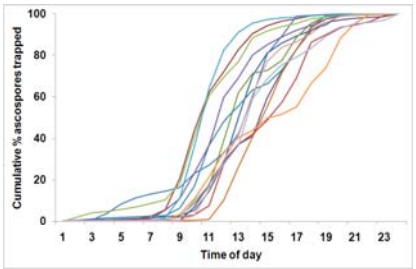
Dry conditions will reduce or stop ascospore development

Halting degree day accumulation has been done successfully for *Venturia inaequalis*, the apple scab fungus

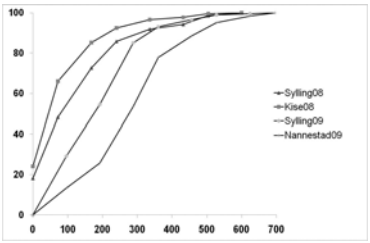
Actual ascospore trapping (blue) compared to halting degree day accumulation after 4 (red) or 7 (green) dry days



Relative ascospore trapping of all season's ascospores for each hour of the day shows that there is a diurnal distribution of ascospore release



- 14 episodes where rain and ascospore release started during night and continued throughout the next day and night
- A clear diurnal pattern in release of ascospores
- This information may be used to reduce the number of fungicide applications

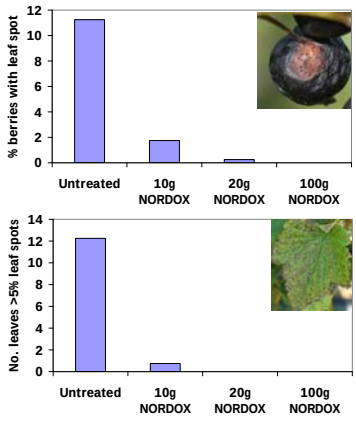


- Fruit cluster stalks collected around bud break of black currant and run through an artificial season in the laboratory
- Stalks kept moist at 20°C
- Conidia released in water twice weekly
- Most conidia released by 600 degree days (= 30 days at 20°C)

Low doses of NORDOX 75 WG (copperoxide)

(Copper not approved as a fungicide in organic production in Norway)

- Cultivar: Ben Nare
- 10, 20 or 100 g NORDOX in 50 litre
- Five applications in late April to mid June



The use of plastic roofs or tunnels to improve quality and reduce disease problems

Recorded climatic conditions outside and under the plastic roof

Leaves with more than 5% of the leaf area with *M. ribis*:
- 91% outside roof
- 0% under roof