



Fig. 1. a) The point of entry via the stomata on a barley leaf and the formation of infection hyphae ; b) urediniospore with numerous cones on the surface; c) a uredinium

Name: *Puccinia hordei* (Ph)

Disease: Barley leaf rust (BLR); brown rust; dwarf leaf rust

Classification: K: Fungi P: Basidiomycota C: Pucciniomycetes O: Pucciniales F: Pucciniaceae

For 2021/2022 crop year, the global production volume of barley was about 145.9 million metric tons. The world's largest producer of barley according to Statistica 2023 is the European Union, followed by Russia and Australia for 2022/2023. The pathogen is found in all barley growing regions of Australia and affects barley production in many parts of the world.

Biology and Ecology:

P. hordei is a macrocyclic, heteroecious rust pathogen. Uredinial infections can be up to 0.5mm in diameter forming orange-brown pustules that darken with age, mainly on the upper surface of leaf blades. They can also be found on the lower surface of leaf blades and on the leaf sheaths. During this stage, the urediniospores can be wind dispersed. Tissue chlorosis and necrosis can occur in stems, glumes and awns during severe infections late in the season. During the sexual stage, brown to black telia form on the leaf sheaths forming stripes.

The urediniospores germinate and the germ tube forms an appressorium over the stomata. The infection peg pushes through the stomata forming a vesicle from which the infection hyphae invades neighbouring cells. As an obligate biotroph, specialised infection structures, i.e., haustoria are formed within the plant cells.

Within 7-14 days post infection, new urediniospores are produced for the next cycle of infection.

Host Range:

The main hosts are cultivated barley and wild barley, *Hordeum spontaneum*, *H. bulbosum* and *H. murinum*. It can also infect the common Star-of-Bethlehem (*Ornithogalum umbellatum*) as well as *O. brachystachys*, *O. trichophyllum*, *Dipcadi erythraeum* and *Leopoldia eburnea*.

Impact:

Cultivated barley, *Hordeum vulgare*, is ranked fourth in terms of global production after maize, rice, and wheat. Yield reductions of up to 62% have been reported in susceptible varieties.

Distribution:

It is found in all barley growing regions of Australia. It is widely distributed worldwide.

Management options:

The best control is the use of different barley genotypes with resistance genes. Designated "*Rph*" (Reaction to *Puccinia hordei*) genes, to date, 28 such loci have been designated, although two (*Rph15* and *Rph16*) are synonymous. The 27 accepted loci are spread across all 7 chromosomes of barley, six originate from *H. vulgare* ssp. *spontaneum*, four from *H. bulbosum*, and the remainder from *H. vulgare*. Three of these genes confer durable Adult Plant Resistance (*Rph20*, *Rph23*, *Rph24*), and the remaining 24 All Stage Resistance (ASR). Four ASR genes have been cloned (*Rph1*, *Rph3*, *Rph15*, *Rph22*).

Foliar fungicides are applied upon first detection of leaf rust, additional applications may be necessary if susceptible cultivars are used under severe epidemics.

Further Reading: Anikster Y (1981) Phytopathol 72:733–35; Das et al (2007) Crop Protection 26 (9): 1422-1430; Park RF (2003) Plant Dis 87 (11): 1311-1316; Park et al (2015) Annual Review Phytopathology 53 (1): 565-589; Sandhu et al (2016) J. Plant Breed. Crop Sci. 8(10):197-205; Wallwork et al (1992) Australasian Plant Pathol 21, 95–97

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