

FRAG-UK statement on SDHI fungicides and resistance risk in cereals. May 2013

The Succinate Dehydrogenase Inhibitor fungicides (SDHIs) are broad spectrum and highly effective against barley and wheat diseases. The SDHIs bring improvements in disease control and yield compared to many older fungicides.

Resistance to fungicides can evolve rapidly where resistance is conferred by a simple mutation, particularly where this does not confer a fitness penalty on mutated individuals. Resistance is less likely and/or slower to develop where multiple genes are involved. FRAG-UK considers that the SDHI fungicides are at a medium/high risk of resistance development in cereal pathogens. We have already seen overseas examples of SDHI resistance in fruit and vegetable pathogens very soon after the introduction of this group of fungicides which fit the simple mutation/low fitness penalty model – for example *Alternaria* spot of pistachios, *Botrytis* of apples and strawberries, *Corynespora* leaf spot of cucumbers. There are examples of laboratory mutants of cereal pathogens showing reduced sensitivity to SDHIs and in 2012 extensive monitoring detected a single isolate of *Septoria* (*Mycosphaerella graminicola*) (France) and two isolates of net blotch (*Pyrenophora teres*) (Germany) with sensitivities outside the base-line. Resistance factors in both cases were very low and field performance was not affected.

All effective fungicides exert a selection pressure on pathogen populations and carry a risk of resistance. This risk can be modified and reduced by either mixing or alternating with fungicides with an alternative mode of action, or by reducing the number of applications or dose of the fungicide. Not enough is known about the relative impact of these strategies to be able to prioritise one over any other.

To maintain the efficacy of the SDHI fungicides against medium and high risk pathogens* in cereals, such as *M. graminicola* in wheat and *Ramularia collo-cygni* in barley, FRAG-UK recommend the following measures to reduce the risk of fungicide resistance development and extend product life. These guidelines apply to both spring and winter cereals:-

Scenario 1 - SDHI Foliar applications

1. Follow the statutory requirement to limit the number of applications to two SDHI fungicide-containing sprays.
2. Always use SDHI fungicides in mixture with at least one fungicide from an alternative mode of action group which has efficacy against the target pathogen(s).
3. Tank mixing two SDHI fungicides is not an anti-resistance strategy. In any such tank mix the SDHI should be applied in a balanced mixture with at least one fungicide with comparable efficacy against the target pathogens from an alternative mode of action group.
4. Keep records of the seed treatment applied. If the seed treatment contains an SDHI fungicide, choose one of the following scenarios according to the efficacy of the SDHI seed treatment against foliar pathogens:

Scenario 2 - SDHI Seed treatments with no efficacy against foliar pathogens

1. These do not count towards the statutory limit of two foliar SDHI applications; advice would therefore be to apply any subsequent foliar SDHI applications as described in Scenario 1 above.
2. The SDHI seed treatment should be co-formulated with a fungicide with an alternative mode of action to reduce selection pressure on seed-borne pathogens.

Scenario 3 - SDHI Seed treatments with efficacy against foliar pathogens

These should count as one of the two SDHI applications to the crop.

However using one or more of the following modifiers, to reduce selection pressure on seed-borne or foliar target pathogens, would allow the use of two SDHI foliar applications in a crop in addition to the SDHI seed treatment:

1. The SDHI seed treatment is co-formulated or mixed with a fungicide with an alternative mode of action which itself provides satisfactory control when used alone on medium/high risk foliar diseases.
2. The SDHI seed treatment is used at a rate where efficacy is targeted only against seed and soil borne diseases or low risk foliar pathogens.
3. The first foliar application to a crop where an SDHI seed treatment was used should not contain an SDHI

ICM statement

In order to reduce disease risk and the selective pressure on fungicides, integrated crop protection measures should be used, such as the use of resistant varieties. Seed should be tested to identify the seed borne pathogens present.

ALWAYS CONSULT PRODUCT LABELS BEFORE USE

Examples of current SDHI fungicides include:-

Foliar fungicide trade name	Active ingredients
Adexar	fluxapyroxad + epoxiconazole
Aviator Xpro	bixafen + prothioconazole
Bontima	isopyrazam + cyprodinil
Cerix	fluxapyroxad + epoxiconazole + pyraclostrobin
Enterprise	boscalid + epoxiconazole
Nebula	boscalid + epoxiconazole + pyraclostrobin
Imtrex	fluxapyroxad
Seguris	isopyrazam + epoxiconazole
Siltra Xpro	bixafen + prothioconazole
Tracker	boscalid + epoxiconazole
Treoris	penthiopyrad + chlorothalonil
Vertisan	penthiopyrad
Zulu	isopyrazam

Seed treatment fungicide trade name	Active ingredients	Known foliar activity from SDHI
Raxil Star	fluopyram + prothioconazole + tebuconazole	No – go to scenario 2
Anchor	carboxin + thiram	No – go to scenario 2

Active ingredients in bold denotes an SDHI

*Medium or high risk pathogens as defined by FRAC

<http://www.frac.info/>