BULLETIN

ramularia *leaf spot*

Ramularia is caused by *Ramularia collo-cygni*. This disease is economically important in Europe, South America and New Zealand. The pathogen was positively identified for the first time in 1998 in Scotland. Yield losses of 1 ton/ha were observed.

This fungal disease can occur on various grass species as well as maize and thus can appear in areas where barley isn't planted or where Ramularia leaf spot is not considered an important barley disease. Ramularia has a complex life cycle which could start with infected seed, but can also spread by airborne spores.

Symptoms

Early Stages

The first stage of Ramularia are irregular brown pepper spots on the leaf surface of the bottom leaves during tillering. It is just visible to the naked eye.

The lesions are visible on the top and bottom surface of the leaf. Physiological spots only appear on the top surface.

Ramularia leaf spot has "pepper spot" symptoms next to the characteristic rectangular lesions.

Ramularia leaf spot

Development

Appearance of first symptoms of Ramularia leaf spot

The first symptoms appear from tillering to flag leaf appearance. At tillering (GS 25-30) Ramularia develops on the bottom of older leaves which die off as a result of the stress caused by nutrient deficiencies, climate conditions (frost) or burning of the leaves (phytotoxicity).

Post ear appearance

When barley starts flowering (GS61-69) Ramularia can develop lesions on the top leaves. Exposure to sunlight is an important stress factor which could lead to development of symptoms because the incidence of leaf spot is higher in the top two leaves.

Cultivars with an upright growth together with a low density will show more symptoms on the bottom leaves because more sunlight reaches the bottom leaves. With barley with a higher density and cultivars that tiller more, the lower leaves will show less symptoms as the top leaves over shadow them.

The process of flowering is also an important natural stress factor because the plant mobilises nutrient reserves away from the leaves for better ear and grain development.

Ramularia symptoms will appear quicker where nitrogen deficiencies develop. Cultivars with a short growth period also show symptoms quicker.

Sources of infection

Ramularia is seed borne. Infection can also be spread by airborne spores which are spread from volunteer barley and grass.

The longer the leaves stay wet the higher the disease pressure of Ramularia leaf spot after flowering. Drowning condition are also a stressor for Ramularia leaf spot development.

Asymptomatic or invisible phase

Ramularia develops within the plant. The effect of this phase on the plant is still unknown. No symptoms are visible.

Symptomatic or visible phase

When leaves die off due to age, climate conditions or nutrient deficiencies the fungi in the leaf changes which leads to production of the plant toxin, Rubellin D. This toxin is associated with the typical Ramularia leaf spot symptoms and early death of leaves. Although the fungi is more present on the bottom leaves, the symptoms are more prominent on the top leaves because Rubellin D is activated by sunlight and therefore the top leaves are more damaged.

Secondary infection during the season

When Ramularia leaf spot symptoms are present, secondary infection could take place through spores from infected leaves. Spores are released in the air (24 to 48 hours) after the leaves have been wet for a couple of hours.

Infection takes place through the stomata. These released spores could colonize the ear and beard as well as grasses which serve as secondary host for the disease.

CONTROL MEASURES

Resistant cultivars

Currently there are no tolerant cultivars in South Africa.

Foliar sprays

The optimal time to protect barley against Ramularia leaf spot is before symptoms are visible on the top leaves which normally happen right after flowering.

The start of ear emergence (Zadoks 50) is thus the best time to apply chemical control, taken into account the withholding period of most fungicides.

The new SDHI fungicide **Aviator® Xpro™**, can now be applied even later as **Aviator® Xpro™** has a 42-day withholding period. Earlier applications during tillering and stem elongation may have an effect on the ultimate disease pressure, but is not enough to effectively reduce later Ramularia leaf spot symptoms.

These early applications are however important to control other barley diseases like powdery mildew, net blotch, leaf rust and leaf spot.

symptoms

Late stage of Ramularia leaf spot

Later stage of Ramularia leaf spot

Intermediate Stage

The early "pepper spot" symptoms of Ramularia rapidly develop into the typical rectangular Ramularia leaf spot lesion. The rectangular red-brown lesions are 2 mm x 0.5 mm in size. The middle of the lesion is more dark brown because it is where the pepper spot symptom occurred. The red-brown lesion is surrounded by a yellow circle. During this stage the rest of the leaf is the normal green color.

Late Stage

The rectangular lesions are still visible at the bottom and top of the leaf, the leaves lose their green colour, turn yellow and then die completely. The death of the leaves begins at the leaf tips. At the bottom of the leaf, traces of Ramularia collo-cygni develop translucent spores. These spores have nothing to do with the rectangular lesions and will always be visible on dead leaves. Wet conditions in late season cause red discolouration of the Ramularia leaf spot lesions on dead leaves.

Reference : A guide to the recognition and understanding of Ramularia and other leaf spots of barley, Simon Oxley, Neil Havis and Andy Evans of SAC

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