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The surveillance programme for feed and feed materials for terrestrial animals in Norway 2025 - Mycotoxins and fungi

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Summary

In 2025, the surveillance programme for feed and feed materials focused on mycotoxins of potential concern in oats, barley, rye and maize, as well as in compound feed for pigs and poultry. In addition, sclerotia from ergot (*Claviceps purpurea*) was determined in barley and rye.

Related to the regulations, the concentration of deoxynivalenol (DON) in oats exceeded the maximum guidance limit in one of 46 samples, and in compound feed for pigs DON exceeded the maximum guidance limit in one of 19 samples after adjustment for expanded uncertainty. Furthermore, the concentration of ergot sclerotia in rye exceeded the legislation limit in three of 12 samples. However, the rye was uncleansed and thus not ready for sale.

The mean concentration of DON in oats was numerically the highest since 2012. The mean concentration of the sum of T-2 and HT-2 toxin in oats was at the average level of corresponding levels from the last decades. The levels of these mycotoxins in barley were lower than in oats. Oats and barley showed a similar regional pattern with highest levels of DON in Eastern Norway and highest levels of T-2 and HT-2 in Central Norway. This is supposed to reflect the particularly warm and dry summer 2025 in Central regions. Zearalenone (ZEA) showed low prevalence in oats and barley, and ergot alkaloids low prevalence in oats, barley and rye.

There were no significant correlations between ergot sclerotia and alkaloids in neither barley nor rye. Lack of or low correlations between these parameters are also previously observed and indicate an uneven production of the ergot alkaloids in the sclerotia.

In maize, aflatoxin B1 was quantified at trace level in a single sample, but no ochratoxin A (OTA) was found.

In compound feeds for pig and poultry, DON was found in almost all samples, whereas T-2, HT-2, NIV (nivalenol), ZEA, fumonisins, OTA and ergot alkaloids were hardly quantifiable.

Sammendrag

I 2025 omfattet overvåkingsprogrammet for fôr og fôrråvarer mykotoksiner av potensiell betydning i havre, bygg, rug og mais, samt i kraftfôr til gris og fjørfe. I tillegg ble sklerotier fra meldrøye (*Claviceps purpurea*) undersøkt i bygg og rug.

Vurdert opp mot regelverket, oversteg konsentrasjonen av deoksynivalenol (DON) i havre veiledende grenseverdi i én av 46 prøver, og i kraftfôr til gris oversteg DON veiledende grenseverdi i én av 19 prøver etter justering for utvidet usikkerhet. Videre oversteg konsentrasjonen av meldrøye-sklerotier i rug den lovbestemte grenseverdien i tre av 12 prøver, men denne rugen var urenset og derfor ikke ferdig til omsetning.

Gjennomsnittskonsentrasjonen av DON i havre var nummerisk den høyeste siden 2012. Gjennomsnittskonsentrasjonen av summen av T-2 og HT-2 toksin i havre lå på nivå med gjennomsnittet for de siste tiårene. Nivåene av disse mykotoksinene var lavere i bygg enn i havre. Havre og bygg viste et lignende regionalt mønster, med høyest nivå av DON på Østlandet og høyest nivå av T-2 og HT-2 i Midt-Norge. Dette antas å gjenspeile den spesielt varme og tørre sommeren 2025 i Midt-Norge. Zearalenon (ZEA) viste lav forekomst i havre og bygg, og meldrøye-alkaloider viste lav forekomst i både havre, bygg og rug.

Det ble ikke funnet noen signifikant sammenheng mellom meldrøye-sklerotier og -alkaloider verken i bygg eller rug. Manglende eller svak korrelasjon mellom disse parameterne er også observert tidligere, og indikerer en ujevn produksjon av meldrøye-alkaloider i sklerotiene.

I mais ble det påvist spor av aflatoksin B1 i én enkeltprøve, men det ble ikke funnet okratoksin A (OTA).

I kraftfôr til gris og fjørfe ble DON funnet i nesten alle prøver, mens T-2, HT-2, NIV (nivalenol), ZEA, fumonisiner, OTA og meldrøyealkaloider i liten grad var målbare.

Introduction

The annual surveillance programme on mycotoxins and microorganisms in feed and feed materials is a collaboration between the Norwegian Food Safety Authority (NFSA) and the Norwegian Veterinary Institute (NVI). NFSA decides the scope of the programme based on scientific advice from NVI, with NFSA responsible for collecting the samples, NVI for analysing and reporting of the results, and finally NFSA for result management. The agents for analyses usually consist of important mycotoxins and fungi, in some years also selected bacteria. The programme gives basis for assessments of feed quality, the impact of animal health and human exposure via animal products.

Fungi in cereals may be differentiated into field and storage fungi. Field fungi invade the seeds and produce toxins before harvest and may affect the appearance and quality of seed or grain. Common field fungi in Norwegian cereal grain include mould species of the *genera Fusarium, Alternaria, Microdocchium, Cladosporium, Acremonium, Epicoccum, Phoma* and more. In addition, *Claviceps purpurea* (ergot) is a field fungus [1]. Storage fungi usually occur in small amounts before harvest. However, under improper storage conditions, the storage fungi can grow rapidly. The most common storage fungi *are Penicillium, Aspergillus* and *Mucorales*. In addition, yeasts can occur in variable amounts among field and storage fungi [1].

Fusarium species are the most important mycotoxin-producing field fungi. They produce important mycotoxins such as the trichothecenes deoxynivalenol (DON), T-2 toxin (T-2) and HT-2 toxin (HT-2), as well as zearalenone (ZEA) and fumonisins [1].

More than two decades of surveillance in Norwegian cereals have shown that DON can occur in high concentrations, particularly in oats, but also in barley and wheat. DON is hazardous to health if ingested by animals and humans [1]. Well-documented gastrointestinal disorders of DON exposure are reduced feed intake and stunted growth rate, predominantly observed in pigs. In addition, DON may impair the immune system. T-2 and HT-2 are usually present in levels of concern only in oats and products with oats. They have similar but potentially stronger toxic effects than DON, causing gastrointestinal lesions as well as immune suppression [1]. Based on more limited available surveillance data, the oestrogenic mycotoxin ZEA produced by the same *Fusarium* species as DON, is usually present at insignificant levels in Norwegian cereals [1].

Data on the occurrence of the ergot alkaloid mycotoxins are of considerable interest in EU [2]. The toxins produce moderate acute neurotoxic effects, inhibit blood circulation and interfere hormone levels. Ergot alkaloids are produced by *Claviceps purpurea* and are found mainly in rye but may also occur in other cereal species [3-5].

Species of genera *Penicillium* and *Aspergillus* are the most important mycotoxin-producing storage fungi. *Penicillium* species generally grow and produce mycotoxins at lower temperatures than species of *Aspergillus* and are therefore of main concern under common Norwegian storage conditions while *Aspergillus* species are more related to imported feed or feed materials [1].

Ochratoxin A (OTA) is an important mycotoxin produced by several species of both *Penicillium* and *Aspergillus*. The most prominent adverse effect of OTA in livestock is nephrotoxicity, mainly observed in pigs. It may also suppress immune responses and growth performance [1]. As far as we know, OTA has not caused problems for

Norwegian livestock. Nonetheless, active surveillance of OTA is important, particularly because they may occur in imported feed ingredients [1].

Furthermore, aflatoxins may be produced by some *Aspergillus* species that occur in imported feed ingredients [1]. These carcinogenic and liver toxic compounds must be kept at low levels to minimize human health risks via consumption of animal products and to ensure animal health. Aflatoxins in feed can result in human exposure via dairy products since bioactive metabolites are secreted into the milk.

Aims

The aims of the programme on surveillance of feed and feed materials for terrestrial animals in Norway are to document compliance with the legislation on the occurrence of important mycotoxins and selected microorganisms, primarily fungi. The data are used to assess adverse animal health risks related to these agents in feed and to human exposure of transmissible agents via animal products.

Materials and methods

In 2025, the surveillance programme for feed consisted of the following samples shown in Table 1.

Table 1. Samples in the surveillance programme for feed 2025.

Matrix	Planned	Analysed	Analyses
Oats	50	46	Trichothecenes, zearalenone and ergot alkaloids
Barley	50	48	Trichothecenes, zearalenone, ergot alkaloids and ergot sclerotia
Rye	20	12	Ergot alkaloids and ergot sclerotia
Maize	10	7	Aflatoxins and ochratoxin A
Complete compound feed for pigs	20	19	Trichothecenes, zearalenone, fumonisins, ergot alkaloids and ochratoxin A
Complete compound feed for poultry	20	20	Trichothecenes, zearalenone, fumonisins, ergot alkaloids and ochratoxin A

Oats, barley and rye from mills in grain production areas were sampled during autumn, representing the 2025 harvest. Batches of imported maize from third countries and compound feed for pigs and poultry from feed industries were sampled at animal feed plants throughout the year. To ensure representative samples, sampling procedures according to EU Regulation 152/2009 were followed.

