

INDUSTRY MYCOTOXIN MEETING

Monitoring of contaminants in UK cereals used for processing food and animal feed Harvest 2020 (summary of results)

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Partners AIC, BOBMA, MAGB, nabim (now UK Flour Millers)

Background

For the UK grain supply chain to remain competitive, it needs to maintain its reputation for compliance and quality

- Agrochemical residues, mycotoxins and other major contaminants in cereals and co-products have been monitored independently since the mid-1980s
- The current five-year (2016–2021) AHDB monitoring contract (21130040) is led by Fera
- Commercial grain samples* from each harvest are tested for key contaminants
- The results presented show harvest 2020 data for mycotoxins**

*Commercial intake samples have been provided by member companies of AIC, BOBMA, MAGB and nabim

**Full monitoring results are published on the AHDB project page: ahdb.org.uk/monitoring-of-contaminants-in-uk-cereals-used-for-processing-food-and-animal-feed

Take home messages - 2020 harvest results

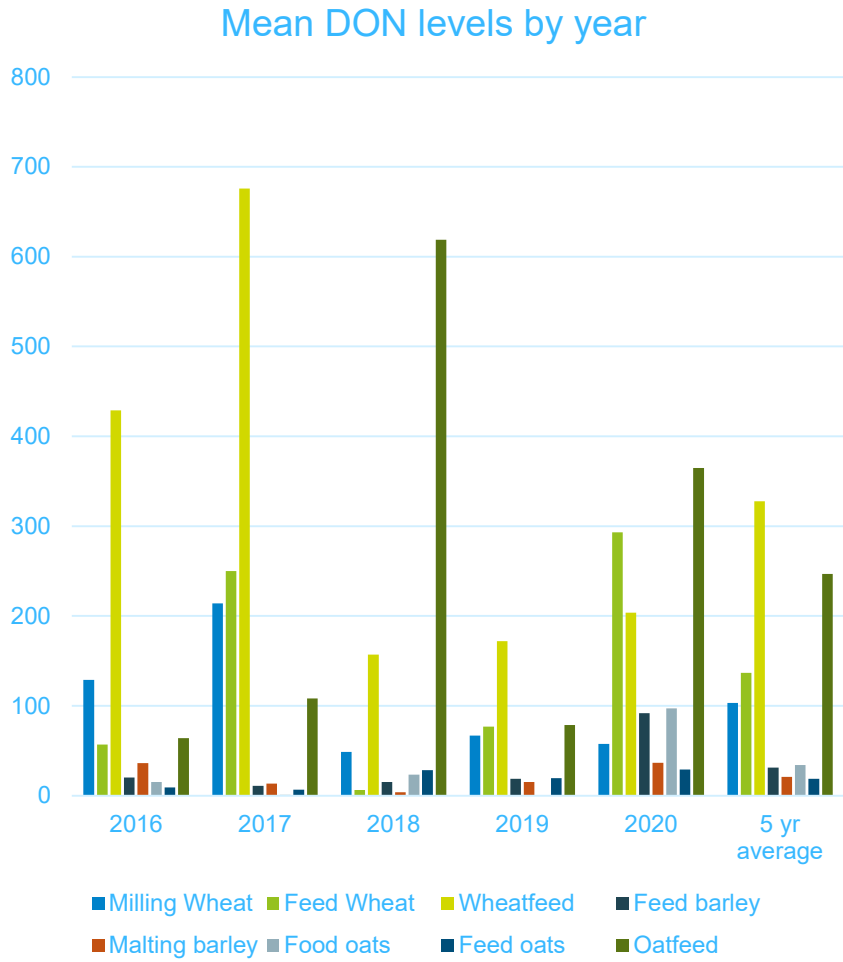
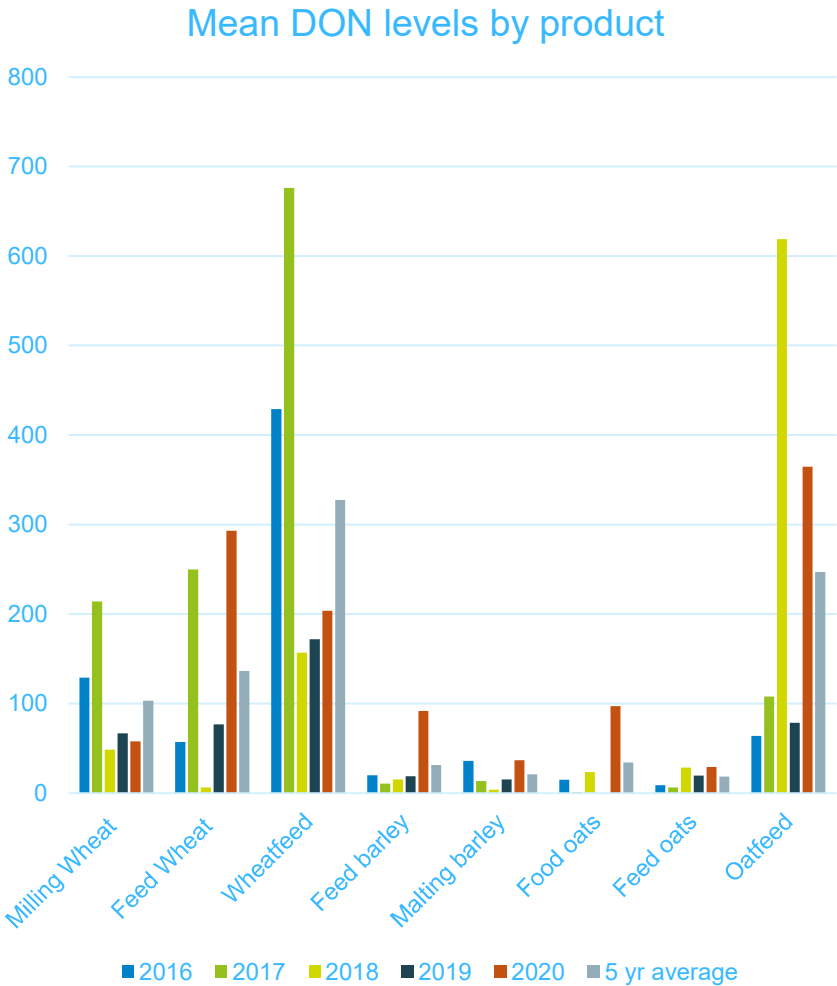
- Detailed good quality analytical data are available for a range of mycotoxins, pesticides and metals in 2020 UK harvest cereals.
- Results provide a small overall snapshot of the 2020 harvest and give ongoing evidence UK cereal production complies with current EU Regulations for mycotoxins, pesticides and other contaminants.
- There were no Maximum level exceedances for any mycotoxins analysed, and in many cases the results from 2020 were lower than the 5 year rolling average.
- Industry testing that is undertaken on a wider scale mirror these results, these fully quantitative results support industry data.
- Over 400 pesticides were analysed using multi-residue and single residue methods – no MRL exceedances were found.
- Seven metals, including 4 regulated metals, were tested and no maximum level exceedances were found.

