MANAGING FUNGICIDE RESISTANCE IN ASCOCHYTA BLIGHT OF LENTILS

FACT SHEET

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

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Ascochyta blight of lentils

KEY POINTS

- Resistance to the Group 1 fungicides carbendazim and thiabendazole has been detected in laboratory tests of isolates collected from South Australia.
- No cases of resistance or reduced sensitivity to Group 1 fungicides have been detected in the field in Australia.
- Careful use and rotation of available fungicides in pulses will lower the risk of encouraging fungicide resistance in ascochyta blight, regardless of the disease being targeted.
- Agronomic practices that minimise disease pressure reduce the need to apply fungicides.
- Good management will help protect the long-term viability of current fungicides.

Photo: GRDC.

Ascochyta blight of lentils is caused by the fungal pathogen *Ascochyta lentis* and is an important disease of lentils in Australia, especially in the southern growing region.

This disease can infect seed pods, potentially causing seed staining or seed abortion. Economic losses may result due to the reduced grain quality and yield.

Ascochyta blight of lentils is hard to detect without careful inspection and the disease can affect all above-ground parts of the plant. Unprotected crops can suffer yield losses of 50% or more.

While there have been no verified field cases of ascochyta blight showing reduced sensitivity or resistance to fungicide in Australia, resistance to the Group 1 fungicides carbendazim and thiabendazole has been detected in laboratory tests.

As a result, lentil growers are advised to use caution when planning Group 1 fungicide applications.

Fungicide resistance in ascochyta blight of lentils

Several *A. lentis* isolates collected from South Australian lentil paddocks during 2010 and 2011 were later found to exhibit resistance to the Group 1 fungicide carbendazim in laboratory tests. This may signal a risk of the pathogen developing resistance to other Group 1 fungicides in the field.

While carbendazim has limited efficacy against ascochyta and therefore has no registration, the product is used frequently for managing botrytis grey

P Level 4, 4 National Circuit, Barton ACT 2600 | PO Box 5367, Kingston ACT 2604
T +61 2 6166 4500 **F** +61 2 6166 4599 **E** grdc@grdc.com.au

mould in lentils. This use pattern will still place selection pressure on resistant ascochyta isolates.

Resistance to the Group 1 fungicide thiabendazole has also been detected in laboratory tests of *A. lentis* isolates collected from South Australia in 2020. Thiabendazole is an active ingredient (along with thiram) in the seed treatment fungicide P-Pickel T®.

These laboratory detections indicate the potential risk of *A. lentis* developing resistance to Group 1 fungicides in the field and resistant isolates may well be present in states other than South Australia.

Resistance to Group 11 fungicides has been detected in *A. lentis* populations overseas, clearly indicating that the pathogen is capable of developing resistance to different fungicides in Australia.

Growers need to consider these risks when planning a fungicide application and rotation strategy.

Repeat applications of Group 1 or Group 11 fungicides to control other diseases of lentils can also favour resistant strains of *A. lentis* that may be present in the crop.

Managing fungicide resistance

It is important to recognise that fungicide use, and the development of fungicide resistance, is a numbers game. That is, as the pathogen population increases, so does the likelihood and frequency of naturally resistant strains being present.

A compromised fungicide will only control susceptible individuals while resistant strains within the population continue to flourish.

As a result, it is best to use fungicides against a small pathogen population. That way, only a small number of resistant individuals will be present to survive the fungicide application and they will remain vulnerable to other competitive pressures in the agri-ecosystem.

Keeping the pathogen population low can be achieved by taking all possible agronomic steps to minimise disease pressure (see *Non-chemical controls* below) and by applying fungicide at the first sign of infection once the crop has reached its key growth stages.

Fungicide resistance terminology

When a pathogen is effectively controlled by a fungicide, it is defined as sensitive to that fungicide. As fungicide resistance develops, that sensitive status can change to:

REDUCED SENSITIVITY

When a fungicide application does not work optimally but does not completely fail.