Chemical analysis of rye, barley, oats, compound feed for pigs and poultry

A multi mycotoxin liquid chromatography–tandem mass spectrometry (LC MS/MS) method (ME05_202) was used for the simultaneous determination of mycotoxins. ME05_202 was developed in-house at the Norwegian Veterinary Institute and validated in accordance with the guidance document SANTE 11312/2021 and FOR-2014-07-03-871.

The performance parameters, including linearity, selectivity, mean recovery, precision, and limit of quantification (LOQ), were accessed and summarized in Table 2 and Table 3. According to the validation data, considerable matrix effects, ranging from 4 to 157 %, were observed for all mycotoxins across the four selected animal feed/feed products. To improve the accuracy of the method, stable isotope labelled internal standards (IS) were introduced for eleven of the analysed mycotoxins, including DON and its related compounds 3 acetyl DON (3 Ac DON), 15 acetyl DON (15 Ac DON) and DON 3 glucoside (DON 3 G), as well as nivalenol (NIV), HT 2 toxin, T 2 toxin, fumonisin B1 (FB1), fumonisin B2 (FB2), zearalenone (ZEA) and ochratoxin A (OTA). For the quantitative analysis of ergot alkaloids, matrix matched calibration curves were prepared for each matrix.

The accuracy of the method was assessed by determining recovery from spiking experiments and the expanded measurement uncertainty (U') (U' = 2 x u', where u'= rot(u'_{bias}^2+ $u'_{precision}$^2)), where $u'_{precision}$ = RSD (%) and u'_{bias} is the difference between the spiked and the measured concentration in percent (Table 2). Limit of quantitation (LOQs) is the lowest spiked concentration of an analyte in a tested sample which can be quantitatively determined with an acceptable level of precision and accuracy (Table 3).

Results from proficiency tests coordinated by the EU Reference Laboratory (EURL) confirmed the satisfactory performance of the method. Recoveries should preferably fall within the range of 70–120 %. Analytical results were corrected when recoveries were outside this range, provided they were not lower than 50 % or higher than 140 %. Samples with recoveries outside the interval of 50–140 % were reanalysed.

Table 2. Performance validation parameters for multi-analyte mycotoxin LC-MS/MS method (internal method-ID ME05_202).

	Recovery (%) and expanded uncertainty (%)**							
Toxin	**Rye**		**Barley**		**Oats**		**Pig feed**	
Ergocornine*	110	31	116	33	116	33	104	25
Ergocristine*	109	29	115	35	104	34	104	32
α-Ergocryptine*	90	37	120	41	95	41	103	35
Ergonovine*	116	34	93	15	85	33	90	23
Ergosine*	114	31	116	32	112	32	99	25
Ergotamine*	115	44	118	36	115	31	101	27
15-ADON	117	43	106	24	115	48	110	50
3-ADON	114	30	85	43	90	40	86	36
DON	118	64	74	67	102	12	109	23
DON-3-G	103	18	100	16	110	32	120	56
Fumonisin B1	120	40	118	36	120	42	98	29
Fumonisin B2	104	21	111	31	103	34	102	21
HT-2	116	35	102	39	114	57	103	44
NIV	115	32	102	16	75	51	107	15
OTA	105	35	75	54	110	29	87	31
T-2	97	44	86	42	116	63	101	33
ZEN	107	26	71	63	88	25	92	47

*sum of epimers (-inine and -ine)

**expanded uncertainty U' = 2u = 2 √(u_bias^2 + u_presisjon^2)

Table 3. LOQ (µg/kg) of various mycotoxins in different matrices.

Toxin	Rye	Barley	Oats	Pig /Poultry feed
Ergocornine*	50	12.5	10	25
Ergocristine*	50	12.5	10	25
α-Ergocryptine*	25	12.5	5	25
Ergonovine*	25	12.5	5	25
Ergosine*	25	12.5	10	25
Ergotamine*	25	12.5	10	25
15-Ac-DON	25	51	40	51
3-Ac-DON	25	12.5	20	50
DON	25	25	60	100
DON-3-G	50	25.1	20	25
Fumonisin B1	80	80	161	100
Fumonisin B2	81	81	41	101
HT-2	50	25	10	50
NIV	200	100	161	201
OTA	25	25	20	50
T-2	25	12.5	5	60
ZEN	12.5	12.5	10	50

* sum of epimers (-inine and -ine)

The samples were finely milled and thoroughly mixed. A subsample of 2.5 g (± 0.5 %) was weighed out for analysis. The samples were extracted using a two step extraction procedure (MeCN:H_2O:HCOOH, 80:19.9:0.1, v/v/v followed by MeCN:H_2O:HCOOH, 20:79.9:0.1, v/v/v). The extracts were then centrifuged, filtered, and injected into the instrument.

LC MS/MS analyses were performed on an Agilent Triple Quadrupole LC MS system (1290 6470) equipped with an AJS electrospray ionization (ESI) source. Agilent MassHunter software was used for data acquisition and quantitative processing. A 2 µL aliquot of the sample extract was injected into the LC system, and analytes were separated on a Kinetex F5 100 Å column (100 × 2.1 mm) with a pre-column, using a constant flow rate of 0.25 mL/min. Gradient elution was carried out using 5 mM ammonium acetate/1 % acetic acid in water and 100 % methanol, achieving optimal separation within 21 minutes.

Due to differences in the chemical properties of the analytes, the Triple Quadrupole was operated in both positive and negative ionization modes to ensure optimal sensitivity. Mycotoxin identification was based on three compound specific MRM transitions for each toxin.

Chemical analysis of aflatoxins and ochratoxin A in maize

Aflatoxins and ochratoxin A (OTA) were analysed using a separate LC MS/MS method (internal method-ID ME05_203), developed and validated in accordance with SANTE 11312/2021 and NS EN 17641:2022, with minor modifications.

The evaluated performance parameters included linearity, selectivity, recovery, precision, and limits of quantification (LOQ), all of which complied with the requirements of FOR 2015 07 03 871. The validation demonstrated pronounced matrix effects for both aflatoxins and OTA in maize. To correct for these effects and compensate for losses during sample preparation, stable isotope labelled analogues were added to calibration standards and all samples prior to extraction. Participation in proficiency tests organized by the EU Reference Laboratory (EURL) confirmed the suitability of the method.

Method accuracy was assessed and calculated as described above in ME05_202 (internal method-ID). The limit of quantification (LOQ) represents the lowest analyte concentration in a sample that can be quantified with acceptable precision and accuracy (Table 4).

Table 4. Performance validation parameters for multi-analyte mycotoxin LC-MS/MS method (internal method-ID ME05_203).

	Maize		
Toxin	**LOQ (µg/kg)**	**Recovery (%)**	**Expanded uncertainty* (%)**
AFB1	0.16	119	50
AFB2	0.31	105	14
AFG1	0.31	81	42
AFG2	0.31	86	32
OTA	1.25	111	24

*expanded uncertainty U' = 2u = 2 √(u_bias^2 + u_presisjon^2)

Samples were ground into a fine powder or slurry, and a 2 g subsample (± 0.5 %) was weighed out. The subsamples were then extracted using the extraction procedure described in EN 17641:2022, with minor modifications.

LC MS/MS analyses were performed on an Agilent Triple Quadrupole LC MS system (1290 6470) equipped with an AJS electrospray ionization (ESI) source, and Agilent MassHunter software was used for data acquisition and quantitative analysis. A 1 µL aliquot of the sample extract was injected into the LC system. Analytes were separated on an EVO C18 100 Å column (100 × 1.0 mm) with a pre-column, using a constant flow rate of 0.1 mL/min. Gradient elution was carried out with 5 mM ammonium formate/0.1 % formic acid in water and 98 % methanol, achieving optimal separation within 16 minutes.

The Triple Quadrupole was operated in positive ionization mode, and mycotoxins were identified using three compound specific MRM transitions for each toxin.

Quantitative determination of *Claviceps purpurea* in barley and rye

Claviceps purpurea sclerotia in grams per kg cereal were calculated according to the method described by Vrålstad et al. [6]. The weighed sample was spread over a large light surface for visual inspection. Detected sclerotia of *C. purpurea* were picked out and weighed separately.

Statistical analysis

Descriptive statistics followed by One-way Anova were used to determine significance in statistical differences between groups (e.g. geographical regions) for variables that were measured quantitatively. Geographical regions were Eastern Norway (samples from counties Østfold, Vestfold, Akershus and Innlandet), Central Norway (samples from counties Trøndelag and Møre and Romsdal) and Western Norway (samples from Rogaland). To investigate possible linear correlation between two variables in the same feed type, scatter plots and Pearson correlations with p-values were determined.

For all mycotoxins, half of the lowest quantified levels for undetected toxins specific to a variable were used for calculation of statistical descriptors when levels were not quantifiable. Detected toxins below quantification levels were used as is.

Analytical results from all individual samples are presented in Appendix tables 1-6.

