Ramularia leaf spot in barley

Figure 1. Ramularia leaf spot symptoms – the ‘5Rs’: (1) Ringed with yellow margin of chlorosis, (2) Rectangular shape, (3) Restricted by the leaf veins, (4) Reddish-brown colouration, (5) Right through the leaf

Latest information

- Resistance ratings for spring and winter barley varieties are published in the AHDB Recommended List
- Mature ramularia lesions can be distinguished from other foliar symptoms by applying the ‘5Rs’
- The latest information on ramularia risk forecasting is published at sru.co.uk/cropclinic

Action

- Consider using a more resistant variety if yield losses have occurred in recent years
- In high-risk situations, use a preventative spray at booting (GS45 to GS49)
- Use identification guidelines and look for symptoms late in the season
- Avoid saving seed for re-sowing from heavily infected crops
- Ensure nitrogen does not become limiting in malting barley crops, as this will increase ramularia levels

Importance

Ramularia leaf spot symptoms have been reported with increasing frequency across the UK. However, ramularia is probably still underreported, due to unfamiliarity with the symptoms. Though previously associated with spring crops, evidence of ramularia in winter crops has increased in recent years. Trials suggest yield loss can be up to 0.5t/ha in heavily infested crops.

Life cycle and symptoms

The fungus *Ramularia collo-cygni* causes ramularia and grows from infected seed. It then moves systemically within new plant growth. Airborne spores produced on trash and crop debris, however, can also infect plants. Infected crops do not display visible symptoms initially. Senescing leaves may show signs of infection early in the season but the main damage occurs on the top leaves after flowering.

Later in the season, rows of white spores can be seen with a hand lens on the undersides of affected leaves. As leaves senesce, these structures can be seen with the naked eye.

Stressed crops are thought to be more likely to show symptoms, including those exposed to high light levels, waterlogging and rainfall after flowering. However, even stress associated with flowering may be sufficient to initiate symptoms.

Figure 2. Life cycle of *Ramularia collo-cygni*
Early symptoms comprise small brown pepper spots on the upper leaves. These develop quickly into typical ramularia leaf spot lesions. Mature ramularia lesions can be distinguished from other foliar symptoms by applying the ‘5Rs’ (see Figure 1):

1. Ringed with yellow margin of chlorosis
2. Rectangular shape
3. Restricted by the leaf veins
4. Reddish-brown colouration
5. Right through the leaf

Ramularia is often mistaken for other diseases, such as the spot form of net blotch, tan spot or physiological spotting. Net blotch and tan spot lesions are not rectangular or restricted by leaf veins. Physiological leaf spots, caused by oxidative stress, tend to be caused by superficial browning on upper leaf surfaces, while the undersides remain unaffected. These cause less yield loss but can trigger the production of ramularia leaf spots.

Forecasting

A ramularia risk forecast for UK barley is being developed, with AHDB funding, to allow field-level ramularia risk to be assessed and growers to make informed judgements on control.

Previous research suggested that long periods of leaf surface wetness at stem extension could be the main influence on ramularia disease severity. More recent work, however, shows the relationship between environmental and crop factors and ramularia levels is more complex. Factors now being examined include previous cropping, cultivation system, variety, rainfall and light levels after flowering. Data from Recommended Lists trials is being used to quantify the importance of these factors to produce a risk score system.

Control

Variatel resistance ratings for ramularia leaf spot are included on the AHDB Recommended List for spring barley and winter barley.

Ramularia is seed borne but it is not controlled effectively by seed treatments. Farm-saved seed from crops which had high levels of ramularia symptoms should be avoided.

Some foliar fungicide treatments can control ramularia but resistance to fungicides is increasing. Resistance to strobilurin fungicides was reported many years ago. Cases of resistance to azole and SDHI fungicides have also been reported recently in the UK and Europe.

Chlorothalonil is not effected by mutations in the fungus and should be included in programmes to ensure effective control and slow further spread of resistance to azoles and SDHIs.

The most effective timing for fungicide applications against ramularia is at booting (GS45 to GS49). Later applications, up to ear fully emerged (GS59), may also be effective but may be restricted for malting barley crops. Once symptoms develop on the upper leaves post-flowering, treatment is not effective.

Further information

Please refer to AHDB’s ‘Identification and field scoring guide for ramularia leaf spot’ or cereals.ahdb.org.uk/disease, for further information about ramularia, including its control.