Deoxynivalenol (DON)

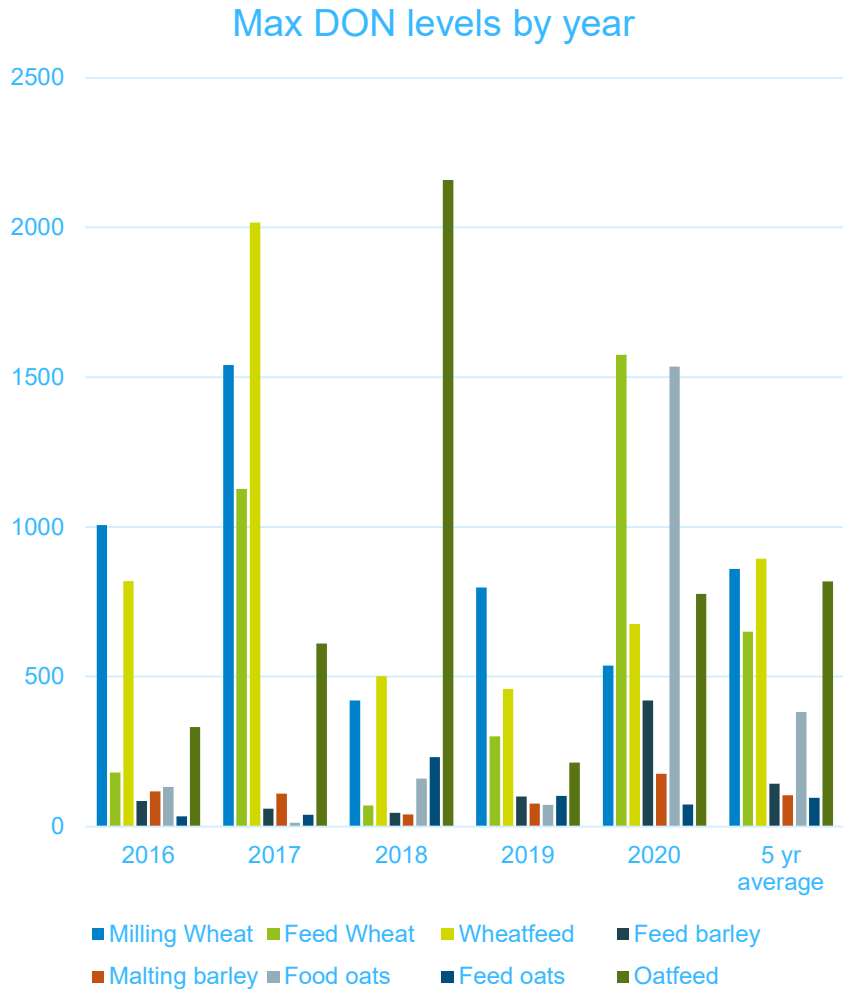
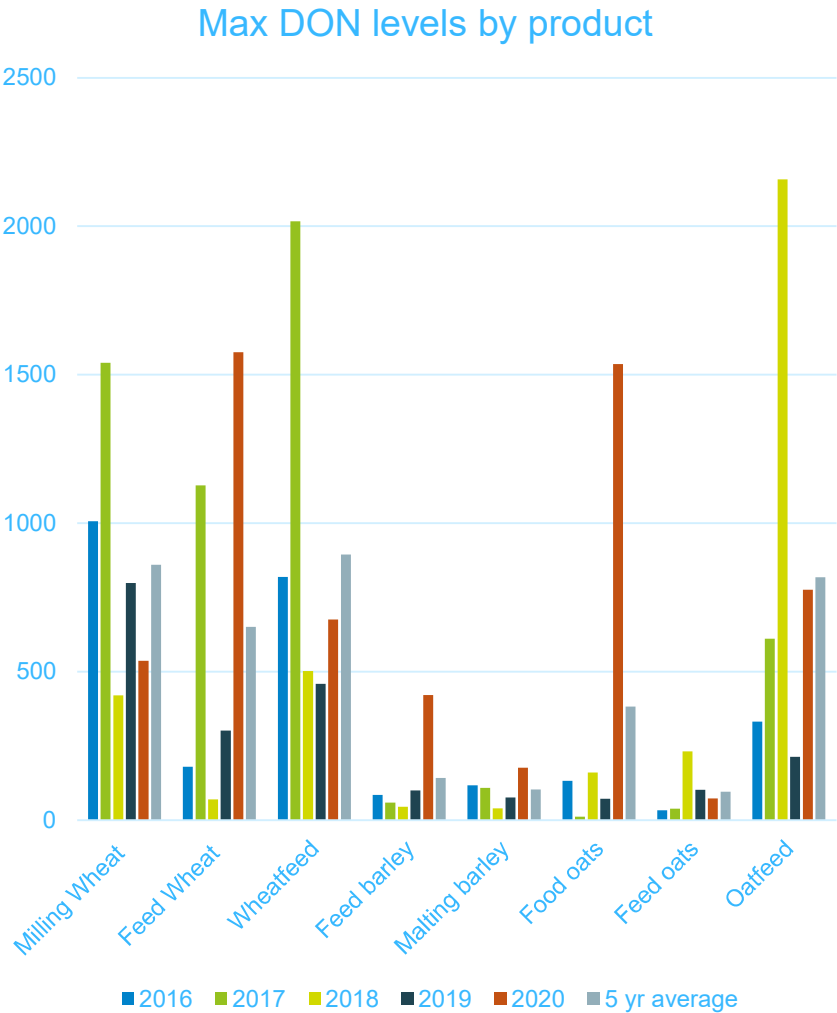
DON Harvest (September 2020)							
	No. of Samples Analysed	% > Reporting Limit	Minimum Level µg/kg	Maximum Level µg/kg	Mean Level µg/kg (*)	Median Level µg/kg	5 year average µg/kg
Milling Wheat	51	88%	<10	537	57.7 (66.7)	26.6	103
Feed Wheat	10	90%	<10	1575	293 (76.9)	23.5	137
Wheatfeed	20	100%	62.3	676	204 (172)	180	328
Feed Barley	10	80%	<10	421	91.7 (18.8)	50.4	31
Malting Barley	43	67%	<10	176	34.4 (15.2)	18	21
Food Oats	29	45%	<10	1535	97.1 (<10)	<10	34
Food Barley	1	100%	105.4	105	105 (<10)	105	-
Feed Oats	10	80%	<10	72.6	29.2 (19.5)	24.7	19
Oatfeed	10	100%	56.8	776	365 (78.5)	418	247

(*) 2019 mean level in brackets

Comparison Mean DON by product & year



Comparison Max DON by product & year



Fusarenon-X (Fus-X)

	No. of Samples Analysed	% > Reporting Limit	Minimum Level µg/kg	Maximum Level µg/kg	2020 Mean Level µg/kg	2019 Mean Level µg/kg	Median Level µg/kg