Results and discussion

Cereals

Levels of various mycotoxins in oats

DON was detectable in all but one sample of oats from the harvest autumn 2025 (98 %). The total mean DON concentration was 1110 µg/kg, which is the numerically highest mean concentration since 2012 (Table 5; Figure 1) – slightly above the mean level in 2023, the penultimate survey. However, only one sample (2 %) had DON level above the guidance limit for DON in feed materials recommended by EU and Norway (8000 µg/kg) [7].

The DON-related compounds included in the analysis of oats were the plant metabolite DON-3-glucoside (DON-3-G) and the acetylated precursor compounds (3-Ac-DON and 15-Ac-DON). DON-3-G was detectable in 93 % of the samples. Also 3-Ac-DON was detected in several oat samples (76 %) while 15-Ac-DON was hardly detectable. The DON concentrations were strongly positively correlated with those of DON-3-G and 3-Ac-DON (Figures 2 and 3). The pattern of DON with their related compounds DON-3-G, 3-Ac-DON and 15-Ac-DON is similar as previous years [3-4].

Table 5. Mycotoxins (µg/kg) in oats (N=46) in Norway 2025, consisting of deoxynivalenol (DON), 3-acetyl-DON (3-Ac-DON), 15-acetyl-DON (15-Ac-DON), DON-3-glucoside (DON-3-G), T-2 and HT-2 toxin and the sum of T-2/HT-2, nivalenol (NIV)), zearalenone (ZEA), and sum ergot alkaloids (∑Ergot alk.)

	DON	3-Ac-DON	15-Ac-DON	DON-3-G	T-2	HT-2	T-2+HT-2	NIV	ZEA	∑Ergot alk.
Mean	1 110	87	<40	190	64	135	199	169	30	115
Median	594	52	<40	110	35	91	128	<161	<10	<50
Minimum	<60	<20	<40	<20	<5	<10	<15	<161	<10	<50
Maximum	12 600	887	40	1 720	391	545	723	620	418	1 350
SD	1 890	135	3	266	78	124	194	129	77	317
% samples >LOQ	98	76	2	93	83	93	93	20	24	13
% samples >GL	2						13		0	

SD = Standard Deviation, <LOQ = above limits of quantification, >GL = numerically above guidance limits for feed ingredients. Empty fields mean no guidance values are set.

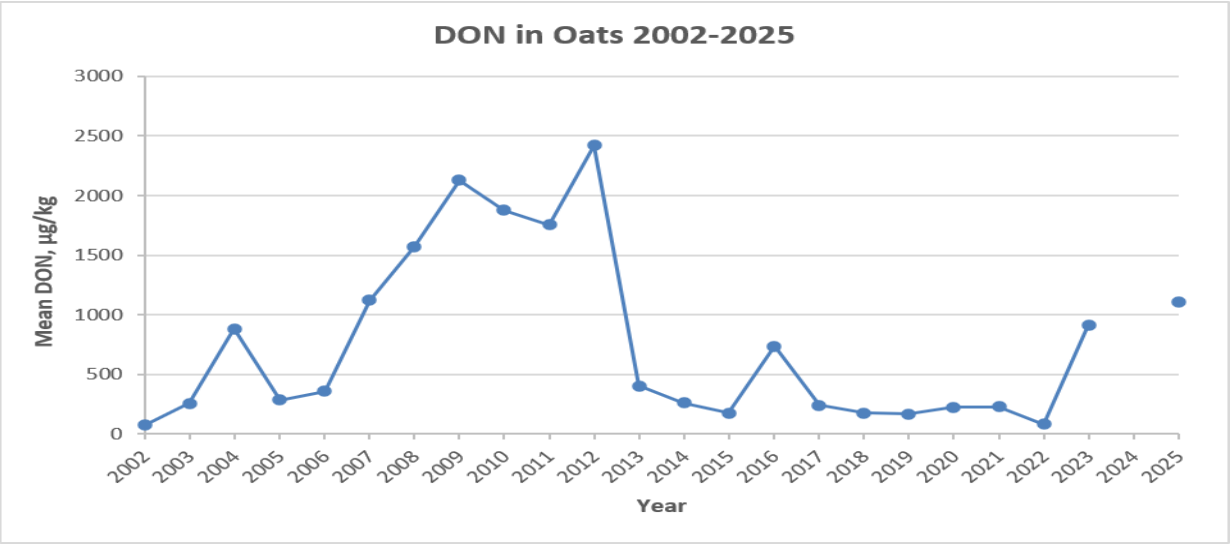

Figure 1. Mean concentration of deoxynivalenol (DON) in 30-60 samples of oats per year in the Norwegian surveillance programme for feed.

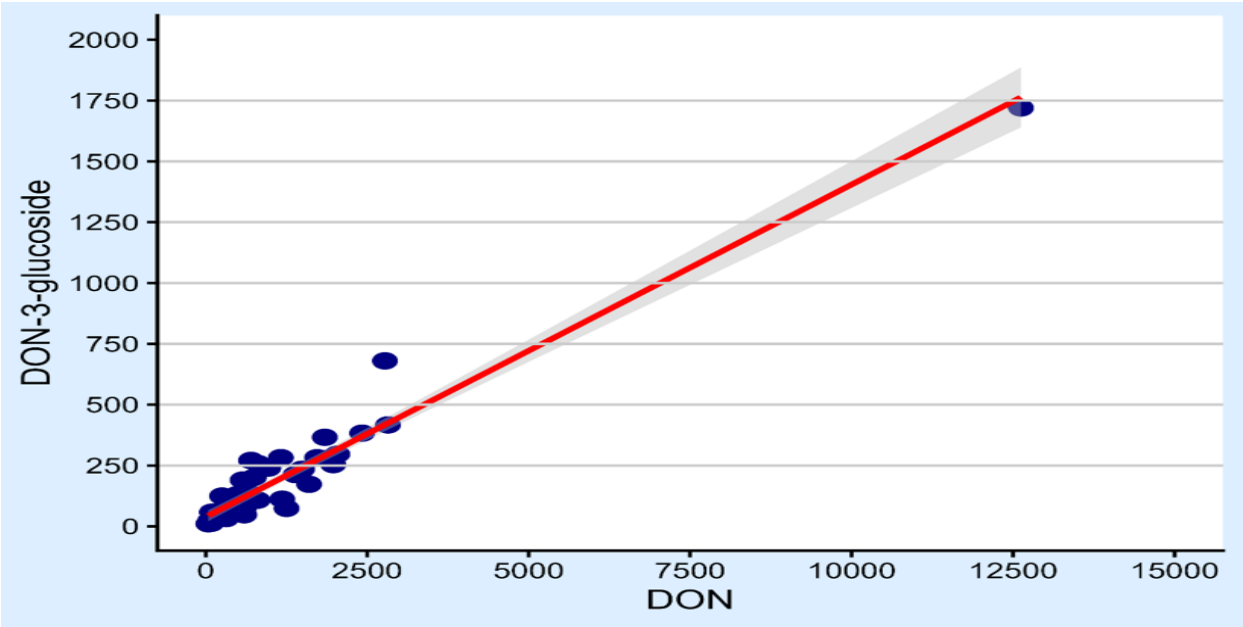

Figure 2. Deoxynivalenol (DON) and DON-3-glucoside (µg/kg in oats (N=46) 2025 given as µg/kg. Pearson correlation coefficient r=0.97, p<0.0001. A regression line with 95 % confidence interval fitted to the points allows predictions of levels of DON-3-G given the level of DON detected and vice versa.