This may not be noticeable at field level, or the grower may find previously experienced levels of control require higher chemical concentrations up to the maximum label rate. Reduced sensitivity must be confirmed through specialised laboratory testing.

RESISTANCE

When a fungicide fails to provide disease control in the field at the maximum label rate.

Resistance must be confirmed by laboratory testing and be clearly linked to a loss of control when using the fungicide correctly in the field.

LAB DETECTION

A measurable loss of sensitivity can often be detected in laboratory *in vitro* tests before or independent of any loss of fungicide efficacy in the field. Laboratory testing can indicate a high risk of resistance or reduced sensitivity developing in the field.

Photo: Emma Leonard.

Fungicide usage recommendations for lentils

Planning of fungicide rotations needs to consider all fungal pathogens that may be present in the crop. Otherwise, the fungicide treatment for one pathogen may encourage resistance in another.

Careful fungicide use will minimise the risk of fungicide resistance developing in ascochyta blight of lentils in Australia and help ensure the longevity of the available chemical protections.

Advice to lentil growers includes:

- **Limit** the use of each MoA group to no more than two applications per season, rotating between different MoA groups for sequential applications.

  Group 1 (MBC) fungicides
  - Group 1 fungicides include the actives carbendazim (e.g. Motac®) and thiabendazole (e.g. P-Pickel T®, in mixture with M3 multisite fungicide thiram).
  - Apply only one foliar application of group 1 fungicides per season, to avoid selecting for resistance traits that have been detected in the lab.

  Group 2 (Dicarboximide) fungicides
  - Group 2 fungicides include actives such as procymidone (e.g. Procymidone 500®, Sumisclex®).

  Group 3 (DMI) fungicides
  - Group 3 fungicides include tebuconazole (e.g. Veritas®, in mixture with G11 fungicide azoxystrobin) and prothioconazole (e.g. Aviator®, in mixture with G7 fungicide bixafen).

  Group 11 (QoI) fungicides
  - Group 11 (QoI) fungicides include actives such as azoxystrobin (e.g. Veritas®, in mixture with G3 fungicide tebuconazole).
- **Rotate and mix** fungicide actives and MoA groups while minimising the use of fungicides known to have compromised efficacy due to resistance.
  - Avoid using the same fungicide active or MoA consecutively, both within and across seasons.
  - Use mixtures containing different MoA groups whenever possible, especially if disease pressure is high.
- **Use multi-site (M3, M5) fungicides** as rotation and mixing partners for single site (Group 1, 2, 3, 7 and 11) fungicides, to reduce selection pressure that might favour resistance to those targeted Modes of Action.
  - M3 fungicides include dithiocarbamate and its related electrophiles, such as mancozeb (e.g. Apparent®), metiram (e.g. Polyram®) and thiram (e.g. Thiram 600®).
  - M5 fungicides are the chloronitriles (phthalonitriles) including chlorothalonil (e.g. Bravo®).
- **When seed is retained** on farm, the fungicide group used for seed treatment and the first foliar application should be different to the group applied in the final foliar spray of the previous season.

Finally, it is always important to follow the AFREN 'Fungicide Resistance Five' recommendations for fungicide use. These guidelines can be applied to all crops and pathogens, regardless of their formal fungicide resistance status, to reduce the chances of resistance developing.

Photo: SARDI.

Non-chemical controls

Ascochyta blight of lentils is favoured by cool (5° to 15°C) and wet conditions early in the growing season. Heavy rainfall later in the season can also encourage infection of the seeds and pods.

Signs of infection can be hard to detect without close inspection, but all above-ground parts of the plant can be affected including stems, leaves, flowers and pods. Unprotected crops can suffer more than 50% yield loss and, in severe cases, the crop may drop all of its leaves.

The pathogen is spread via rain splash from stubble, self-sown infected plants and infected seed.