Milling Wheat	51	0%	<10	<10	<10	<10	<10
Feed Wheat	10	0%	<10	<10	<10	<10	<10
Wheatfeed	20	0%	<10	<10	<10	<10	<10
Feed Barley	10	0%	<10	<10	<10	<10	<10
Malting Barley	43	0%	<10	<10	<10	<10	<10
Food Oats	29	0%	<10	<10	<10	<10	<10
Food Barley	1	0%	<10	<10	<10	<10	<10
Feed Oats	10	30%	<10	13.6	3.7	<10	<10
Oatfeed	10	0%	<10	<10	<10	<10	<10

3 Acetyl-Deoxynivalenol (3Ac-DON)

	No. of Samples Analysed	% > Reporting Limit	Minimum Level µg/kg	Maximum Level µg/kg	2020 Mean Level µg/kg	2019 Mean Level µg/kg	Median Level µg/kg
Milling Wheat	51	0%	<10	<10	<10	<10	<10
Feed Wheat	10	0%	<10	<10	<10	<10	<10
Wheatfeed	20	5%	<10	11.2	0.6	<10	<10
Feed Barley	10	10%	<10	11.2	1.1	<10	<10
Malting Barley	43	0%	<10	<10	<10	<10	<10
Food Oats	29	14%	<10	352	16.4	<10	<10
Food Barley	1	0%	<10	<10	<10	<10	<10
Feed Oats	10	0%	<10	<10	<10	1.4	<10
Oatfeed	10	80%	<10	145	58.8	2.9	73.2

