

Biology of a rust fungus infecting *Rhamnus frangula* and *Phalaris arundinacea*

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Reed canarygrass (*Phalaris arundinacea*)

Nature Center, Roseville, MN



Reed canarygrass (*Phalaris arundinacea*)
and glossy buckthorn (*Rhamnus frangula*)



From "Flora of Wisconsin"

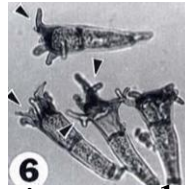
Ranked Order of Terrestrial Invasive Plants That Threaten MN

-Minnesota Terrestrial Invasive Plants and Pests Center

Rank	Scientific name	Common name	Priority Score
1	<i>Centaurea stoebe</i> ssp. <i>micranthos</i>	spotted knapweed	93.35
2	<i>Tanacetum vulgare</i>	common tansy	91.39
3	<i>Lonicera morrowii</i>	Morrow's honeysuckle	89.55
4	<i>Frangula alnus</i>	glossy buckthorn	86.73
5	<i>Phragmites australis</i> ssp. <i>australis</i>	European common reed	86.32
6	<i>Lonicera tatarica</i>	Tatarian honeysuckle	85.14
7	<i>Rhamnus cathartica</i>	common buckthorn	84.38
8	<i>Cirsium arvense</i>	Canada thistle	82.76
9	<i>Euphorbia esula</i>	leafy spurge	79.05
10	<i>Pastinaca sativa</i>	wild parsnip	78.86
11	<i>Polygonum cuspidatum</i>	Japanese knotweed	78.28
12	<i>Phalaris arundinacea</i>	reed canarygrass	78.18
13	<i>Carduus acanthoides</i>	spiny plumeless thistle	77.39
14	<i>Coronilla varia</i>	crown vetch	77.32
15	<i>Alliaria petiolata</i>	garlic mustard	76.38
16	<i>Berberis thunbergii</i>	Japanese barberry and hybrids	74.87
17	<i>Celastrus orbiculatus</i>	oriental bittersweet	74.87
18	<i>Polygonum sachalinense</i>	giant knotweed	74.47
19	<i>Vincetoxicum nigrum</i>	black dog-strangling vine, black swallowwort	74.16
20	<i>Amaranthus palmeri</i>	Palmer amaranth	73.72
21	<i>Berberis vulgaris</i>	common barberry and hybrids	72.84
22	<i>Acer platanooides</i>	Norway maple	71.85
23	<i>Centaurea debeauxii</i>	meadow knapweed	71.69

Puccinia coronata var. *hordei* Jin & Steff.

✧ Unique spore morphology:



✧ Cycles between *Rhamnus cathartica* and grasses in Triticeae:

- *Hordeum* spp.
- *Secale* spp.
- *Triticum* spp.
- *Elymus* spp.

✧ Other accessory hosts:

- *Bromus tectorum*
- *Poa* spp.
- *Phalaris arundinacea*

Rust infection on *Rhamnus frangula*
Central Park Nature Center, Roseville, MN
June 2017



