

## Agronomical control

# The varietal resistance option

With the arrival of productive varieties resistant to septoria, fungicide protection can now be revised downwards. On the horizon: treatment savings and a more sustainable approach to managing the efficacy of targeted applications.



With a variety resistant to septoria, half as much fungicide is required to protect a crop than with a variety which is highly susceptible to it.

### Vulnerable varietal resistance

Varietal resistance evolves with time. The more a variety is grown, the more its resistance is likely to get overtaken by a pathogen, with variable speed depending on the disease. The overtaking of a resistance gene can be connected to mutations, but also depends on the selective pressure exerted by the distribution of the gene. This results in the evolution of pathogenic populations being closely linked to the evolution of the varietal landscape.

With regards to rusts, a variety can change very quickly from "resistant" status to "susceptible", depending on its popularity, because rust populations evolve very quickly, in spite of the low incidence of rust these past few years. Aubusson, registered in 2002 with a score of 8 (resistant category in the official French catalogue of wheat varieties), this year figures among the most susceptible varieties because all the specific resistance genes currently known (Lr10; Lr13; Lr 37) have been overtaken and most probably this variety does not have any partial resistance. For septoria, this phenomenon evolves more gradually, but nonetheless real.

For instance, in the United States, the variety Gene carrying only one specific resistance gene, Stb4, saw its resistance overtaken after being grown for 6 years.

In practical terms, a variety like Caphorn, which is grown on a large area in France, needs to be monitored.

The wide spread of septoria strains moderately resistant to triazoles has severely affected their efficacy, now resulting in unacceptable levels of protection, whereas other chemicals such as epoxiconazole and prothioconazole still produce satisfactory results.

Strobilurins, for their part, are of limited use against septoria due to the general resistance developed north of a Bordeaux-Valence line (northern France).

Those two facts must lead to diversifying septoria control measures. The range of solutions available this season is indeed greater than before, but disease control should not be restricted to fungicides. Agronomical practices can have a significant impact on disease development rate, with varieties playing a crucial role.

### Two to four times less fungicide

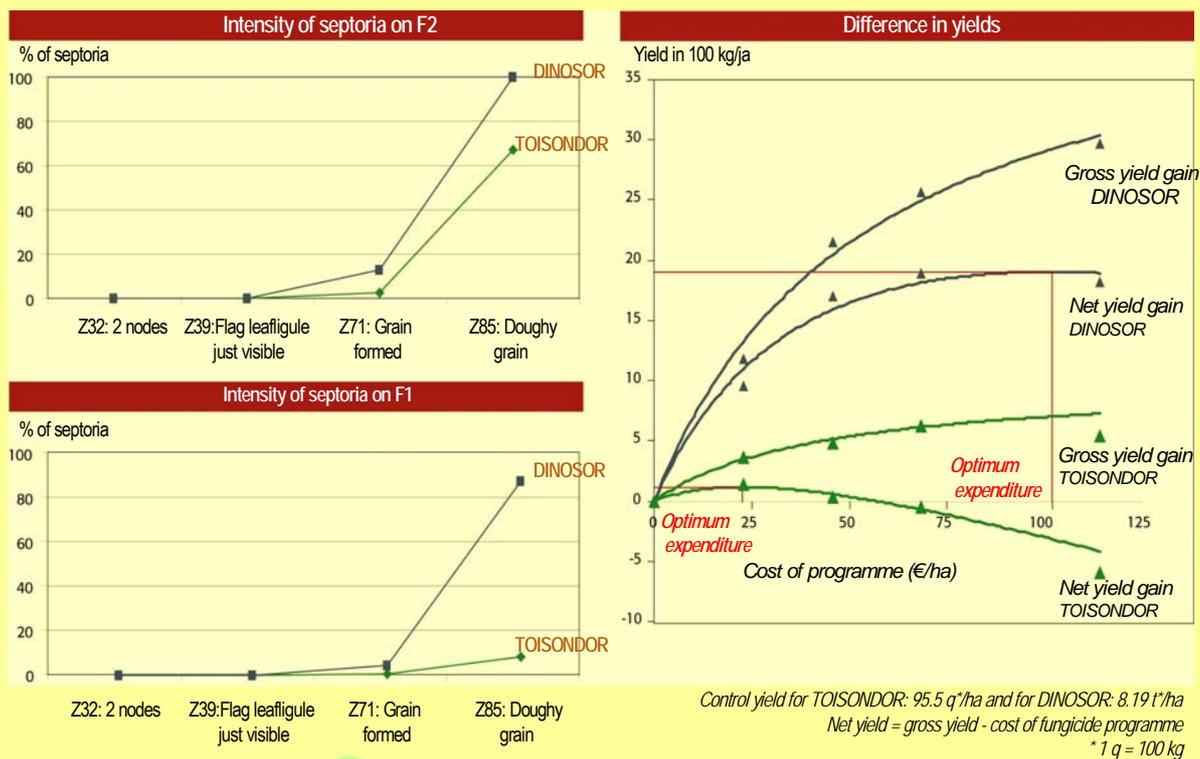
Treating a variety which is resistant to septoria in the same way as a variety which is highly susceptible to it, not only leads to exerting a selective pressure on septoria populations, but is also a missed opportunity of achieving potential savings of fungicides applications and of reducing their impact on the environment. Illustrating this point, a 2006 trial carried out on two varieties with very different susceptibility to septoria, shows that the disease appears at the same time on the final two leaves, but with very limited intensity on the resistant variety. In the end, in this situation, the resistant variety (Toison dor) produced the same yield as the highly susceptible variety (Dinosor) but with up to four times less fungicide (*figure 1*).