15 Acetyl Deoxynivalenol (15Ac-DON)

	No. of Samples Analysed	% > Reporting Limit	Minimum Level µg/kg	Maximum Level µg/kg	2020 Mean Level µg/kg	2019 Mean Level µg/kg	Median Level µg/kg
Milling Wheat	51	0%	<20	<20	<20	<20	<20
Feed Wheat	10	10%	<20	20.4	2.0	<20	<20
Wheatfeed	20	0%	<20	<20	<20	1.1	<20
Feed Barley	10	10%	<20	36.8	3.7	<20	<20
Malting Barley	43	0%	<20	<20	<20	<20	<20
Food Oats	29	0%	<20	<20	<20	<20	<20
Food Barley	1	0%	<20	<20	<20	<20	<20
Feed Oats	10	0%	<20	<20	<20	<20	<20
Oatfeed	10	0%	<20	<20	<20	<20	<20

Nivalenol (NIV)

	No. of Samples Analysed	% > Reporting Limit	Minimum Level µg/kg	Maximum Level µg/kg	2020 Mean Level µg/kg	2019 Mean Level µg/kg	Median Level µg/kg
Milling Wheat	51	10%	<50	117	<50	<50	<50
Feed Wheat	10	20%	<50	76.4	13.5	<50	<50
Wheatfeed	20	60%	<50	99.2	43.1	32.5	56.0
Feed Barley	10	60%	<50	552	131	50	62.6
Malting Barley	43	19%	<50	169	20.9	32.7	<50
Food Oats	29	62%	<50	363	101	<50	87.9
Food Barley	1	0%	<50	<50	<50	<50	<50
Feed Oats	10	70%	<50	1368	406	116.3	218
Oatfeed	10	100%	63.8	560	215	283.4	133

Diacetoxyscirpenol (DAS)

	No. of Samples Analysed	% > Reporting Limit	Minimum Level µg/kg	Maximum Level µg/kg	2020 Mean Level µg/kg	2019 Mean Level µg/kg	Median Level µg/kg
Milling Wheat	51	0%	<10	<10	<10	<10	<10
Feed Wheat	10	0%	<10	<10	<10	<10	<10
Wheatfeed	20	0%	<10	<10	<10	<10	<10
Feed Barley	10	0%	<10	<10	<10	<10	<10
Malting Barley	43	0%	<10	<10	<10	<10	<10
Food Oats	29	0%	<10	<10	<10	<10	<10
Food Barley	1	0%	<10	<10	<10	<10	<10
Feed Oats	10	10%	<10	13.0	1.3	<10	<10
Oatfeed	10	0%	<10	<10	<10	<10	<10

Neosolaniol (NEO)

	No. of Samples Analysed	% > Reporting Limit	Minimum Level µg/kg	Maximum Level µg/kg	2020 Mean Level µg/kg	2019 Mean Level µg/kg	Median Level µg/kg
Milling Wheat	51	0%	<10	<10	<10	<10	<10
Feed Wheat	10	0%	<10	<10	<10	<10	<10
Wheatfeed	20	0%	<10	<10	<10	<10	<10
Feed Barley	10	0%	<10	<10	<10	<10	<10
Malting Barley	43	2%	<10	30.9	0.7	<10	<10
Food Oats	29	28%	<10	65.7	8.0	15.6	<10
Food Barley	1	0%	<10	<10	<10	<10	<10
Feed Oats	10	40%	<10	48.7	10.7	<10	<10
Oatfeed	10	100%	16.9	55.8	36.8	42.6	37.5

HT-2 toxin (HT-2)

	No. of Samples Analysed	% > Reporting Limit	Minimum Level µg/kg	Maximum Level µg/kg	2020 Mean Level µg/kg	2019 Mean Level µg/kg	Median Level µg/kg
Milling Wheat	51	6%	<10	50.2	<10	<10	<10
Feed Wheat	10	10%	<10	10.2	1.0	<10	<10
Wheatfeed	20	50%	<10	47.8	12.0	13.0	5.5
Feed Barley	10	20%	<10	20.5	3.1	12	<10
Malting Barley	43	30%	<10	103	7.4	9.1	<10
Food Oats	29	86%	<10	938	211	335	89.7
Food Barley	1	0%	<10	<10	<10	<10	<10
Feed Oats	10	70%	<10	332	122	200	85.9
Oatfeed	10	100%	224	1534	828	904	856

T-2 Toxin (T-2)

