**Puccinia punctiformis (F. Strauss.) Rohl.**

**INVASIVE SPECIES ATTACKED:** Canada thistle (*Cirsium arvense* (L.) Scop.)

**TYPE OF AGENT:** Leaf and stem rust (fungus)  
**COLLECTABILITY:** Not permitted

**ORIGIN:** Unknown

**DESCRIPTION AND LIFE CYCLE**

**General Development:**
*Puccinia punctiformis* is a systemic rust that is specific to Canada thistle\(^2\).\(^5\). The rust spores redistribute by wind\(^6\).

**Detailed Development:**
*P. punctiformis* has several stages of spore development and ideal conditions are necessary for the successful advancement of the stages. The overwintering mycelium infects new shoot growth that develops from Canada thistle roots\(^5\). The dormant, thick walled spores (teliospores) store themselves in dead plant tissue in preferred environments and in ideal conditions will germinate in the spring to produce spores that require cross pollination (basidiospores). Up to four basidiospores develop in the basidium and germinate and attack other parts of the host plant including adventitious root buds\(^5\).\(^6\). Next, the orange coloured asexual spores (spermagonia) develop, followed by the reproductive body (aecia). The aecium of *P. punctiformis* produces spores (aeciumspores) that are capable of infecting adjacent host plant leaves. The leaves that become infected with the aeciumspores then develop self-producing spores (urediniospores)\(^5\). The urediniospores are then redistributed to other plants and nearby patches by wind\(^6\). An early symptom of *P. punctiformis* development is visible when the orange spermagonia are accompanied with a strong sweet smell\(^5\).

**Overwintering stage:**
The mycelium overwinters on the plants’ rhizomes\(^6\). Urediniospores may overwinter in dead leaves and teliospores may overwinter in the soil\(^6\).

**EFFECTIVENESS ON HOST PLANT**

*P. punctiformis* infested shoots block the plant’s ability to absorb light and produce chlorophyll referred to as etiolation. This process eventually causes necrosis to other plant parts, including the leaves and stems\(^5\). Significant damage can be caused from the systematic rust and infected roots generally do not survive\(^4\). Most likely, *P. punctiformis* is unable to provide complete control of Canada thistle, however, studies have shown that in some populations it is capable of causing 95% host plant decline when it occurs on a site with the approved biocontrol agent *Hadroplontus litura*\(^5\). In a growth chamber study, the flowers and vegetative reproduction capabilities of Canada thistle plants infected with *P. punctiformis* were reduced\(^5\). In southern Ontario, where *P. punctiformis* appears to be common, Canada thistle plants can be killed from the rust\(^1\). Also in Ontario, the decline of Canada thistle plants at one infestation was partially attributed to the presence of the three adventives species, *P. punctiformis*, *Cassida rubiginosa* and *Cleonus piger*\(^4\).
HABITAT AND DISTRIBUTION

Native:

*P. punctiformis* is believed to be established throughout most of the world, however, its specific native range is unknown. It is widespread in the eastern hemisphere, occurring in Asia, Australia, New Zealand and Europe. In Asia it is found in Afghanistan, Armenia, Azerbaijan, Republic of Georgia, Iran, Japan, Kazakhstan, Kirgizia, Tadzhikistan, and east and south Russia. It is found throughout all of Australia and New Zealand. In Europe, it is established in Austria, Belarus, Belgium, Denmark, Estonia, Finland, France, Germany, Great Britain, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, western Russia, Spain, Sweden, Switzerland and Ukraine.

North America:

Although *P. punctiformis* is found widespread throughout Canada and the U.S. it is considered to be adventive to North America. In Canada it is more common in B.C., N.S., and Que, but, is rarer in the prairies. In the U.S.A., it is recorded to be more widespread through varying habitat types in Calif., Maine, Mass., Mich., Mont., N. J., N.Y., Ohio, Penn., R.I., S. Dak., Vt., Wash., and Wis.. In Canada, *P. punctiformis* appears to be more frequently found in eastern Canada and in moist sites.

British Columbia:

*P. punctiformis* has been recorded established in the Bunchgrass, Coastal Douglas-fir, Coastal western hemlock, Interior Douglas-fir and Sub-boreal spruce biogeoclimatic (BEC) zones. It is believed *P. punctiformis* is much more widespread in B.C. and established in more BEC zones than what is currently recorded.

BRITISH COLUMBIA RECORD

Origin:

*P. punctiformis* is relatively widespread in Canada, however, the original source of the adventive rust found in B.C. is unknown.

History:

It is not known when *P. punctiformis* was first found in B.C. There has been interest in using *P. punctiformis* for biological control of Canada thistle in North America and New Zealand since 1923. There is renewed interest in the potential of this rust as a biocontrol agent in North America, particularly in the U.S.A.

Field results:

In any infestation a number of plants may have varying levels of *P. punctiformis*, from those showing no sign of attack, to others with light, moderate and heavy attack. In B.C., in the Salmon Arm area, some plants have been found to be completely collapsed when found heavily infested with the rust. Plants observed in July at Smithers appeared to be unaffected by the rust. A plant can be heavily laden with rust and show signs of total collapse while standing adjacent to healthy plants appearing resistant to attack. The rust appears to be quite widespread, but, it occurs sporadically and to varying degrees.

NOTES

- Studies in Switzerland have shown that the weevil *Apion onopordi*, an established feeder of European thistles, readily transfers *P. punctiformis* spores on Canada thistle. Research also shows female *A. onopordi* appear to prefer to oviposit on rust-infested plants and their offspring are larger and lay more eggs than those reared on plants free of *P. punctiformis*.
- In a laboratory study carried out on Canada thistle plants, the best disease symptoms occurred when host plant roots were stored at 5, 10, or 15°C after being inoculated with *P. punctiformis*. All the clones tested, including both male and female plants, became infected. However, there was a varying range of receptiveness to the rust.
- Studies have shown that *Hadroplontus litura* does not assist with the dispersal of *P. punctiformis*. However, it is unknown whether research has been carried out on other biocontrol agents such as *Rhinocyllus conicus* and *Larinus planus* to determine their effectiveness as a vector of the rust.
REFERENCES