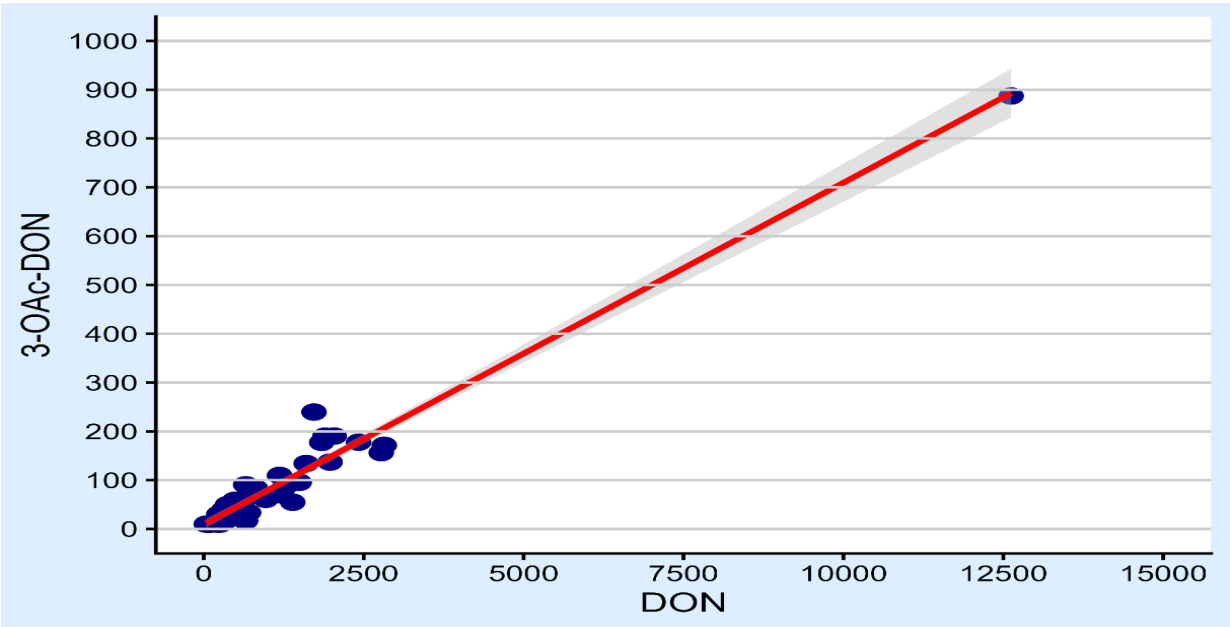

Figure 3. Deoxynivalenol (DON) and 3-acetyl-DON (3-OAc-DON) in oats (N=46) 2025 given as µg/kg. Pearson correlation r=0.98, p<0.0001. A regression line with 95 % confidence interval fitted to the points allows predictions of levels of 3-OAc-DON given the level of DON detected and vice versa.

T-2 and HT-2 were detected in 83 and 93 %, respectively, of the oat samples. Six samples (13 %) had a sum of T-2+HT-2 concentrations which numerically exceeded the guidance level of 500 µg/kg in EU and Norway [7] (Table 5). However, after subtraction of expanded uncertainty of the analytical method, no samples exceeded this guidance level. The mean concentration of T-2+HT-2 was at the average level of corresponding levels from the last decades (Figure 4).

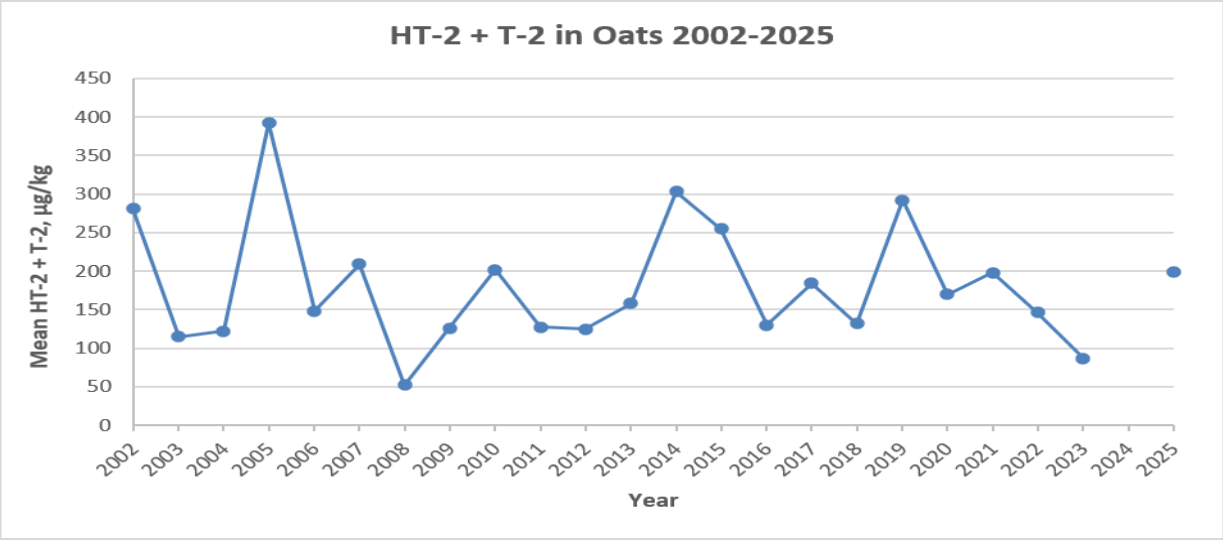

Figure 4. Figure 4. Mean concentration of the sum of T-2 and HT-2 toxin in 30-60 samples of oats per year in the Norwegian surveillance programme for feed.

In line with previous years, T-2 and HT-2 were significantly correlated in oats (Figure 5) with levels of HT-2 exceeding that of T-2 [3-4].

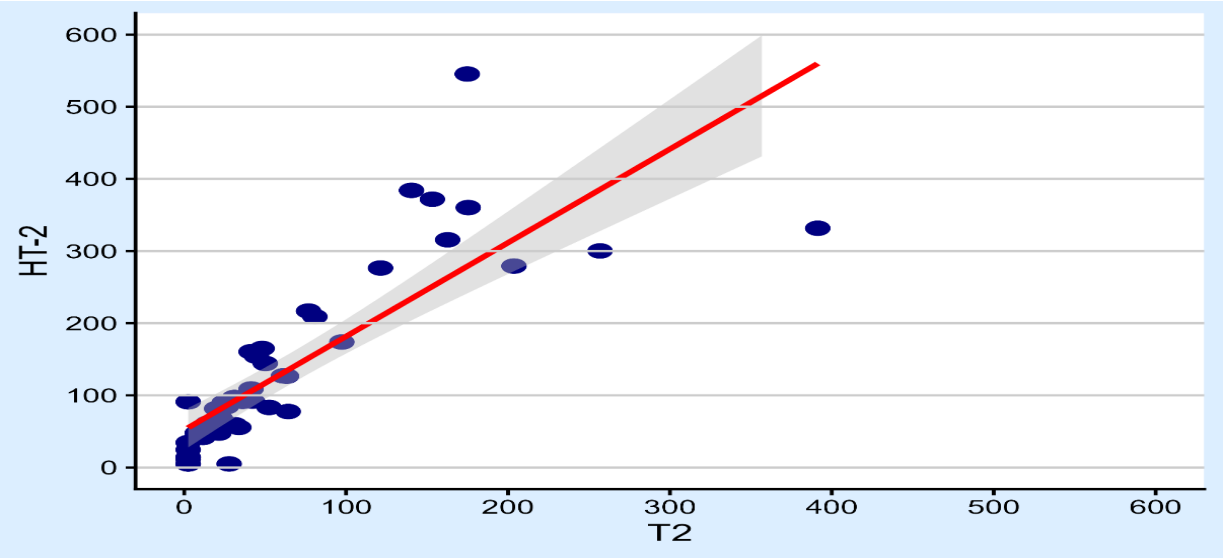

Figure 5. T-2 toxin and HT-2 toxin (µg/kg) in oats (N=46) 2025. Pearson correlation coefficient was r=0.82, p<0.0001. A regression line with 95 % confidence interval fitted to the points allows predictions of levels of HT-2 toxin given the level of T-2 toxin detected and vice versa.

NIV was detected in 20 % of the oat samples, all at rather low levels (Table 5).

ZEA was detected in 24 % of the samples (Table 5), with all samples far below the recommended maximum limit for ZEA in feed material (2000 µg/kg) [7]. The level of ZEA in 2025 was lower than in 2023 [3] but higher than in 2022 [4].

Ergot alkaloids were quantifiable in some oat samples (13 %) with a relatively high maximum concentration, 1350 µg/kg (Table 5). Data on ergot alkaloids in oats are sparse, but both the frequency and maximum concentration were three times higher than in corresponding oat samples from 2022 [4].

Levels of various mycotoxins and ergot sclerotia in barley

The results of various trichothecenes (DON, 3- and 15-AcDON, DON-3-G, T-2, HT-2 and NIV) and ZEA and sum ergot alkaloids are presented in Table 6. A pattern of lower concentrations of DON and T-2/HT-2 in barley compared with oats is like previous years [3-5]. However, DON was quantifiable in most of the samples (83 %), and DON-3-G constituted relatively high levels (approximately 50 %) of those of DON, which are far higher than in oats (averagely 15 %). DON and DON-3-G was highly correlated in barley (Figure 6).

Sum T-2+HT-2 was quantifiable in 25 % of the barley samples – all far below guidance limit. NIV was quantifiable in 8 % of the barley, but with a maximum at 1240 µg/kg, which was twice the maximum in oats.

ZEA was present in barley at a similarly low level as in oats. Similar levels of ZEA in barley and oats are also observed previous years [3-4].

Also, ergot alkaloids were present in barley (quantifiable in 17 %). The ergot alkaloid maximum concentration in barley (270 µg/kg) was far lower than that in oats. Usually, barley is considered as more exposed to ergot and ergot alkaloids than oats [8-12]. Some years (2016, -17 and -19) the maximum alkaloid level in barley was about 10 times higher than in 2025 [9, 11-12]. The maximum concentration of ergot alkaloids was relatively high in 2023 (1620 µg/kg and the compounds quantifiable in 68 % of the barley samples [3]). Thus, there are great yearly variations in alkaloid levels, but knowledge on possible influence of climate or weather conditions on occurrence of ergot and ergot alkaloids is still unknown.