Management practices to help reduce disease pressure and spread include:

- **Planting less susceptible varieties.** Any level of genetic resistance to Ascochyta blight will help slow the rate of pathogen and disease development within a crop. This, in turn, reduces the reliance on fungicides for managing the disease.

  Avoid growing S and VS lentil varieties in disease-prone areas. However, all varieties should be carefully monitored for signs of infection regardless of their resistance rating.

  Resistance-breaking fungal isolates may develop quickly in cropping systems with a high lentil intensity and limited variety diversity.

- **Maintaining a safe crop distance.** Ascochyta spores are easily spread from lentil stubble and volunteers, so any lentil crop should be planted at least 250 metres from other lentil crops or stubble.

- **Practicing good crop rotation.** Paddocks should be given a three-year break between lentil crops, as rotating with cereals helps reduce inoculum levels.

- **Sowing into cereal stubble** Sowing lentils into the standing stubble of a preceding cereal rotation will help protect the emergent plants from spores being spread in rain splash.

- **Planting at the optimum time.** Sow lentils at the optimum time for your region. Sowing early exposes a lentil crop to additional disease cycles and allows disease to increase to higher levels on the plants.

The Fungicide Resistance Five!

1. **Avoid susceptible crop varieties**
2. **Rotate crops – use time & distance to reduce disease carry-over**
3. **Use non-chemical control methods to reduce disease pressure**
4. **Spray only if necessary & apply strategically**
5. **Rotate & mix fungicides / MoA groups**

Photo: GRDC.

FREQUENTLY ASKED QUESTIONS

How does fungicide resistance develop?

Fungicide resistance occurs when fungicide resistant strains of a pathogen dominate the whole pathogen population. Fungicide resistant strains are 'selected for' by applications of the fungicide. That is, the non-resistant strains are controlled by the fungicide allowing the resistant strains to proliferate.

For more on the causes and effects of fungicide resistance, read the AFREN Fact Sheet How Fungicide Resistance Develops.

How do I know if I have a fungicide resistant disease in my crop?

If a fungicide application fails to provide adequate control of the disease, or if the lower range of application rates on the label for a fungicide must be steadily increased from application to application, there is cause for concern.

You should keep an accurate record of every fungicide application – including dates, times, weather conditions, application rates, crop growth stage and notes of any evidence of a disease being present.

What should I look for?

It is important to inspect the crop after every fungicide application to confirm whether the expected level of control has been achieved.

If the disease is still present or increasing, review records of the application for reasons why it may have failed. If there is no obvious cause, consult an expert and consider having samples of the infected crop tested for fungicide resistance.

Who do I contact?

Contact your agronomist or adviser and have them review the crop and your fungicide application records. If they suspect fungicide resistance, they will be able to arrange further investigation, sample collection and lab analysis.

Alternatively, you can visit the AFREN website About page for details of fungicide resistance experts in your region.

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USEFUL RESOURCES

Australian Fungicide Resistance Extension Network (AFREN)
Dedicated site for the latest Fungicide Resistance information, reference materials, case studies, grower survey and news.
afren.com.au

AFREN Fungicide Resistance Information Guide
Comprehensive guide to fungicide resistance issues, instances and management – including details of fungicide Mode of Action groups, chemical actives and diseases by crop. Prepared by AFREN and published by the GRDC.
afren.com.au/resources#FRManagementGuide

GRDC Fungicide Resistance In Pulses Fact Sheet

GRDC Fungicides In Australia Fact Sheet

GRDC How Fungicide Resistance Develops Fact Sheet

afren.com.au/resources#factsheets

REFERENCES

The content in this Fact Sheet is based on the content and sources included in the AFREN Guide **Fungicide Resistance Management in Australian Grain Crops.** See 'Useful Resources' above.

MORE INFORMATION

Australian Fungicide Resistance Extension Network
afren.com.au

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