Rust diseases

- Rust diseases are caused by basidiomycetous fungi in the order Uredinales.
- the rust fungi are obligate parasite.
- They are **heteroecious**.
- Members of this group produce five spore types (pycniospores, aeciospores, urediospores, teliospores, and basidiospores).

White pine blister rust

Causal agent: ***Cronartium ribicola***

Hosts: white pine (five needled pine) at all ages.

Alternate hosts: currants and gooseberries in the genus *Ribes.*

Symptoms on pine

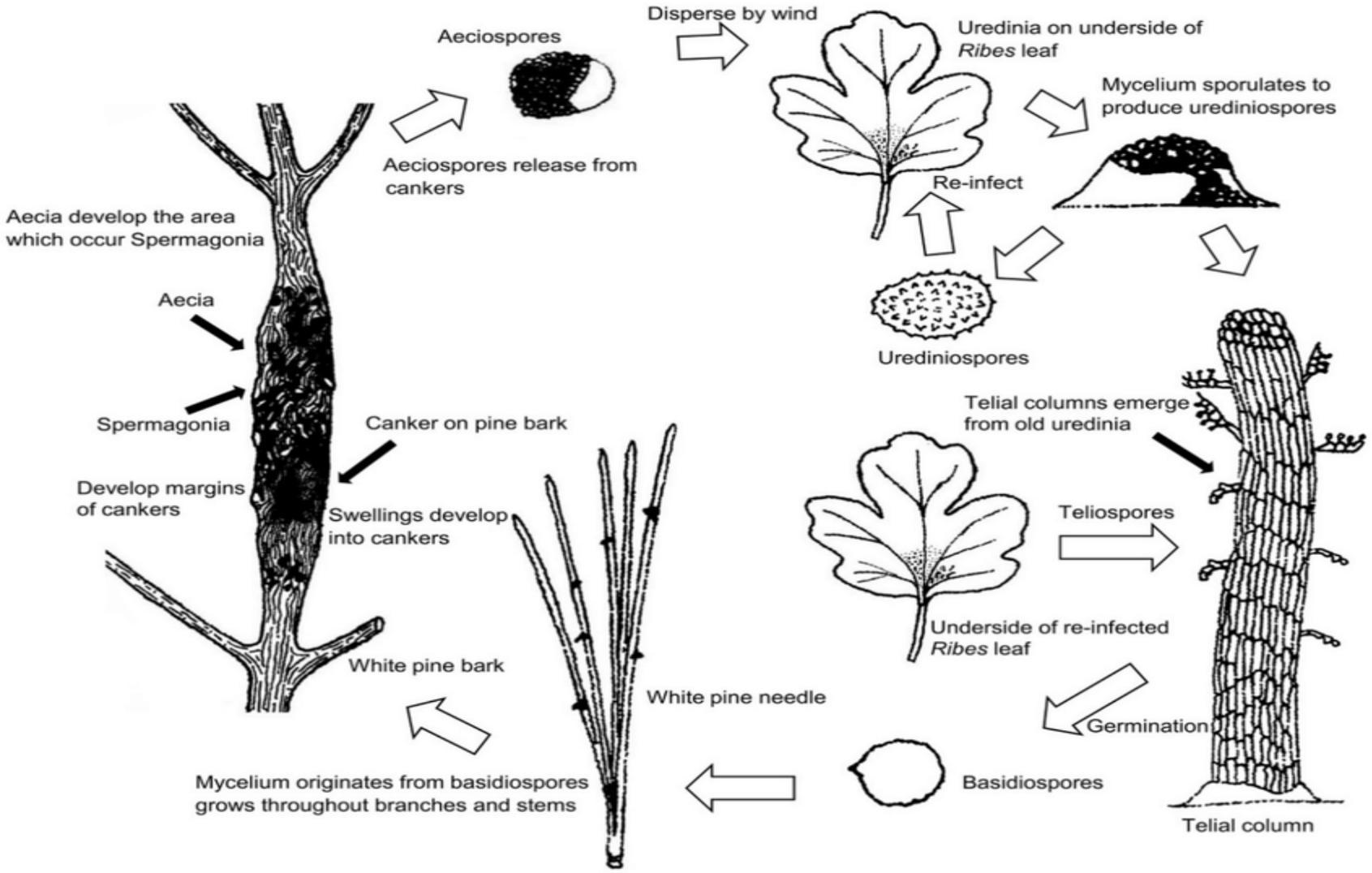
Bright red, recently killed “flagged branches” are the most obvious symptom of white pine blister rust

Symptoms on pine

Diamond-shaped stem cankers are often swollen and resinous and sometimes have an orange margin.

In the spring and early summer, the yellow to orange blisters can often be seen around or within the margins of trunk cankers.

Life cycle of *Cronartium ribicola*



Symptoms on the branches

Yellow orange patches on the stem are the sign of the disease

Also canker are visible on the branches

Signs on *Ribes spp*.

In the summer and fall (uredinia and later telia) spores on the undersurface of leaves and hairlike teliospores will appear, premature defoliation occur but otherwise, the disease causes little damage.

Symptoms on *Ribes*

management

1- Alternate host eradication to prevent complete their life cycle.

2- planting rust-resistant cultivars

3- Prune and destroy all branches with cankers.

4- Apply an appropriate fungicide in late summer to protect pines from infection from basidiospores released by an alternate host.

Cedar apple rust

Causal agent: Gymnosporangium juniperi-virginianae.