Also, ergot sclerotia (*Claviceps purpurea*) were determined in barley and their levels were rather low with detectable level in 31 % of the samples and a maximum at 43 mg/kg. This is far lower than the legislated maximum concentration of ergot sclerotia of 1000 mg/kg [13], and somewhat lower than the levels in recent previous years [3-5]. The correlation between ergot sclerotia and alkaloids in barley was weak and not statistically significant, which is in accordance with the findings in most years [3-4, 8-9].

Table 6. Mycotoxins (µg/kg) and ergot sclerotia (mg/kg) in barley (N=48) in Norway 2025. The mycotoxins consist of deoxynivalenol (DON), 3-acetyl-DON (3-Ac-DON), 15-acetyl-DON (15-Ac-DON), DON-3-glucoside (DON-3-G), T-2 and HT-2 toxin and the sum of T-2/HT-2, nivalenol (NIV)), zearalenone (ZEA) and sum of ergot alkaloids (∑Ergot alk.).

	DON	3-Ac-DON	15-Ac-DON	DON-3-G	T-2	HT-2	T-2+ HT-2	NIV	ZEA	∑Ergot alk.	Ergot sclerotia
Mean	250	20	<51	125	<13	26	38	<100	17	<78	2
Median	134	<13	<51	82	<13	<25	<38	<100	<13	<78	0
Minimum	<25	<13	<51	<25	<13	<25	<38	<100	<13	<78	0
Maximum	1 710	135	<51	899	81	139	221	1 240	290	270	43
SD	311	23	0	159	15	26	13	172	41	44	7
% samples >LOQ	83	40	0	73	21	31	25	8	25	17	31
% samples >GL	0						0		0		0

* SD = Standard Deviation, >LOQ = above level of quantification, >GL = above guidance limits.

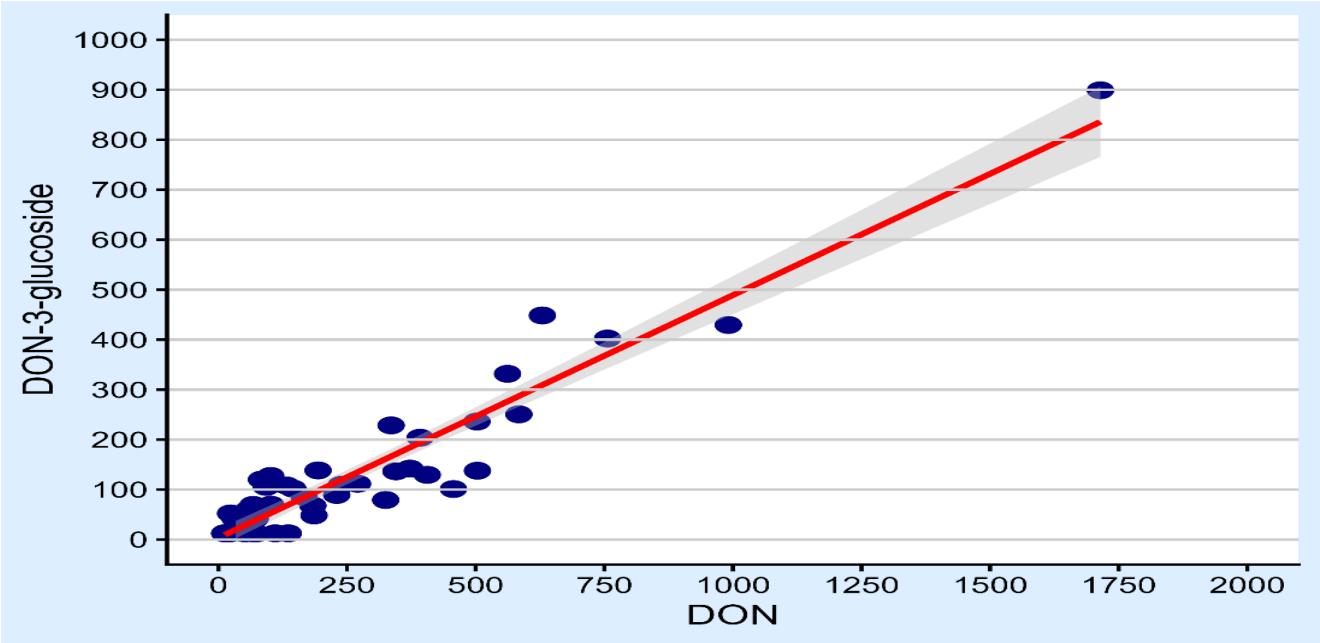

Figure 6. Deoxynivalenol (DON) and DON-3-glucoside (µg/kg) in barley (N=48) 2025. Pearson correlation coefficient r=0.95, p<0.0001. A regression line with 95 % confidence interval fitted to the points allows predictions of levels of DON-3-G given the level of DON detected and vice versa.

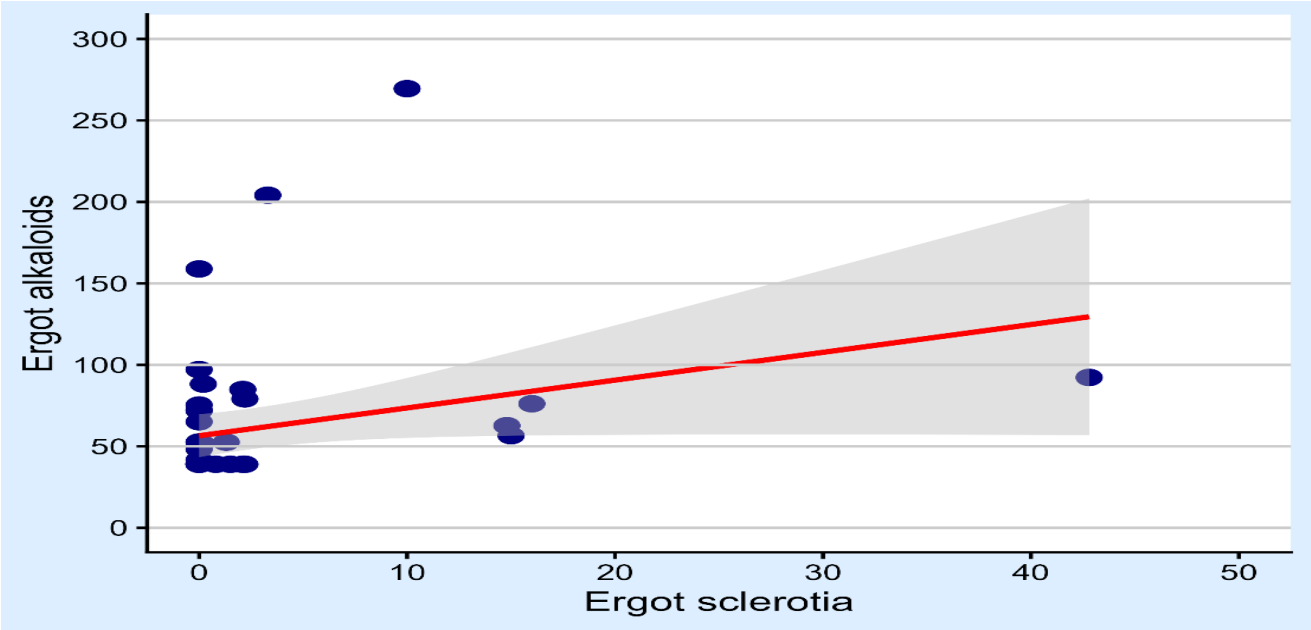

Figure 7. Ergot sclerotia (mg/kg) and ergot alkaloids (µg/kg) in barley (N=48) 2025. Pearson correlation coefficient r=0.28, p=0.058. A regression line with 95 % confidence interval is fitted to the points.

Levels of ergot alkaloids and sclerotia in rye

Ergot alkaloids were present in two of twelve samples of rye (17 %), a similar prevalence as in barley and oats, with a maximum concentration of 1050 µg/kg – somewhat below that in oats. The level of ergot alkaloids in the rye samples 2025 must be considered as relatively low, with a similar level as in 2023 but far lower than in 2022 (prevalence 83 % and maximum 13160 µg/kg [3-4]).

Both in rye, barley and oats, samples positive for these alkaloids most often contain more than one of the individual alkaloids.

Ergot sclerotia were present at higher prevalence and levels in rye compared with barley. Most of the rye samples contained the sclerotia (83 %) and three of twelve samples were contaminated above the legislated maximum concentration of ergot sclerotia of 1000 mg/kg (Appendix Table 3) [13]. However, the samples examined were collected before the cleansing process performed on rye. Lack of correlation between ergot sclerotia and alkaloids (Figure 8) indicates an uneven production of the ergot alkaloids in the sclerotia. Also, previous years' examination of correlation between ergot sclerotia and alkaloids have shown low or no significance [3-4].

