

Field prevention first

Controlling safety quality in cereal crops is made easier by effective prevention tools. Wheat, durum wheat and maize each have a mycotoxin risk assessment grid. Knowledge is most extensive for wheat, but the *Fusarium* complex in maize has not yet relinquished all its secrets and researchers are only beginning to find out about T-2 and HT-2 toxins. Here is a review of field prevention measures.



According to the 2006 SCEES survey, fields with a high risk of DON content (maize as the previous crop and no tillage) account for 8% of the soft wheat area and less than 3% for durum wheat.

Common and durum wheats - Tackling DON head on

Following the many lessons learned in 2007 regarding DON content in wheat, ARVALIS - Institut du végétal further developed its risk prevention tools.

The agronomical factors which increase DON risks in wheat have now been clearly established. The farmer can use two main levers before establishing the crop: residue management (depending on previous crop and soil cultivation) and varietal choice (susceptibility to *Fusarium* and DON accumulation). During the cropping season, a flowering stage treatment against *Fusarium* producing DON also helps to limit risks.

A DON risk assessment grid is now available for durum wheat.

The aim is to do everything possible to avoid combining factors responsible for DON production, in order to minimize agronomical risks. This objective is a key element to include in DON risk management strategies.

Grids to help farmers assess their own situation

The risk of DON can be assessed using agronomical grids supplied by ARVALIS – Institut du végétal. The grid published in 2005 for soft wheat has now been updated with two new additions (*table 1*) Out of 6 risk categories (from 1, the lowest, to 6 the highest), most crops are in category 2. It was divided into two classes (2a and 2b) based on varietal susceptibility. It is worth mentioning that the classification of varieties for susceptibility to *Fusarium* head blight and DON accumulation is updated every year.

In addition, the level of risk after forage maize has been differentiated from the level after grain maize (and put in the next category down).

A similar grid has been validated for durum wheat, following field surveys carried out since 2001 in conjunction with partner grain stores (*table 2*). As with soft wheat, it divides DON risk levels into 6 categories (from a to f), taking account of residue management and varietal susceptibility.

2007 (like 2000 and 2003) saw high DON content levels. However, the grids proved reliable tools in field surveys carried out this year.

DON risk assessment grid on wheat (tab 1.)

Cropping system		Varietal susceptibility	Risk category (6 = high risk)			
Cereals, oilseed rape, linseed, peas, fababeans, sunflower	Ploughing	Low susceptibility	1			
		Medium susceptibility	1			
		Susceptible				
	Min-till techniques	Low susceptibility		2a		
		Medium susceptibility		2a		
		Susceptible			2b	
Sugarbeet, potatoes, soyabean, other...	Ploughing	Low susceptibility		2a		
		Medium susceptibility		2a		
		Susceptible			2b	
	Min-till techniques	Low susceptibility		2a		
		Medium susceptibility		2a		
		Susceptible				3
Maize, sorghum, (forages)	Ploughing	Low susceptibility		2a		
		Medium susceptibility		(2a)	2b	
		Susceptible				3
	Min-till techniques	Low susceptibility				(3) 4
		Medium susceptibility				(4) 5
		Susceptible				(5) 6

With a category 1 risk, no field is over the legal limit, whereas a category 6 risk means that 50% of fields are over this limit.

Taking climate into account

A decision-making tool named Myco-LIS® was made available in 2006 for soft wheat in order to refine the DON risk forecast at field level. It incorporates actual meteorological data at flowering time and facilitates the overall management of the risk, from field to silo.

In 2007, this tool had forecast a medium global DON risk in our partners, with sometimes high levels in fields with high agronomical risks. In order to verify this forecast, ARVALIS – Institut du végétal organised several ear sampling operations before harvest.

Analysis results confirmed trends and this type of support, appreciated by our volunteer partners, can be proposed again in the future in difficult years like 2007.



Residue management (previous crop + soil cultivation) offers prime agronomical leverage to control safety quality in cereals.

DON risk assessment grid on durum wheat (tab 2.)

Cropping system		Varietal susceptibility	Risk category (f = high risk)			
Others	Ploughing	Medium susceptibility	a			
		Susceptible	a			
		High susceptibility		b		
	Min-till techniques	Medium susceptibility		b		
		Susceptible		b		
		High susceptibility			c	
Maize, Sorghum (forages)	Ploughing	Medium susceptibility	(b)	c		
		Susceptible	(b)	c		
		High susceptibility		(c)	d	
	Min-till techniques	Medium susceptibility		(c)	d	
		Susceptible			(d)	e
		High susceptibility				(e) f

Each category is linked to a level of risk of exceeding the legal limit of 1,750 µg/kg in durum wheat. For example, category "a" corresponds to a 5% risk, compared with 65% for a field in category "f".











Residue management while using min till techniques

Residue management is not a simple question of ploughing or no ploughing.

A survey carried out by SCEES in 2006 on current cropping practices, showed that the number of fields where minimum tillage techniques were implemented, was increasing. Illustrating this, the soft wheat areas falling into the 4 to 6 categories in the agronomical assessment grid (maize as previous crop and no ploughing) have doubled between the 2001 and 2006 surveys, jumping from 4 to 8% respectively. In view of this increase, it is becoming crucial to identify the different residue management practices and their impact on DON content.

A soil cultivation trial in fields in which maize was the previous crop (*figure 1*), highlighted the fact that direct drilled wheat crops are, on average, three times more contaminated than reference fields (chopping / ploughing). For practices between ploughing and min-till, the finer the residue is managed (chopping and incorporating), the higher the safety quality is. A technique tested this year for the first time seems promising: chopping maize canes after sowing helps to halve DON contents compared with direct drilling. This process offers two other benefits: it improves residue decomposition and makes it easier to sow than when chopping is carried out beforehand. The risk is that wheel tracks may result from the chopping operation if the soil is very wet. Trials will have to be repeated over several years before the advantages of this technique can be confirmed.

Soil cultivation impact on DON level on wheat (long-term trial – Boigneville 2007) fig1)

	Chopping Ploughing	Chopping ROTAVATOR	SEMAVATOR	Direct-drilling	Direct-drilling Chopping
1999 – 2007	100	177		355	
2003 - 2007	100	158	286	329	
2007	100	209	234	355	159
Surface residues in October					
Surface residues in June					
Of all the strategies involving minimum tillage techniques, chopping after sowing halves DON contents compared with direct drilling.					

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