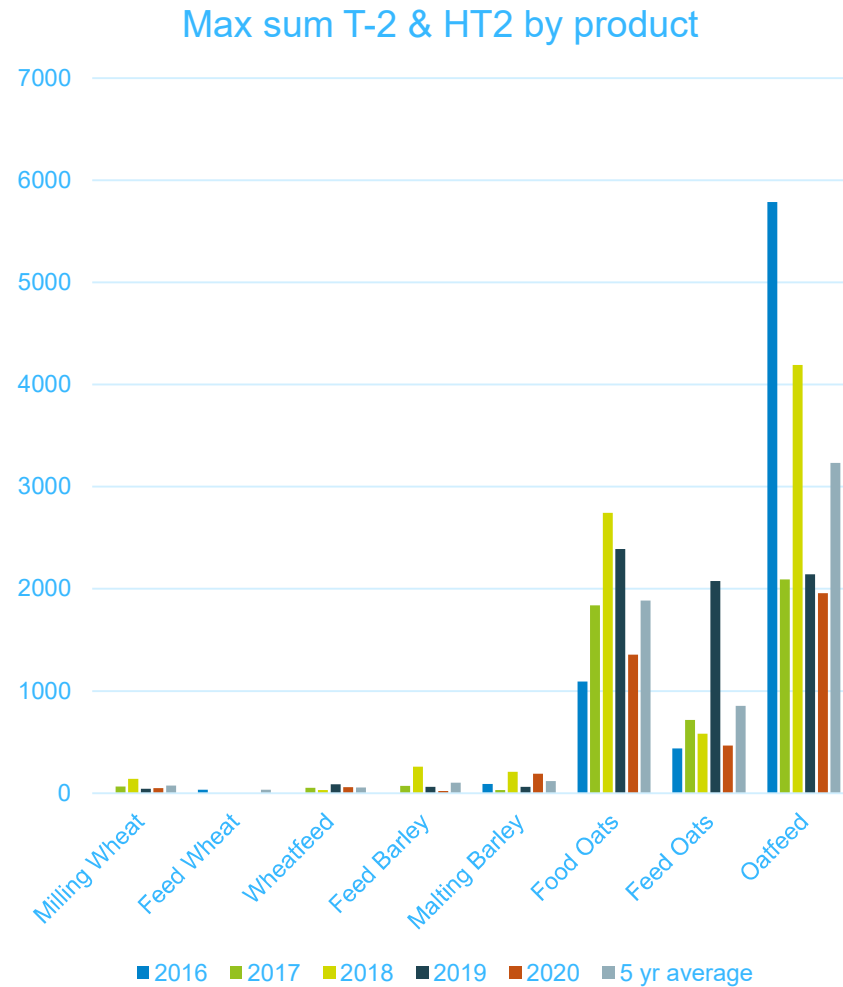
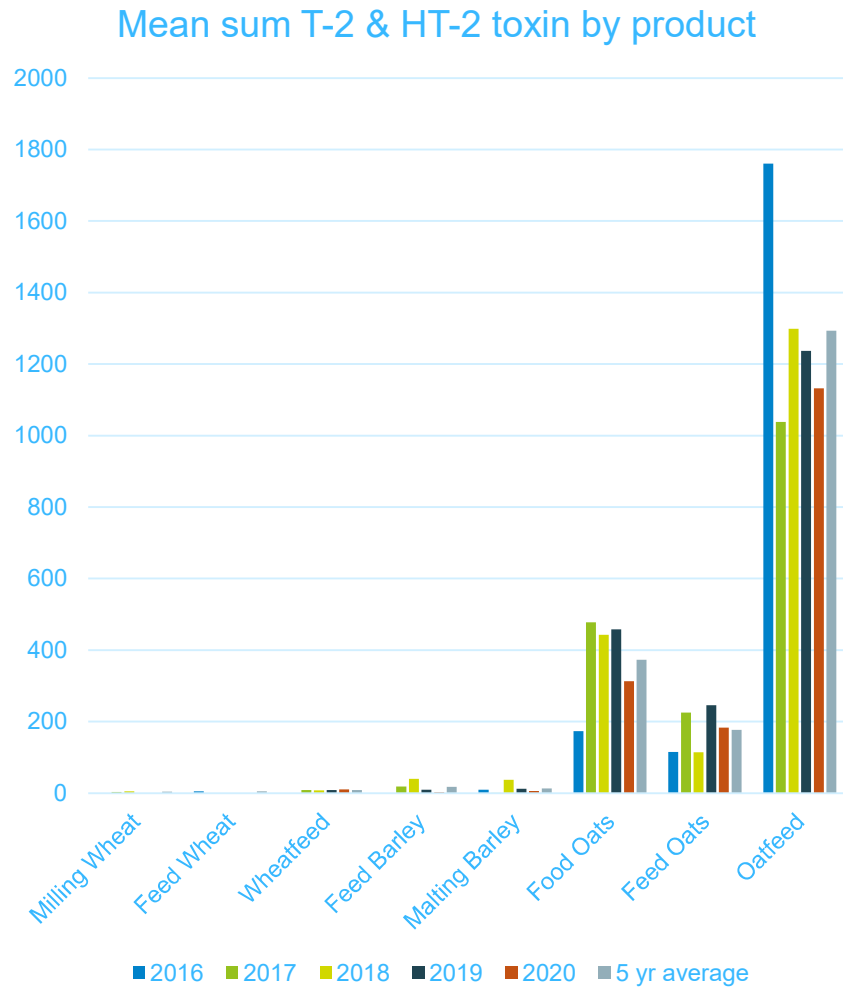
	No. of Samples Analysed	% > Reporting Limit	Minimum Level µg/kg	Maximum Level µg/kg	2020 Mean Level µg/kg	2019 Mean Level µg/kg	Median Level µg/kg
Milling Wheat	51	0%	<10	<10	<10	<10	<10
Feed Wheat	10	0%	<10	<10	<10	<10	<10
Wheatfeed	20	5%	<10	10.7	0.5	0.9	<10
Feed Barley	10	0%	<10	<10	<10	2.3	<10
Malting Barley	43	12%	<10	87.3	3.6	3	<10
Food Oats	29	79%	<10	417	102	123	37.8
Food Barley	1	0%	<10	<10	<10	<10	<10
Feed Oats	10	60%	<10	173	62.2	48.1	37.7
Oatfeed	10	100%	109	576	304	333	300