Table 7. Ergot alkaloids (µg/kg) and ergot sclerotia (mg/kg) in rye (N=12) in Norway 2025.

	Ergo-novine/-inine	Ergo-sine/-inine	Ergot-amine/-inine	Ergo-cornine/-inine	α-Ergo-cryptine/-inine	Ergo-cristine/-inine	∑ Ergot alkaloids	Ergot sclerotia
Mean	<25	31	<25	<50	<25	91	221	655
Median	<25	<25	<25	<50	<25	<50	<200	94
Minimum	<25	<25	<25	<50	<25	<50	<200	0
Maximum	126	225	116	134	138	754	1 050	2 630
SD	34	61	32	31	36	209	299	1 020
% samples >LOQ	8	8	17	8	8	17	17	83
% samples >GL								25

* SD = Standard Deviation, >LOQ = above level of quantification, >GL = above guidance limit.

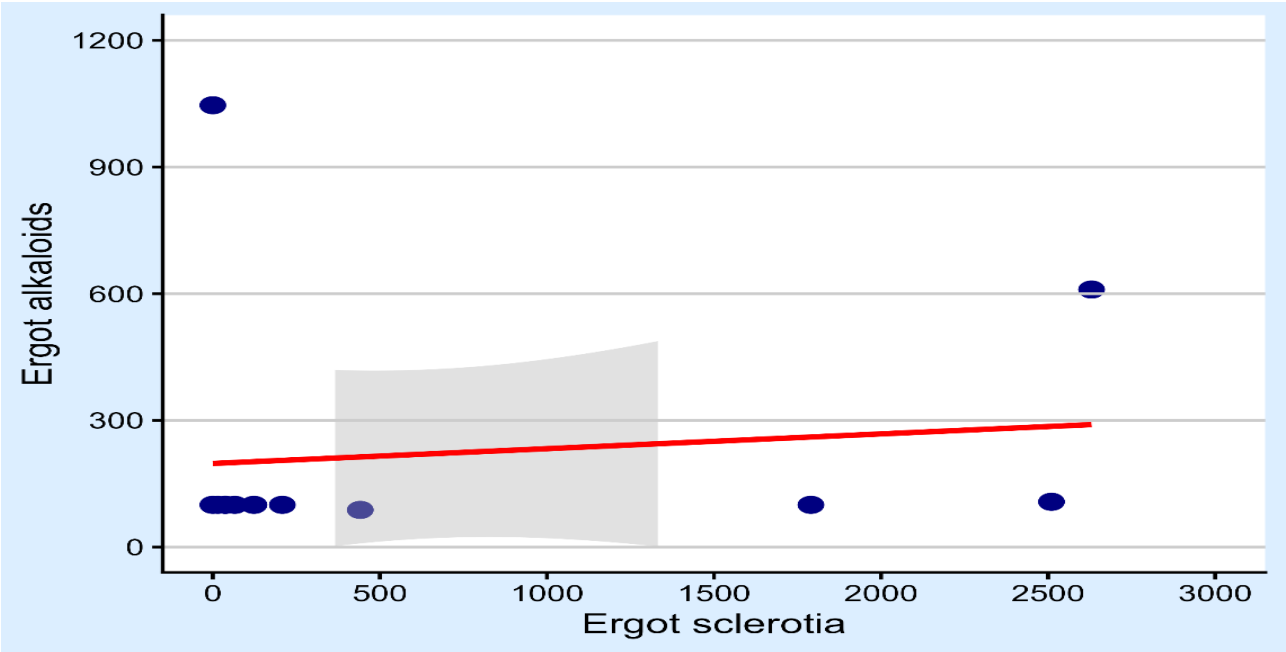

Figure 8. Ergot sclerotia (mg/kg) and ergot alkaloids (µg/kg) in rye (N=12) 2025. Pearson correlation coefficient r=0.12, p=0.71. A regression line with 95 % confidence interval is fitted to the points.

Examination of regional differences of mycotoxins in oats and barley

The most striking result when comparing mycotoxin levels between regions is the significantly higher levels of T-2+HT-2 in Central Norway compared with Eastern Norway. This regional difference was statistically significant for both oats and barley (Tables 8 and 9). For barley, T-2+HT-2 levels in Central and Eastern Norway were significantly higher than in samples from Western Norway. Usually, T-2+HT-2 shows numerically lower and often significantly lower levels in Central compared with Eastern Norway [3-5, 14]. In 2025, the summer weather during the cereal growing season was extremely warm and drier than normal, particularly in Central Norway [15]. Such weather is known to create conditions favourable for T-2 and HT-2 production [16].

Furthermore, the levels of ergot alkaloids in barley were significantly higher in Central than in Eastern and Western Norway. However, the tendency for oats (non-significant) indicated elevated alkaloid levels in the Eastern Norway. No significant regional difference was shown for ergot sclerotia, which was examined in barley. The factors governing the formation of ergot sclerotia and their toxins are still unclear.

The levels of DON, however, were higher in the cereals from Eastern compared with Central Norway. This was statically significant for barley and despite numerically large differences, only a tendency for oats. This is a common finding, that DON has higher levels in Eastern than Central Norway [14]. That the weather conditions for producing T-2/HT-2 and DON in cereal fields are different and in some cases opposite, is also previously documented [16]. DON production is more common in humid field conditions under cereal flowering, which is usually in July [1]. In 2025, July was warm and dry. The relatively high DON level could be due the wet conditions in 2024 [17], as it is known that microclimatic conditions in soil also the previous year may influence. Unfortunately, no samples were collected to surveillance programme in 2024.

Also, NIV in oats showed significantly higher levels in Eastern than Central Norway. Usually, levels of NIV are far lower and of less influence for feed safely than those of DON [1, 3-5].

No significant regional differences were shown for ZEA.

Table 8. Regional levels of mycotoxins (µg/kg) in oats in Norway 2025, consisting of deoxynivalenol (DON), sum of T-2 and HT-2 toxin, NIV (nivalenol), ZEA (zearalenone) and sum ergot alkaloids. Variables that were significantly different between regions are indicated by an * (p<0.05).

Toxin		Eastern Norway N=36	Central Norway N=10
DON	Mean	1 320	356
	Median	728	283
	Maximum	12 600	746
T-2 +HT-2	Mean	169*	305*
	Median	106	207
	Maximum	720	723
NIV	Mean	191*	<161*
	Median	<161	<161
	Maximum	620	163
ZEA	Mean	36	<10
	Median	<10	<10
	Maximum	418	<10
∑Ergot alk.	Mean	136	<50
	Median	<50	<50
	Maximum	1 350	173

Table 9. Regional levels of mycotoxins (µg/kg) in barley in Norway 2025, consisting of deoxynivalenol (DON), sum of T-2 and HT-2 toxin, NIV (nivalenol), ZEA (zearalenone) and sum ergot alkaloids, and ergot sclerotia. Variables that were significantly different between regions are indicated by an * (p<0.05).

Toxin		Eastern Norway N=34	Central Norway N=11	Western Norway N=3
DON	Mean	301*	83*	277
	Median	185	68	194
	Maximum	1 710	406	562
T-2 +HT-2	Mean	<38*	65*	<38*
	Median	<38	<38	<38
	Maximum	124	221	57
NIV	Mean	<100	<100	<100
	Median	<100	<100	<100
	Maximum	1 240	123	<100
ZEA	Mean	19	<13	14
	Median	<13	<13	<13
	Maximum	290	23	28
∑Ergot alk.	Mean	<78*	90*	<78*
	Median	<78	<78	<78
	Maximum	159	270	<78
Ergot sclerotia	Mean	1	5	5
	Median	0	0	0
	Maximum	15	43	16

Aflatoxins in maize

Aflatoxins B1, B2, G1 and G2, and OTA were analysed in seven maize samples with quantification limits 0.16 µg/kg for B1, 0.31 µg/kg for B2, G1 and G2, and 1.25 µg/kg for OTA. The only positive finding was traces of aflatoxin B1 in one sample, 0.59 µg/kg.

Feed

Feed for pigs

Samples of complete compound feed for pigs were analysed for trichothecenes, ZEA, fumonisins, OTA and ergot alkaloids. The results show that DON was quantifiable in all samples (Table 10). Two samples were numerically above the guidance limit of DON for pig feed in Norway (500 µg/kg), and one sample was still above this limit after subtraction of the expanded analytical uncertainty. DON-3-G was present in some samples, in average at about 20 % of that of DON. 3-Ac-DON was present as trace amount in one sample and 15-Ac-DON was not quantifiable. These DON-related compounds can be an additional factor to the total DON exposure and EFSA considers their toxic effects to be like that of DON [18].

The other trichothecenes T-2, HT-2 and NIV, as well as ZEA, fumonisins, ergot alkaloids and OTA were all below quantification levels in the compound feed for pigs. However, the quantification level for OTA by using the multi-toxin analytical method is high and above than the guidance limit of OTA in feed for pigs at 10 µg/kg [7].

