Fungicide Resistance Management in Oilseed Rape

Introduction

Fungicides are used for disease control and, in some cases, for plant growth regulation and other physiological effects.

Stem canker, light leaf spot and sclerotinia stem rot are the most serious diseases of oilseed rape against which fungicides are used.

Disease development is very variable from year to year and spray timing is critical to ensuring effective disease control.

Fungal pathogens of oilseed rape are showing reduced sensitivity to some fungicides and there is concern about declines in efficacy.

Robust strategies to prevent further deterioration are vital if we are to retain effective fungicides in the future.

Follow the guidelines on fungicide usage issued by FRAG-UK and FRAC to minimise the risk of resistance.

This leaflet and further information on resistance are available at FRAG-UK website: **ahdb.org.uk/frag**

The authors are grateful to the members of FRAG-UK for comments during the preparation of this edition of the leaflet, and to Phil Walker (ADAS) who also contributed.

Always check the approval status of a product before use.

General strategy for managing fungicide resistance

The risk of pathogens developing resistance to fungicides can be reduced by various means. Follow an integrated approach to manage disease risks.

Use disease resistant cultivars. Where possible, varieties should be selected with good resistance ratings to the diseases of most concern on the farm. Reduced fungicide inputs may be possible and should reflect overall disease risk.

Target fungicides on crops where there is risk of yield loss. Seasonal variation in risk can be large, so use local guidance. Use disease forecasts, crop monitoring information and thresholds, where available.

Ensure fungicide applications are well-timed and the appropriate dose is used.

Avoid repeated sequential use of the same product or fungicide containing the same mode of action. Follow all statutory conditions of approval, including the maximum number of product applications per crop or a maximum total dose for the active ingredient. Alternate modes of action and use mixtures/co-formulations throughout the fungicide programme.

Manage crop residues, which are a source of inoculum for phoma leaf spot and stem canker (*Plenodomus* spp. formerly *Leptosphaeria* spp.), light leaf spot (*Pyenopeziza brassicae*) and dark leaf-spot (*Alternaria* spp.). Oilseed rape debris and stubble left on the soil surface, e.g. direct drilling of the next crop, will pose a greater risk than crops drilled after deep ploughing. Burying crop residues may help to decrease the production of air- or splash-borne spores. Avoid planting new oilseed rape crops adjacent to the previous year's stubble and isolate by 200–500 m, if possible.

Sow by late August to ensure plants are well-grown prior to the onset of phoma leaf spot. It is less damaging and easier to manage on plants with large leaves. Early drilling can increase the risk of light leaf spot. Therefore, all crops should be walked and monitored regularly.

Extend rotations. Oilseed rape rotations are often shorter than ideal. The risk of soil-borne diseases, such as clubroot (*Plasmodiophora brassicae*) and stem rot (*Sclerotinia sclerotiorum)* will be reduced by extending rotations to at least one in four, preferably longer. Trash-borne disease risk (light leaf spot and phoma) will also be reduced in extended rotations.

Consider biopesticides, including the use of plant defence inducers, as part of an integrated pest management (IPM) strategy. Examples include *Coniothyrium minitans* (approved for use as a soil treatment against sclerotinia) and *Bacillus amylofiquefaciens* (as a seed treatment which can reduce levels of phoma).

Phoma leaf spot and stem canker

(*Plenodomus lingam* and *P. biglobosus,* formerly *Leptosphaeria maculans* and *L. biglobosa*)

Timing of fungicide application is critical. Use fungicides in response to disease forecasts, crop monitoring and thresholds. Control of stem canker is best achieved by controlling the asexual phase of the pathogen, i.e. phoma leaf spot, in the autumn. This can be achieved by applying fungicides in response to thresholds (10 to 20% plants affected and further treatment when re-infection observed 4 to 10 weeks later) to decrease the likelihood of the disease spreading to the stems. Varieties with good resistance may only require a single fungicide application at threshold to achieve sufficient disease control.

DMI, SDHI and strobilurin fungicides are approved as treatments. DMIs are a component of many currently available products. Products containing mixtures of fungicides with different modes of action, such as SDHIs or strobilurins allow for a range of actives to be used in a spray programme with a lower risk of selecting for resistance for any one component.

Consult the latest AHDB fungicide performance updates when selecting fungicides as this provides information on the most effective products and doses. Consider where different modes of action can be used throughout the fungicide programme for the control of all diseases, not just stem canker.

There are recent reports of decreased sensitivity to DMI fungicides in the UK and western Europe for *P. lingam*. Other countries, including Australia, have also previously reported decreased sensitivity to DMI fungicides. Therefore, resistance management strategies should be an integral part of the fungicide programme for disease management. There are no reports of decreased sensitivity to SDHI or strobilurin fungicides.

Light leaf spot

(*Pyrenopeziza brassicae*)

Use fungicides protectantly in response to disease risk. Consider information from disease forecasts and crop monitoring. The risk of disease can also be affected by the disease resistance rating of the variety. Fungicides are most effective when applied before significant levels of disease are present and so application in late autumn and in the following spring are common. Prior to 2014, light leaf spot control was reliant on DMI fungicides and some strains with decreased sensitivity have been noted/or reported. SDHI plus strobilurin mixture products or solo strobilurin products are now available which allow for alternation with different products containing different modes of action to DMIs within the fungicide programme.