Sum T-2 & HT-2 toxins in Harvest 2020 samples

T-2 & HT-2 Harvest (September 2020)							
	No. of Samples Analysed	% > Reporting Limit	Minimum Level µg/kg	Maximum Level µg/kg	Mean Level µg/kg (*)	Median Level µg/kg	5 year average µg/kg
Milling Wheat	51	4%	<20	50.2	<20 (<20)	<20	3.8
Feed Wheat	10	0%	<20	<20	<20 (<20)	<20	5.0
Wheatfeed	20	35%	<20	58.5	10.5 (9.1)	<20	9.1
Feed Barley	10	10%	<20	21.0	2.1 (9.4)	<20	17.5
Malting Barley	43	12%	<20	190	8.5 (12.1)	<20	13.3
Food Oats	29	86%	<20	1355	313 (458)	106	373
Food Barley	1	0%	<20	<20	<20 (<20)	<20	-
Feed Oats	10	60%	<20	466	183 (246)	124	177
Oatfeed	10	100%	350	1956	1132 (1237)	1092	1293

(*) 2019 mean level in brackets

Collated results sum T-2 & HT-2 toxin



Deoxynivalenol-3-glucoside (DON-3-Glc)

	No. of Samples Analysed	% > Reporting Limit	Minimum Level µg/kg	Maximum Level µg/kg	2020 Mean Level µg/kg	2019 Mean Level µg/kg	Median Level µg/kg
Milling Wheat	51	57%	<10	84.3	13.3	<10	12.4
Feed Wheat	10	50%	<10	174	36.4	11.2	5.3
Wheatfeed	20	100%	14.8	106	29.6	18.9	25.7
Feed Barley	10	80%	<10	324	64.7	4.9	47.6
Malting Barley	43	42%	<10	70.7	12.6	4.6	<10
Food Oats	29	34%	<10	537	33.1	<10	<10
Food Barley	1	100%	42.5	42.5	42.5	<10	42.5
Feed Oats	10	80%	<10	23.3	12.1	<10	12.6
Oatfeed	10	100%	20.8	235	118	21.9	105

T-2 toxin B3-glucoside (T2-B3-Glc)

	No. of Samples Analysed	% > Reporting Limit	Minimum Level µg/kg	Maximum Level µg/kg	2020 Mean Level µg/kg	2019 Mean Level µg/kg	Median Level µg/kg
Milling Wheat	51	0%	<10	<10	<10	<10	<10
Feed Wheat	10	10%	<10	10.1	1.0	<10	<10
Wheatfeed	20	0%	<10	<10	<10	<10	<10
Feed Barley	10	30%	<10	10.8	3.1	<10	<10
Malting Barley	43	7%	<10	56.1	1.8	1.4	<10
Food Oats	29	66%	<10	205	37.1	67.4	18.6
Food Barley	1	0%	<10	<10	<10	<10	<10
Feed Oats	10	40%	<10	239	61.5	28.9	<10
Oatfeed	10	100%	29.8	205	118	231	105

Zearalenone Harvest 2020 samples

ZEN Harvest (September 2020)							
	No. of Samples Analysed	% > Reporting Limit	Minimum Level µg/kg	Maximum Level µg/kg	Mean Level µg/kg (*)	Median Level µg/kg	5 year average µg/kg
Milling Wheat	51	16%	<2.5	37.2	<2.5 (<2.5)	<2.5	10.2
Feed Wheat	10	50%	<2.5	191	29 (5.2)	1.9	38.8
Wheatfeed	20	80%	<2.5	178	23.5 (<2.5)	10.9	18.9
Feed Barley	10	80%	<2.5	114	25.8 (<2.5)	9.9	13.2
Malting Barley	43	26%	<2.5	28.1	2.5 (0.6)	<2.5	1.3
Food Oats	29	24%	<2.5	948	33.8 (<5)	<2.5	17.0
Food Barley	1	0%	<2.5	<2.5	<2.5 (<2.5)	<2.5	-
Feed Oats	10	30%	<2.5	4.0	1 (<2.5)	<2.5	1.1
Oatfeed	10	80%	<2.5	102	40.3 (<2.5)	41.0	40.5

(*) 2019 mean level in brackets

α -Zearalenol (α -ZEL)