The level of DON in feed for pigs in 2025 was somewhat higher than the last previous years of surveillance, 2021-23 [3-5]. The lack of quantifiable levels of T-2+HT-2 was the same as in 2022, but the results indicate somewhat lower contamination levels of these toxins in 2025 than in 2021 and 2023. As in the last years, there were no

findings of NIV, ZEA, fumonisins and ergot alkaloids [3-5], but it must be pointed out that the level of quantifications have varied somewhat between years.

Table 10. Concentrations (µg/kg) of deoxynivalenol (DON), 3-acetyl-DON (3-Ac-DON), 15-acetyl-DON (15-Ac-DON), DON-3-glucoside (DON-3-G), sum of T-2 and HT-2 toxin, nivalenol (NIV), zearalenone (ZEA) fumonisin B1 and B2 (FUM B1, FUM B2), ochratoxin A (OTA) and sum ergot alkaloids in complete compound feed for pigs (n = 19) sampled in Norway in 2025.

	DON	3-Ac-DON	15-Ac-DON	DON-3-G	T-2 + HT-2	NIV	ZEA	FUM B1	FUM B2	OTA	∑ Ergot alkaloids
Mean	303	<50	<51	54	<110	<201	<50	<100	<101	<50	<150
Median	261	<50	<51	<25	<110	<201	<50	<100	<101	<50	<150
Minimum	127	<50	<51	<25	<110	<201	<50	<100	<101	<50	<150
Maximum	823	69	<51	163	<110	<201	<50	<100	<101	<50	<150
SD	172	11	1	56	10	0	9	0	3	0	9
% samples >LOQ	100	5	0	42	0	0	0	0	0	0	0
% samples >GL	11				0		0				

* SD = Standard Deviation, >LOQ = above level of quantification, >GL = above guidance limits.

Feed for poultry

The compound feed for poultry was analysed for the same mycotoxins as the feed for pigs.

DON was quantifiable in all but one sample, numerically slightly above the levels in pig feed (Table 11). However, no samples had DON levels above the higher guidance limit for poultry feed (2000 µg/kg) [7]. DON-3-G was shown at similar levels as in feed for pigs, whereas 3-and 15-Ac-DON were not quantifiable in the poultry feed.

The other trichothecenes T-2, HT-2 and NIV were not present in the compound feed for poultry.

ZEA was quantifiable at low levels in two samples, and fumonisins, ergot alkaloids and OTA were below the limit of quantifications in all samples of poultry feed. It must again be commented that the quantification level for OTA in the multi-toxin method is high – in this case the same as the guidance limit in feed for poultry at 50 µg/kg [7].

The surveillance of mycotoxin data in Norwegian feed for poultry has a short history but compared with those from 2023 [3] elevated levels of DON and lower levels of T-2+HT-2 were present in 2025. For the other mycotoxins no significant differences were observed.

Table 11. Concentrations (µg/kg) of deoxynivalenol (DON), 3-acetyl-DON (3-Ac-DON), 15-acetyl-DON (15-Ac-DON), DON-3-glucoside (DON-3-G), sum of T-2 and HT-2 toxin, nivalenol (NIV), zearalenone (ZEA) fumonisin B1 and B2 (FUM B1, FUM B2), ochratoxin A (OTA) and sum ergot alkaloids in complete compound feed for poultry (n = 20) sampled in Norway in 2025.

	DON	3-Ac-DON	15-Ac-DON	DON-3-G	T-2 + HT-2	NIV	ZEA	FUM B1	FUM B2	OTA	∑ Ergot alkaloids
Mean	384	<50	<51	56	<110	<201	<50	<100	<101	<50	<150
Median	300	<50	<51	<25	<110	<201	<50	<100	<101	<50	<150
Minimum	<100	<50	<51	<25	<110	<201	<50	<100	<101	<50	<150
Maximum	1 540	<50	<51	258	<110	<201	188	<100	<101	<50	<150
SD	295	6	0	67	11	0	39	14	15	0	14
% samples >LOQ	95	0	0	45	0	0	10	0	0	0	0
% samples >GL	0				0		0				

* SD = Standard Deviation, >LOQ = above level of quantification, >GL = above guidance limits.

Conclusions

Cereals

- Oats:
  - The mean level of DON was the highest since 2012, and one sample had DON level above the guidance limit for DON in feed materials.
  - The mean level of sum T-2+HT-2 was at the average of corresponding levels from the last decades, but no oat samples had T-2+HT-2 above the guidance limit after subtraction of expanded analytical uncertainty.
  - T-2+HT-2 was significantly higher in Central than in Eastern Norway, which may be related to an extremely warm and dry summer in Central Norway. DON tended to show an opposite pattern.
  - ZEA was shown in some samples at low levels.
  - Ergot alkaloids were shown in some samples, and with a relatively high maximum concentration.
- Barley:
  - The trichothecenes DON and T-2+HT-2 were present in lower levels than in oats and with a similar pattern: T-2+HT-2 was significantly higher in Central than in Eastern Norway, whereas DON was significantly lower in Central Norway.
  - ZEA was found at a similar level as in oats.
  - Ergot alkaloids had similar prevalence as oats but with a lower maximum concentration.
  - Ergot sclerotia was found in some samples, all at very low levels. No significant correlation between ergot sclerotia and ergot alkaloids was present.
- Rye:
  - Ergot alkaloids had similar prevalence as in oats and barley, and with maximum concentration numerically between those of oats and barley.
  - Ergot sclerotia was detected in most of the rye samples with 25 % of the samples above the legislation limit. As the samples were taken from the batches before the cleansing of ergot, the results were not representative for rye distributed at the market.
  - No correlation between ergot sclerotia and ergot alkaloids was shown.
- Maize:
  - Aflatoxin B1 was shown at trace levels in one of seven samples.
  - OTA was not quantifiable in any samples.

Feed

- Compound feed for pig: DON was found in all samples, and one sample exceeded the maximum guidance limit after adjustment for expanded uncertainty. T-2, HT-2, NIV, ZEA, fumonisins, OTA and ergot alkaloids were not quantifiable.

- Compound feed for poultry: DON was found in almost all samples but none above the maximum guidance limit. ZEA was present in low concentrations in a few samples. T-2, HT-2, NIV, fumonisins OTA and ergot alkaloids were not quantifiable.

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Appendix

Appendix Table 1. Results (in µg/kg) on mycotoxins in 46 individual samples of **oats** from different regions in 2025. DON=deoxynivalenol, 3-Ac-DON=3-acetyl-DON, 15-Ac-DON=15-acetyl-DON, DON-3-G=DON-3-glucoside, T-2=T-2 toxin, HT-2=HT-2 toxin, NIV=nivalenol, ZEA=zearalenone. Ergot alkaloids are given as a sum of two epimers, the -ine and -inine (eks. ergonovine= ergonovine + ergonovinine).

ID-nr.	DON	3-Ac-DON	15-Ac-DON	DON-3G	T-2	HT-2	NIV	ZEA	Ergo-novine	Ergo-sine	Ergot-amine	Ergo-cornine	α-Ergo-cryptine	Ergo-cristine
OATS Central Norway														
2025-23-194-2	655	91	<40	100	53	83	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-195-2	209	<20	<40	61	153	372	163	<10	5	<10	<10	11	10	<10
2025-23-196-2	357	27	<40	84	257	300	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-196-4	746	83	<40	201	20	48	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-200-2	95	<20	<40	58	64	78	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-200-4	68	<20	<40	<20	391	332	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-201-2	700	34	<40	271	97	174	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-201-4	487	41	<40	76	31	97	<161	<10	<5	38	<10	<10	7	113
2025-23-243-2	68	<20	<40	24	<5	11	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-244-2	180	<20	<40	49	204	279	<161	<10	<5	<10	<10	<10	<5	<10
OATS Eastern Norway														
2025-23-124-2	320	<20	<40	104	34	56	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-124-4	357	21	<40	107	20	53	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-124-6	252	<20	<40	124	22	60	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-129-2	1 601	134	<40	173	41	161	620	<10	<5	<10	<10	<10	<5	<10
2025-23-130-2	1 390	55	<40	212	25	90	<161	<10	<5	<10	<10	11	9	<10
2025-23-131-1	2 822	171	<40	417	121	277	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-131-3	2 421	178	<40	383	81	209	<161	<10	<5	10	<10	23	16	<10
2025-23-132-2	105	<20	<40	27	20	82	<161	<10	5	12	<10	<10	<5	15
2025-23-139-2	1 492	96	<40	235	77	217	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-141-2	372	50	<40	117	22	68	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-142-2	969	61	<40	240	175	545	<161	18	<5	<10	<10	<10	<5	<10
2025-23-143-2	12 622	887	40	1 720	26	84	372	95	<5	<10	<10	<10	<5	<10
2025-23-173-1	315	24	<40	32	14	61	420	<10	12	137	206	222	613	23
2025-23-173-2	235	30	<40	42	22	48	278	<10	6	17	15	27	24	<10
2025-23-173-3	485	59	<40	130	<5	15	<161	47	6	<10	<10	12	<5	<10
2025-23-191-1	1 896	190	<40	279	176	360	<161	418	5	<10	<10	<10	<5	<10