Consult the latest AHDB fungicide performance updates when selecting fungicides as this provides information on the most effective products and doses. Consider where different modes of action can be used throughout the fungicide programme, not just light leaf spot.

Decreased sensitivity to DMIs has been reported in the UK population in laboratory tests, however, field performance of DMIs against light leaf spot remains similar to that of non-DMI fungicides. DMIs and other modes of action should be included in the fungicide programme as this is important for resistance management.

Avoid home-saving seed from heavily infected crops as there is some evidence of transfer via surface contamination of seed.

Stem rot

(*Sclerotinia sclerotiorum*)

Only use fungicides when necessary. The risk of yield loss is low on farms with no history of the disease, so treatment may not always be necessary. Disease risk is increased where there is a previous history of the disease, by short rotations and by wet weather during petal fall. Make use of disease forecasting systems that monitor for risk factors including spore release, prevailing climate and crop growth stage to help guide decisions. Manage disease risk in the context of your crop rotations and extend rotations of susceptible crops as part of an IPM approach. Consider the use of a biological control agent in fields, where disease is noted.

Do not rely on one fungicide group. A range of fungicides with different modes of action are available such as DMIs, strobulurins and SDHIs. Try to use different modes of action to those used earlier in foliar disease control programmes.

SDHI resistance has been detected in this pathogen in Europe, particularly in France. A single strain with decreased sensitivity to SDHIs has been detected in the UK, however, the last report was in 2017. No issues with field performance for SDHIs against sclerotinia has been reported and there is no evidence that these strains are widespread.

Refer to the product label for recommendations on the use of solo modes of action, as some may require application in tank mix with a product from another mode of action group e.g. SDHIs. Consider where different modes of action can be used throughout the fungicide programme, not just for stem rot control.

Dark leaf and pod spot

(*Alternaria brassicae*, *A. brassicicola*)

Do not rely on one fungicide group. There is now a range of fungicides with different modes of action available, including examples from the DMIs, strobilurins and SDHIs. Sprays applied to target sclerotinia containing these actives will also have efficacy against dark leaf and pod spot.

Only treat for this disease if the severity warrants it. Reducing the use of marginal sprays and, hence, the overall number of sprays to the crop is important in reducing selection pressure.

Grey mould

(*Botrytis cinerea*)

Avoid reliance on a single fungicide group. Resistance is known to exist to strobilurin fungicides. Mutations conferring reduced sensitivity to SDHIs in botrytis are reported in Europe.

Powdery mildew

(*Erysiphe cruciferarum*)

The need to treat powdery mildew as a standalone disease is rare. DMI fungicides have activity and no resistance has been reported.

Table 1. Summary of fungicide resistance issues in oilseed rape pathogens in the UK

Pathogen	Active ingredient	Sensitivity shifts (from laboratory tests)	Field performance on oilseed rape affected
Dark leaf and pod spot (*Alternaria brassicae* and *A. brassicicola*)	DMI	x	x
	SDHI	x	x
	QoI	x	x
Grey mould (*Botrytis cinerea*)	DMI	x	x
	SDHI	✓ (Europe)	x
Powdery Mildew (*Erisyphe cruciferarum*)	DMI	x	x
Phoma leaf spot and stem canker (*Plenodomus lingam,* formerly *Leptosphaeria maculans*)	DMI	✓[1]	x
	SDHI	x	x
	QoI	x	x
Phoma leaf spot and stem canker (*Plenodomus biglobosus,* formerly *Leptosphaeria biglobosa*)	DMI	x	x
	SDHI	x	x
	QoI	x	x
Light leaf spot (*Pyrenopeziza brassicae*)	DMI	✓	x[2]
	SDHI	x	x
	QoI	x	x
Sclerotinia stem rot (*Sclerotinia sclerotiorum*)	DMI	x	x
	SDHI	✓	✓ (France only)
	QoI	x	x

x = not reported or not tested; ✓ = published evidence available.

[1] Laboratory tests indicate that recent isolates of *P. biglobosus* may be slightly less sensitive to some DMIs than *older isolates*.

[2]DMI fungicides performance similarly to non-DMI fungicides to control light leaf spot in the field.

Table 2. Fungicide groups available for use on oilseed rape

Fungicide Group	FRAC Mode of Action Code	Chemical Families	Common name of active substance	Examples of products with active substances[1]	
				Alone	In Mixtures
DMI fungicides (DeMethylation Inhibitors, SBI: Class I)	3	Imidazole	difenoconazole	Plover	Priori Gold
		Triazole	prothioconazole	Proline	Aviator Xpro
			tebuconazole	Folicur	Agate
SDHI fungicides (Succinate dehydrogenase inhibitors)	7	Pyridine carboxamide	boscalid	Filan	Pictor
				-	Shepherd
			fluopyram	-	Propulse
			isopyrazam	-	Symetra
			bixafen	-	Aviator Xpro
QoI fungicides (Quinone outside Inhibitors)	11		pyraclostrobin	Architect	Shepherd
			dimoxystrobin	-	Pictor
			azoxystrobin	Amistar	Priori Gold
Biologicals (multiple modes of action)	BM 02	Microbial	*Pythium oligandrum* M1[2]	Polyversum	-
			Coniothyrium minitans	Contans	-
			Bacillus amylofiquefaciens	Integral Pro	-

[1]Other products are available.

[2] *P. oligandrum* is not classified into a FRAC group, however, group characteristics would be applicable.

Published April 2024