### Savings of 20 to 30 €

This trend is also evident in the Performance Network, which groups trials together in three susceptibility categories (resistant, susceptible, very susceptible).

In 2006, a total of 104 trials revealed a yield difference of 0.8 t/ha between resistant varieties (0.8 t/ha) and very susceptible varieties (1.6 t/ha). In 2005, with 108 trials, this difference was 1.2 t/ha (1.9 t/ha compared with 0.7 t/ha for resistant varieties).

## Impact of varietal susceptibility on fungicide use, Ceseville (Normandy) 2006 (fig. 1)



In this trial, Toisondor (productive variety resistant to septoria) shows an optimum fungicide expenditure of approximately 25 €, compared with 100 € per hectare for Dinosor (highly susceptible variety), i.e. four times more!



Soil cultivation can limit the negative impact of diseases: with direct drilling and no treatment (left), the crop is much more affected by leaf stripes disease (helminthosporium) than with ploughing and no treatment (right).



This variation between 2005 and 2006 is mainly due to higher septoria pressure in 2005 and more significant take-all in June 2006. From a financial point of view, the yield losses due to diseases and the fungicide cost necessary to control them being closely linked, 0.8 t/ha

of loss corresponds to 20 € and 1.2 t/ha to 30 € per hectare.

Choosing a resistant variety therefore resulted in average savings in fungicide treatments of 20 to 30 € per hectare for the last two seasons. Those figures sound attractive, especially in regions with a high septoria risk!

## Impact of agronomical practices on wheat diseases (tab. 1)

	Wheat after maize (min-till)	Second wheat (min-till)	Continuous wheat (min-till)	Early sowing	High seed rate	High nitrogen fertilisation
Take-all	=	++	+/=	+	+	+(2)
Eyespot	-	++	-	+	+	=
Septoria	=	+	+	+	+	+/=
Leaf stripes disease (Helminthosporium)	=	++	++	=	=	=
Fusarium	++	=	=	=	=	=
Mildew	=	=	=(1)	+/=	++	++
Brown and yellow rust	=	=	=(1)	+	+/=	++

= No known effect

+ Potentially more disease

++ Significant impact

- Potentially less disease

+/= Variable impact

■ Disease encouraged by the rotation

(1) Remains on volunteers and grasses if weed control problem

(2) Dosage adjusted and no omission of first application

Agronomical practices can have a significant impact on the risk of disease.

## Avoid growing diseases

Practices often interact with each other (tab. 1). The use of resistant varieties, optimum sowing dates, a crop rotation restricting the amount of wheat grown, the incorporation or destruction of stubble, all contribute also, and in different ways for different diseases, to limiting parasitic risks. They help reduce the yield loss from leaf diseases as well as fungicide expenditure.

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