	No. of Samples Analysed	% > Reporting Limit	Minimum Level $\mu\text{g}/\text{kg}$	Maximum Level $\mu\text{g}/\text{kg}$	2020 Mean Level $\mu\text{g}/\text{kg}$	2019 Mean Level $\mu\text{g}/\text{kg}$	Median Level $\mu\text{g}/\text{kg}$
Milling Wheat	51	0%	<2.5	<2.5	<2.5	<2.5	<2.5
Feed Wheat	10	10%	<2.5	4.0	<2.5	<2.5	<2.5
Wheatfeed	20	0%	<2.5	<2.5	<2.5	<2.5	<2.5
Feed Barley	10	0%	<2.5	<2.5	<2.5	<2.5	<2.5
Malting Barley	43	0%	<2.5	<2.5	<2.5	<2.5	<2.5
Food Oats	29	3%	<2.5	4.8	<2.5	<50	<2.5
Food Barley	1	0%	<2.5	<2.5	<2.5	<50	<2.5
Feed Oats	10	0%	<2.5	<2.5	<2.5	<2.5	<2.5
Oatfeed	10	0%	<2.5	<2.5	<2.5	<2.5	<2.5

β-Zearalenol (β-ZEL)

	No. of Samples Analysed	% > Reporting Limit	Minimum Level µg/kg	Maximum Level µg/kg	2020 Mean Level µg/kg	2019 Mean Level µg/kg	Median Level µg/kg
Milling Wheat	51	0%	<2.5	<2.5	<2.5	<2.5	<2.5
Feed Wheat	10	10%	<2.5	5.7	0.6	<2.5	<2.5
Wheatfeed	20	5%	<2.5	5.0	0.3	<2.5	<2.5
Feed Barley	10	20%	<2.5	8.0	1.4	<2.5	<2.5
Malting Barley	43	0%	<2.5	<2.5	<2.5	<2.5	<2.5
Food Oats	29	3%	<2.5	14.4	<2.5	<50	<2.5
Food Barley	1	0%	<2.5	<2.5	<2.5	<50	<2.5
Feed Oats	10	0%	<2.5	<2.5	<2.5	<2.5	<2.5
Oatfeed	10	20%	<2.5	3.5	0.7	<2.5	<2.5

Zearalenone-14-Glucoside (ZEN-14-Glc)

	No. of Samples Analysed	% > Reporting Limit	Minimum Level µg/kg	Maximum Level µg/kg	2020 Mean Level µg/kg	2019 Mean Level µg/kg	Median Level µg/kg
Milling Wheat	51	0%	<5	<5	<5	<5	<5
Feed Wheat	10	0%	<5	<5	<5	<5	<5
Wheatfeed	20	0%	<5	<5	<5	<5	<5
Feed Barley	10	0%	<5	<5	<5	<5	<5
Malting Barley	43	0%	<5	<5	<5	<5	<5
Food Oats	29	0%	<5	<5	<5	<5	<5
Food Barley	1	0%	<5	<5	<5	<5	<5
Feed Oats	10	0%	<5	<5	<5	<5	<5
Oatfeed	10	0%	<5	<5	<5	<5	<5

α -Zearalenol-glucoside (α -ZEL-Glc)

	No. of Samples Analysed	% > Reporting Limit	Minimum Level $\mu\text{g}/\text{kg}$	Maximum Level $\mu\text{g}/\text{kg}$	2020 Mean Level $\mu\text{g}/\text{kg}$	2019 Mean Level $\mu\text{g}/\text{kg}$	Median Level $\mu\text{g}/\text{kg}$
Milling Wheat	51	0%	<5	<5	<5	<5	<5
Feed Wheat	10	0%	<5	<5	<5	<5	<5
Wheatfeed	20	0%	<5	<5	<5	<5	<5
Feed Barley	10	0%	<5	<5	<5	<5	<5
Malting Barley	43	0%	<5	<5	<5	<5	<5
Food Oats	29	0%	<5	<5	<5	<5	<5
Food Barley	1	0%	<5	<5	<5	<5	<5
Feed Oats	10	0%	<5	<5	<5	<5	<5
Oatfeed	10	0%	<5	<5	<5	<5	<5

β -Zearalenol Glucoside (β -ZEL-Glc)

	No. of Samples Analysed	% > Reporting Limit	Minimum Level $\mu\text{g}/\text{kg}$	Maximum Level $\mu\text{g}/\text{kg}$	2020 Mean Level $\mu\text{g}/\text{kg}$	2019 Mean Level $\mu\text{g}/\text{kg}$	Median Level $\mu\text{g}/\text{kg}$
Milling Wheat	51	0%	<5	<5	<5	<5	<5
Feed Wheat	10	0%	<5	<5	<5	<5	<5
Wheatfeed	20	0%	<5	<5	<5	<5	<5
Feed Barley	10	0%	<5	<5	<5	<5	<5
Malting Barley	43	0%	<5	<5	<5	<5	<5
Food Oats	29	7%	<5	6.0	<5	<5	<5
Food Barley	1	0%	<5	<5	<5	<5	<5
Feed Oats	10	0%	<5	<5	<5	<5	<5
Oatfeed	10	0%	<5	<5	<5	<5	<5

Total Ergot alkaloids

Total Ergot Alkaloids (n=12) [Sum of quantified residues] Harvest (September 2020)