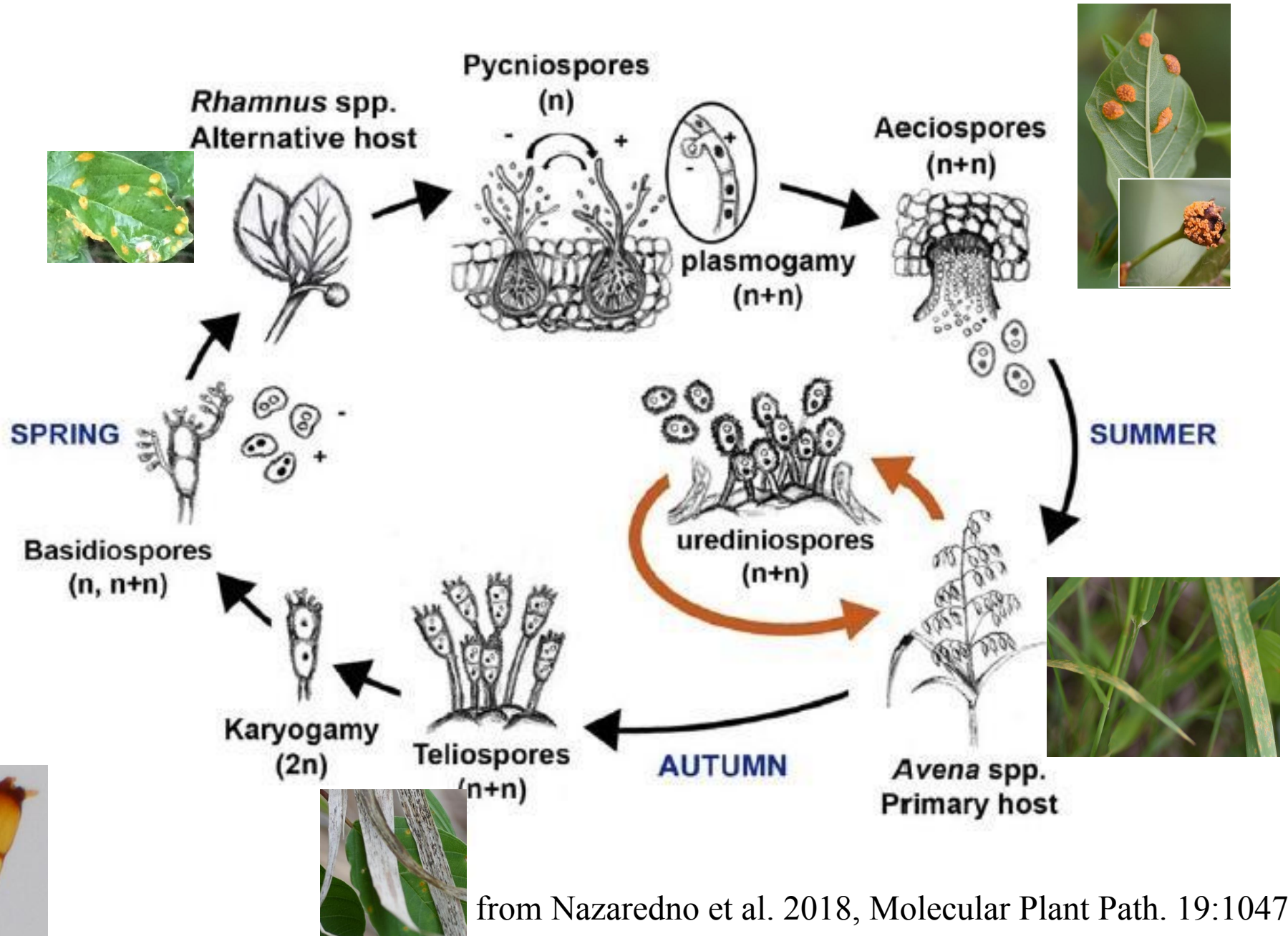
Heavy infections on *Rhamnus frangula*, but not on *Rh. cathartica*



Uredinia formed on *Phalaris arundinacea* soon after mature aecia released aeciospores from infected *Rhamnus frangula*



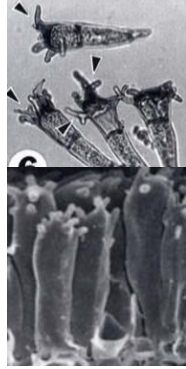
Life cycle of *Puccinia coronata*



from Nazaredno et al. 2018, Molecular Plant Path. 19:1047

Puccinia coronata: a species complex

Forms (var., f. sp.)	Telial host (primary host)	Aecial host (alternate host)
<i>avenae</i>	Oat, grasses in Avenaceae	<i>Rhamnus cathartica</i>
<i>lolii</i>	<i>Lolium</i> spp.	<i>Rh. cathartica</i>
<i>festucae</i>	<i>Festuca</i> spp.	<i>Rh. cathartica</i>
<i>hoci</i>	<i>Hoculus</i> spp.	<i>Rh. cathartica</i>
<i>agrostis</i>	<i>Agrostis alba</i>	<i>Rh. cathartica</i>
<i>hordei</i>	barley, rye, grasses in triticeae	<i>Rh. cathartica</i>
<i>bromi</i>	<i>Bromus inermis</i>	<i>Rh. cathartica</i>
<i>calamagrostis</i>	<i>Calamagrostis canadensis</i>	<i>Rh. alnifolia</i>
?	<i>Phalaris arundinacea</i>	<i>Rh. frangula</i>



Pathogenicity test on cereal crop species using aeciospores from *Rhamnus frangula*

Cereal species	Genotypes	Response
Oats	55	Immune
Barley	52	Immune
Wheat	40	Immune
Rye	6	Immune

*** Conclusion: not a pathogen of cereal crops**

Pathogenicity test on grasses

Grass species	Genotypes	Response
<i>Phalaris arundinacea</i>	12	Susceptible
<i>Ph. minor</i>	2	1 susceptible, 1 resistant
<i>Bromus inermis</i>	6	Immune
<i>Poa pratensis</i>	2	Immune
<i>Lolium perenne</i>	2	Immune
<i>Elymus canadensis</i>	2	Immune
<i>E. glaucus</i>	4	Immune
<i>Pascopyrum smithii</i>	2	Immune
<i>Arrhenatherum elatius</i>	2	Immune

On-going studies:

- ✧ Distribution in the United States
- ✧ Host specificity on *Rhamnus* spp. and grasses
- ✧ Genetic relationships with other crown rusts
 - ITS sequence
 - Sexual compatibility

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Flower infection led to reduction in fruits



Contributors:

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