

## BRIEFING DOCUMENT

# Zearalenone (ZON)

Updated January 2023

### Summary

Zearalenone (ZON), also known as ZEN, is a mycotoxin produced by the fungus *Fusarium graminearum*, with wet conditions at harvest a risk factor for ZON production in wheat in the UK. There are legal limits for ZON in grain and grain-based products intended for human consumption. UK flour millers adopt several strategies to ensure compliance including a significant programme of ZON testing at harvest. Extensive monitoring data show ZON levels in the UK crop have been manageable in recent years.

### ZON

ZON is a mycotoxin, which are secondary metabolites produced by moulds and fungi that are toxic to humans and animals if consumed in enough quantities. It is heat-stable and mainly occurs in grains such as wheat, maize, barley, oats, rice and sorghum. Its occurrence is associated primarily with *Fusarium graminearum*, which causes Fusarium head blight in wheat. Wet weather can delay the progress of the wheat harvest and increase mycotoxin risk as warm and wet conditions encourage ZON production by *Fusarium* species. There is some evidence that ZON levels may also increase post-harvest when high moisture levels may allow a secondary infection to develop on debris on the kernel. ZON is chemically stable and may pose a potential risk to human and animal health if consumed in significant quantities.

### Legislation

The principal piece of legislation regarding mycotoxins is retained Commission Regulation (EC) No. 1881/2006, as amended. This Regulation sets out specific rules in relation to mycotoxins and other contaminants and includes specific maximum levels (MLs) for certain mycotoxins in individual foodstuffs. The EU maximum levels were retained in UK law as part of the EU-UK Withdrawal Agreement and apply to wheat, flour and flour-based products, among other cereals. The GB limits remain the same as those applying in the EU and NI, and are as follows:

Product	EU, NI and GB ZON limit (µg/kg)
Unprocessed wheat and barley	100
Flour / cereal milling products	75
Bread, bakery wares and breakfast cereals	50
Cereal-based infant food	20

There are no statutory maximum levels for animal feeds but there are Guidance Values for ZON in grain intended for animal feedstuffs. The European Commission is considering setting maximum limits for ZON in animal feedstuffs. It is not clear whether the UK is considering similar limits for animal feedstuffs.

Animal feed product	EU guidance value (µg/kg)
Feed grains	2,000
Complete feedstuffs for pigs / piglets	250 / 100
Complete feedstuffs for calves, lambs and kids	500

### The UK Flour Millers strategy

The national control strategy for ZON relies on farmers understanding the issue and taking appropriate steps to amend cultivations, the use of targeted fungicides and awareness of adverse weather conditions during the risk period for ZON production. AHDB has developed a 'risk assessment' for ZON ([available here](#)), which farmers supplying the milling market are familiar with. All suppliers of wheat to flour mills are required to provide a risk assessment number on the grain passport. Growers must also provide a ZON test result on each grain passport demonstrating the grain has been tested and is under the legal maximum.

UK flour millers monitor levels of ZON at intake as part of their 'due diligence' procedures. Should a load of grain arrive at a mill and when tested be found over the maximum legal limit the mill reports this to the Red Tractor Assurance Scheme, who follow up with the grower to ensure the issue is rectified on farm.

In addition to monitoring at intake, millers submit samples each September as part of the AHDB Contaminants Monitoring Project. These samples are tested for ZON using confirmatory methods (typically HPLC).

Milling wheat tested via AHDB Contaminant Monitoring Project							
Year	Samples (n)	LOD (µg/kg)	% samples tested positive	Mean* (µg/kg)	Median* (µg/kg)	Minimum (µg/kg)	Maximum (µg/kg)
2022	50	2.5	2%	1	1	<2.5	3
2021	51	2.5	35%	7	1	<2.5	119
2020	50	2.5	16%	3	1	<2.5	37
2019	50	2.5	22%	2	1	<2.5	19
2018	50	2.5	12%	3	1	<2.5	22
2017	50	2.5	28%	19	7	<2.5	327
2016	51	2.5	24%	2	1	<2.5	17
2015	75	2	8%	1	1	<2	8
2014	75	2	15%	1	1	<2	10
2013	76	2	62%	6	3	<2	65
2012	51	2	63%	17	3	<2	234
2011	47	2	4%	5	5	<2	4
2010	42	2	21%	2	1	<2	12

\*Where <LOQ is assumed as LOQ\*0.5

Millers also contribute a significant quantity of data from ZON testing as grain arrives at the mill. This monitoring programme takes place early in the season to inform the national control strategy for each harvest. Data are shared across all member companies and with partners across the supply chain. This collaborative work culminates in an annual 'Mycotoxin Stakeholder Group' meeting. This format has been very successful in managing the situation and preventing adverse impacts on flour-based foods. This monitoring programme has run for over 15 years and the recent data are presented below.

<b>Milling wheat tested via UKFM harvest monitoring programme</b>						
<b>Year</b>	<b>Total samples</b>	<b>ZON result (<math>\mu\text{g}/\text{kg}</math>)</b>				
		<b>&lt;25</b>	<b><math>\geq 25</math> to &lt;50</b>	<b><math>\geq 50</math> to &lt;75</b>	<b><math>\geq 75</math> to <math>\leq 100</math></b>	<b>&gt;100</b>
2022	899	80.2%	17.9%	1.8%	0.1%	0.0%
2021	1,460	67.3%	22.3%	8.5%	1.8%	0.1%
2020	1,271	92.6%	4.4%	1.8%	0.6%	0.6%
2019	1,206	90.4%	7.4%	1.5%	0.7%	0.1%
2018	1,091	92.1%	7.0%	0.7%	0.2%	0.0%
2017	1,862	83.7%	8.8%	3.7%	2.4%	1.4%
2016	748	85.7%	12.8%	0.9%	0.3%	0.3%
2015	805	85.6%	12.3%	2.1%	0.0%	0.0%
2014	570	65.4%	30.5%	2.6%	1.4%	0.0%
2013	627	67.5%	27.9%	3.8%	0.6%	0.2%
2012	594	81.5%	14.3%	2.2%	0.7%	1.3%

The monitoring data show the levels of ZON in wheat used by UK millers are manageable and on average well below legal limits. The results of both the UKFM harvest monitoring programme and the AHDB Contaminant Monitoring Project show that 2022 is an exceptionally low year for levels of ZON in wheat used by UK flour millers.

#### **Future work**

UK Flour Millers will continue to monitor and report on the levels of ZON in wheat, as well as any changes to legal limits. Dialogue is maintained with the National Farmers Union, AHDB, the UK Assurance schemes, Agricultural Industries Confederation, the Maltsters Association of Great Britain, the Association of Cereal Food Manufacturers, and others in the grain supply chain. The Mycotoxin Stakeholder Group, made up of representatives of these organizations, continues to meet to discuss and manage the risk presented by ZON and ensure the safety of the supply chain.