	No. of Samples Analysed	% > Reporting Limit	Minimum Level µg/kg	Maximum Level µg/kg	Mean Level µg/kg (*)	Median Level µg/kg	5 year average µg/kg
Milling Wheat	51	39%	<6.0	468	31.1 (47.8)	<6.0	54.7
Feed Wheat	10	90%	<6.0	1542	182 (17.7)	31.1	51.6
Wheatfeed	20	100%	54.2	420	193 (113)	162	203
Feed Barley	10	70%	<6.0	213	37.6 (117)	4.6	49.4
Malting Barley	43	56%	<6.0	251	17.6 (11)	0.7	14.5
Food Oats	29	48%	<6.0	242	18.1 (10.1)	<6.0	17.1
Food Barley	1	0%	<6.0	<6.0	<6.0 (2.8)	<6.0	-
Feed Oats	10	60%	<6.0	258	37 (12.9)	7.4	31.1
Oatfeed	10	80%	<6.0	43.0	13.2 (20.3)	4.6	36.1

(*) 2019 mean level in brackets

Pesticides Freshly Harvested Results 2020

	No. of Samples Analysed	% > LOD	Single Pesticide Incidence % > LOD	Multiple Pesticide Incidence % > LOD
Milling Wheat ¹	51	100%	22%	78%
Malting Barley ²	43	19%	14%	5%
Food Oats ³	29	90%	24%	66%
Barley ⁴	1	100%	0%	100%
Feed Wheat ⁵	11	82%	82%	
Feed Barley ⁶	9	89%	89%	
Feed Oats ⁷	10	50%	50%	

¹ azoxystrobin (2) 0.011, 0.016 mg/kg; bixafen (1) 0.023 mg/kg; boscalid (2) 0.012 mg/kg; chlormequat (46) 0.036-1.1 mg/kg; fluoxastrobin (2) 0.020, 0.022 mg/kg; glyphosate (19) 0.14-1.2 mg/kg; mepiquat (7) 0.013-0.36 mg/kg; prothioconazole (2) 0.026, 0.031 mg/kg; tebuconazole (31) 0.010-0.057 mg/kg.

² azoxystrobin (1) 0.032 mg/kg; boscalid (1) 0.076 mg/kg; cyproconazole (2) 0.015 mg/kg; cyprodinil (3) 0.011-0.078; fluxapyroxad (2) 0.014, 0.020 mg/kg; tebuconazole (1) 0.018 mg/kg.

³ azoxystrobin (2) 0.010, 0.019 mg/kg; chlormequat (21) 0.017-5.3 mg/kg; cyproconazole (2) 0.016, 0.020 mg/kg; epoxiconazole (3) 0.014-0.029 mg/kg; glyphosate (16) 0.19-4.2 mg/kg; mepiquat (6) 0.039-0.35 mg/kg; tebuconazole (5) 0.018-0.046 mg/kg.

⁴ bixafen (1) 0.012 mg/kg; glyphosate (1) 0.74 mg/kg.

^{5 6 7} Glyphosate only, (Not tested for other pesticides).

Pesticides Freshly Harvested Results Additional Compounds 2020

	No. of Samples Analysed	% > LOD	Single Pesticide Incidence % > LOD	Multiple Pesticide Incidence % > LOD
Milling Wheat ¹	51	18%	12%	6%
Malting Barley ²	43	35%	19%	16%
Food Oats ³	29	17%	3%	14%
Barley ⁴	1	100%	0%	100%
Feed Wheat ⁵				
Feed Barley ⁶				
Feed Oats ⁷				

¹ deltamethrin (2) 0.087, 0.094 mg/kg; piperonyl butoxide (7) 0.020-0.94 mg/kg; flonicamid metabolite (TFNA) (1) 0.010mg/kg; flonicamid metabolite (TFNG) (2) 0.013, 0.12 mg/kg.

² **2,4-DB (1) 0.060 mg/kg (MRL set at 0.05 mg/kg)**; deltamethrin (7) 0.013-0.19 mg/kg; fluroxypyr (3) 0.014-0.050 mg/kg; isopyrazam (1) 0.014; piperonyl butoxide (12) 0.010-2.5mg/kg.

³ deltamethrin (4) 0.031-0.32 mg/kg; piperonyl butoxide (5) 0.035-2.5 mg/kg.

⁴ No additional residues detected.

^{5 6 7} Glyphosate only (Not tested for other pesticides).

Metals in Milling Wheat Harvest 2020

	No. of Samples Analysed	% > Reporting Limit	Minimum Level mg/kg	Maximum Level mg/kg	Mean Level mg/kg	Median Level mg/kg
Aluminium	25	96	0.5	101	10.8	4.7
Nickel	25	100	0.09	1.21	0.31	0.17
Copper	25	100	2.5	4.4	3.41	3.2
Arsenic	25	16	<0.01	0.04	0.01	<0.01
Cadmium	25	100	0.01	0.14	0.05	0.04
Mercury	25	0	<0.01	<0.01	<0.01	<0.01
Lead	25	32	<0.01	0.05	0.01	<0.01

A vibrant landscape of a green field at sunset. The sun is low on the horizon, casting a warm glow over the scene. The sky is filled with colorful clouds, ranging from soft pinks and oranges to deep blues and greys. A path of light-colored soil or gravel leads from the foreground towards the horizon, flanked by lush green grass. In the distance, rolling hills and a few buildings are visible under the twilight sky. The overall mood is peaceful and inspiring.

**‘Inspiring our farmers, growers
and industry to succeed in a
rapidly changing world’**