Gymnosporangium spend the winter on their juniper hosts as stem galls up to 5 cm in diameter. Galls can be perennial and survive they may take more than one year to reach maturity.

Gymnosporangium has four spore types

Teliospore, pycniospore, aeciospore and basidiospore

to complete the lifecycle of gymnosporangium requires to juniper host and rosaceae host.

Juniper Hosts: eastern red cedar, southern red cedar, Rocky Mountain juniper, some prostrate junipers, and Chinese juniper.

rosaceous hosts: apple, crabapple, hawthorn, quince, serviceberry, and pear.

symptoms

Infected red cedars form brown to chocolate round or kidney-shaped galls that vary in size from 1\4 to 2 inches in diameter. During warm weather distinctive bright orange gelatinous telial spores develop and protrude from the surface of these galls

Small greenish yellow spots which gradually enlarge, changing to orange-yellow appears on apple leaves and surrounded by concentric red band. On the upper leaf surface, the spots become stippled with black specialized fruiting structures (spermogonia).
On the underside of the leaf, lesions are formed called “aecia.” At the point where an aecium is formed, hairlike projections can be observed.

management

1- selecting and planting a resistant varieties such as Skyrocket, Plumosa, Depressa, Douglassi and Meyeri

2- eliminating and removing the alternate hosts (rosaceae family) in the area.

3- pruning and removing galls from the red cedar and juniper hosts during dormant season.

4- applying registered fungicides for control of cedar apple rust including: azoxystrobin, mancozeb, chlorothalonil, myclobutanil and propiconazole

Western gall rust

Causal agent: *Endocronartium harknessii*

Hosts:

Lodgepole pine

Ponderosa pine

Ornamental pines (Austrian, Mugo, Scots)

symptoms

round or ball-shaped galls appear on branches or stems of susceptible pine hosts. In spring, the gall surface ruptures, releasing bright orange spores and kills off that part of the tree.

Hip canker

galls can continue to develop for many years and form large cankers called trunk or “hip” cankers.

A large numbers of galls reduces the aesthetic appearance and value of trees

symptoms

infections on young trees more often result in main stem galls that can cause stem malformations and predispose the tree to breakage in high winds or under heavy snow loads.

Management

1- Pruning branch galls can reduce risk of new infections.

2- removing trees with high numbers of branch cankers.

3- planting resistant varieties.

4- Preventative fungicide sprays can be used on high-value trees during the period of spore release in the spring.

Melampsora rust

caused by *Melampsora medusa,*

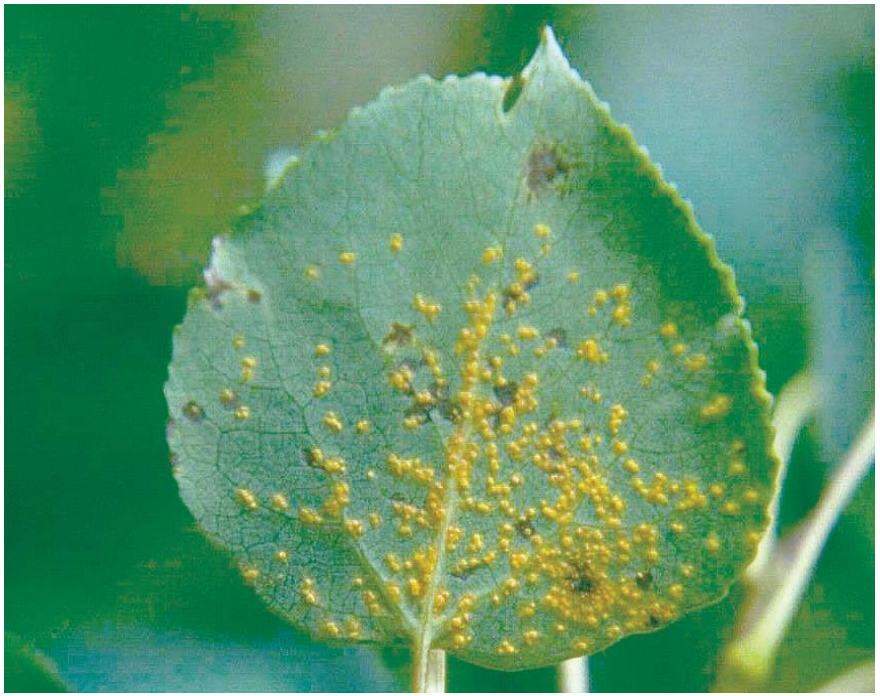
M occidentales, M epitea.

The fungus require two unrelated host plants and five different spore stages.

Aeciospore, Urediospores, pycniospores, teliospores and basidiospores.

Teliospores overwinter on dead poplar or willow leaves on the ground.

Small, yellow spots develop on the upper leaf surface of susceptible willows and poplars in early summer especially on the lower branches.
Bright, lemon-to orange yellow, powdery pustules (or uredinia) form on the lower leaf surface.
The powdery pustules contain many thousands of uridiniospores.
By late summer to mid-autumn, the pustules turn dark brown to black and become crustlike.
These dark pustules contain large numbers of thick-walled resting spores (teliospores) that overwinter in the fallen leaves.



Control

1- Removing and destroying diseased leaves from the ground may help reduce infections.
2- Plant resistant .
3- Wide spacing between trees.
4- Do not plant poplars next to conifer alternate hosts because poplars will become infected early in the summer.