

Collaborative note

INRA, SPV, ARVALIS – Institut du végétal

2008

for cereals diseases resistance management

*This note written by INRA, SPV and ARVALIS – Institut du végétal draws up the resistance situation and expresses recommendations. Shorter than usual, this 2008 note stresses the changes, and especially the emergence of a practical resistance to strobilurins in *Helminthosporium* on barley due to the F129L mutation.*

SITUATION in 2007 AND RECOMMENDATIONS for 2008

SEPTORIA LEAF BLOTCH (*S. tritici*)

Resistance to QoIs (strobilurins, famoxadone) affects all of the French regions producing cereals. This resistance is especially widespread in the North of a line linking Bordeaux to Valence. In the Southern regions, frequencies below 50 % are still often detected. In this context, the efficacy of all the strobilurins is strongly compromised. Concerning triazoles (main class of DMIs), the current *S. tritici* strains show a low to moderate resistance to these compounds. In 2006 and 2007, in France, the strains moderately resistant to DMIs were dominant in all regions.

Recommendations : Though the efficacy of triazoles in the field is decreasing, the most efficient ones are still interesting (mostly epoxiconazole and prothioconazole). Furthermore, the efficacy of triazoles can be reinforced by some multisite fungicides (chlorothalonil, mancozeb), boscalid or prochloraz.

POWDERY MILDEW (*B. graminis f. sp tritici* and *B. graminis f.sp hordei*)

Low disease pressure in 2007. Resistance to strobilurins is probably still deeply established in France, remaining however limited in the South. Even if resistance to SBIs (DMIs and "amines") is widespread in France, many of these molecules are still quite effective.

Some strains strongly resistant to quinoxyfen have been detected in France these last few years and were mainly located in Champagne.

Recommendations : The QoIs family can no longer be considered as efficient on powdery mildew in most of the French regions. Cyprodinil is no longer effective enough to be used on powdery mildew. Quinoxyfen can no longer be used by itself on wheat powdery mildew when resistance occurs.

Metrafenone, which has been recently registered, is effective on all resistant powdery mildew strains.

EYESPOT (*Oculimacula spp.*)

The main species is *Oculimacula yallundae* and the strains now encountered are often resistant to most DMIs, and especially to prochloraz. All strains of *Oculimacula spp.* are sensitive to prothioconazole.

Some strains resistant to cyprodinil can still be detected in France at a low frequency within the two species of *Oculimacula spp.* They have, however, no impact in practice. Boscalid and metrafenone represent two new alternative modes of action available to control eyespot.

Recommendations : Prochloraz remains useful when it is associated with another active ingredient efficient on eyespot. Associations of modes of action are more effective. However, it is recommended to alternate the use of different modes of action over years to limit the risk of resistance.

HELMINTHOSPORIUM ON WHEAT (*H. tritici-repentis*)

In Northern Europe, some strains of *Helminthosporium tritici-repentis* exhibit mutations in the cytochrome b gene (the QoIs' target), either in position 129 (low level of resistance), or in position 143 (high level of resistance). These two mutations can be found both at the same time in a population. Efficacy of strobilurins can then be severely affected. No shift of efficacy has yet been observed in France. These mutations do not seem to be very frequent.

Recommendations : Use strobilurins in association with a triazole effective on wheat *Helminthosporium* (in particular prothioconazole, tebuconazole, propiconazole) if high risk of disease.

HELMINTHOSPORIUM ON BARLEY (*H. teres*)

In France, the resistance of *Helminthosporium teres* to QoIs fungicides is well established. The mutation is located in position 129 (cytochrome b) and leads to low to moderate resistance. In resistance situations, strobilurins efficacy can be strongly affected. It is the case for azoxystrobin, but not for picoxystrobin, nor for pyraclostrobin; the situation is unknown for trifloxystrobin and fluoxastrobin. A shift in sensitivity to DMI is observed in *Helminthosporium teres*, associated with a shift in efficacy. Prothioconazole remains the most efficient product of this family on this disease. Cyprodinil and boscalid represent two other modes of action that are not affected at the moment by resistance.

Recommendations : Always associate strobilurins with efficient fungicides that have other modes of action (in particular prothioconazole or cyprodinil).

RUSTS

2007 was characterized by an exceptional and early strike of brown rust of wheat; this is linked to the mild winter climate. As a consequence, brown rust control was difficult in the beginning of 2007, due to high disease pressure, and not to resistance.

Recommendations : Take into account the potential action on rusts of active ingredients used in treatment programs. At that time, associations of triazoles and strobilurins provide the best efficacy against these diseases.

GENERAL RECOMMENDATIONS TO MANAGE CEREALS DISEASES RESISTANCE IN 2008

Based on this updated view of the situation, we renew our practical recommendations of prophylaxis to:

- Reduce parasitical risks,
 - Limit the use of fungicides and thus the selective pressure on pathogen fungus
 - Manage situations of practical resistance
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- Give preference to varieties tolerant to relevant diseases, and avoid using sensitive wheat or barley cultivars over wide areas.
 - Prefer field practices that reduce the disease risk, in particular those that can limit primary inoculum (for example rotation, ploughing, sowing date...) or the progression of the disease (density, nitrogen).
 - Treat only if necessary, according to the climate, cultivation conditions, models and observations.
 - Design treatment times according to disease development, using reliable methods of observation and symptoms monitoring.
 - Limit the amount of seasonal applications of active ingredients from the same chemical family (usually characterized by a positive cross resistance).
 - Diversify modes of action by alternating or associating molecules in treatment programs, to minimize the risk of resistance development and/or to deal with practical resistance for a given family.
 - On cereals, some diseases are concerned by strobilurins resistance, and some are not. To limit the risk on unconcerned diseases, better use strobilurins only once a year.
 - The most efficient DMI active ingredients can be used to treat cereals diseases in a resistance context. Furthermore, their performances will be improved if they are associated with some other modes of action, or even, in the case of mixtures, between complementary DMIs.

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