2025-23-191-2	2 038	190	<40	296	140	384	<161	296	9	210	129	327	158	488
2025-23-191-3	1 723	240	<40	282	163	316	<161	170	<5	<10	<10	<10	<5	<10
2025-23-203-2	1 844	177	<40	366	<5	91	<161	49	<5	<10	<10	<10	<5	<10
2025-23-204-2	803	74	<40	108	<5	14	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-205-2	571	57	<40	190	45	154	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-206-2	592	55	<40	75	48	165	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-208-2	596	48	<40	48	12	42	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-209-2	1 184	110	<40	112	50	144	247	29	<5	<10	<10	<10	<5	<10
2025-23-210-2	319	40	<40	39	31	59	202	<10	<5	<10	<10	<10	<5	<10
2025-23-211-2	552	48	<40	87	41	109	259	<10	<5	<10	<10	<10	<5	<10
2025-23-212-3	84	<20	<40	<20	<5	<10	<161	<10	5	<10	<10	<10	<5	<10
2025-23-215-2	1 975	137	<40	254	61	127	187	12	<5	<10	<10	<10	<5	<10
2025-23-218-2	<60	<20	<40	<20	28	<10	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-219-2	396	46	<40	69	36	92	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-226-2	653	<20	<40	139	<5	<10	408	<10	<5	<10	<10	<10	<5	<10
2025-23-226-5	811	83	<40	258	63	127	521	<10	20	434	<10	115	773	<10
2025-23-232-2	2 775	156	<40	680	8	48	<161	20	<5	<10	<10	<10	<5	<10
2025-23-233-2	1 251	84	<40	74	42	92	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-238-2	393	27	<40	70	<5	25	<161	<10	<5	<10	<10	<10	<5	<10
2025-23-242-2	1 163	70	<40	282	<5	35	<161	22	<5	<10	<10	<10	<5	<10

Appendix Table 2. Results on mycotoxins (µg/kg) and ergot sclerotia (mg/kg) in **barley** based on 48 individual samples from different regions in 2025. DON=deoxynivalenol, 3-Ac-DON=3-acetyl-DON, 15-Ac-DON=15-acetyl-DON, DON-3-G=DON-3-glucoside, T-2=T-2 toxin, HT-2=HT-2 toxin, NIV=nivalenol, ZEA=zearalenone. Ergot alkaloids are given as a sum of two epimers, the -ine and -inine (eks. ergonovine= ergonovine + ergonovinine).

ID-nr.	DON	3-Ac-DON	15-Ac-DON	DON-3G	T-2	HT-2	NIV	ZEA	Ergo-novine	Ergo-sine	Ergot-amine	Ergo-cornine	α-Ergo-cryptine	Ergo-cristine	Ergot sclerotia
BARLEY Central Norway															
2025-23-181-1	<25	<13	<51	<25	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	0
2025-23-194-1	93	<13	<51	106	81	139	<100	<13	<13	95	<13	18	20	125	10
2025-23-195-1	68	<13	<51	<25	61	52	<100	<13	<13	<13	<13	37	26	<13	0
2025-23-196-1	<25	<13	<51	<25	48	93	<100	<13	<13	<13	<13	<13	<13	14	0
2025-23-196-3	68	<13	<51	69	<13	<25	<100	20	<13	<13	<13	<13	<13	<13	0
2025-23-200-1	<25	<13	<51	<25	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	0
2025-23-200-3	<25	<13	<51	<25	<13	31	<100	<13	<13	136	<13	<13	<13	42	3
2025-23-201-1	102	<13	<51	127	16	44	<100	<13	<13	21	<13	<13	<13	38	2
2025-23-201-3	71	<13	<51	41	13	<25	<100	23	<13	15	<13	<13	43	15	43
2025-23-243-1	32	<13	<51	41	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	0
2025-23-244-1	406	33	<51	130	<13	<25	123	19	<13	<13	<13	<13	<13	<13	0
BARLEY Eastern Norway															
2025-23-124-1	<25	<13	<51	<25	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	2
2025-23-124-3	58	<13	<51	59	33	<25	<100	<13	<13	26	<13	<13	<13	27	2
2025-23-124-5	65	<13	<51	53	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	0
2025-23-125-1	<25	<13	<51	<25	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	0
2025-23-125-2	52	<13	<51	<25	<13	<25	<100	<13	<13	20	<13	<13	<13	<13	0
2025-23-125-3	<25	<13	<51	52	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	0
2025-23-125-4	63	<13	<51	64	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	0
2025-23-125-5	<25	<13	<51	<25	<13	<25	<100	<13	<13	26	<13	<13	<13	21	0
2025-23-129-1	230	<13	<51	89	29	95	100	<13	<13	<13	<13	<13	<13	<13	2
2025-23-130-1	84	<13	<51	120	<13	35	<100	<13	<13	<13	<13	<13	<13	<13	0
2025-23-131-2	336	26	<51	228	<13	28	<100	53	<13	41	<13	<13	<13	92	0
2025-23-131-4	630	45	<51	448	<13	30	<100	17	<13	28	<13	<13	16	24	0
2025-23-132-1	132	<13	<51	108	<13	54	<100	<13	<13	22	<13	<13	<13	24	0
2025-23-139-1	111	<13	<51	<25	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	0
2025-23-141-1	756	58	<51	402	18	51	<100	<13	<13	24	<13	<13	<13	26	0
2025-23-142-1	991	56	<51	429	15	50	<100	32	<13	<13	<13	<13	<13	<13	0
2025-23-143-1	584	25	<51	251	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	0
2025-23-203-1	325	32	<51	79	<13	<25	181	<13	<13	<13	<13	<13	14	<13	15

2025-23-204-1	144	<13	<51	102	<13	<25	<100	<13	<13	<13	<13	<13	<13	16	1
2025-23-205-1	503	40	<51	236	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	0
2025-23-206-1	392	33	<51	204	<13	<25	<100	14	<13	<13	<13	<13	<13	<13	0
2025-23-208-1	184	26	<51	68	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	0
2025-23-209-1	372	25	<51	142	<13	<25	<100	24	<13	<13	<13	13	27	<13	0
2025-23-210-1	270	<13	<51	112	<13	<25	<100	13	<13	<13	<13	<13	<13	<13	0
2025-23-211-1	504	32	<51	138	<13	<25	<100	26	<13	<13	<13	<13	<13	<13	0
2025-23-212-2	239	21	<51	110	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	0
2025-23-215-3	1 715	135	<51	899	<13	<25	<100	<13	<13	14	<13	17	<13	<13	15
2025-23-218-1	48	<13	<51	<25	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	1
2025-23-219-1	345	29	<51	137	<13	30	<100	<13	<13	<13	<13	<13	<13	<13	0
2025-23-226-1	136	<13	<51	<25	<13	<25	<100	290	<13	<13	<13	<13	<13	<13	2
2025-23-226-3	457	21	<51	101	<13	<25	1236	<13	<13	<13	<13	<13	<13	<13	0
2025-23-232-1	167	29	<51	86	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	0
2025-23-238-1	102	<13	<51	70	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	0
2025-23-242-1	186	<13	<51	48	<13	<25	<100	<13	<13	<13	<13	<13	<13	<13	0
BARLEY Western Norway															
2025-23-137-1	562	54	<51	332	18	39	<100	28	<13	20	<13	22	15	<13	16
2025-23-137-2	194	19	<51	138	<13	<25	<100	<13	<13	20	<13	<13	<13	<13	0
2025-23-145-1	74	<13	<51	<25	<13	<25	<100	<13	<13	19	<13	<13	<13	<13	0

Appendix Table 3. Results on mycotoxins (ergot alkaloids; µg/kg) and ergot sclerotia (mg/kg) in **rye** based on 12 individual samples in 2025. The alkaloids are given as a sum of two epimers, the -ine and -inine.

ID-nr.	Ergonovine	Ergosine	Ergotamine	Ergocornine	α-Ergocryptine	Ergocristine	Σ Ergot alkaloids	Ergot sclerotia
2025-23-205-3	<25	<25	<25	<50	<25	<50	<200	65
2025-23-209-3	<25	<25	<25	<50	<25	<50	<200	0
2025-23-212-1	<25	<25	<25	<50	<25	<50	<200	208
2025-23-215-1	126	<25	116	<50	<25	754	1046	0
2025-23-215-4	<25	<25	<25	<50	<25	<50	<200	15
2025-23-215-5	<25	<25	<25	<50	<25	<50	<200	38
2025-23-231-1	<25	<25	<25	<50	<25	<50	<200	1790
2025-23-231-2	<25	<25	<25	<50	<25	<50	<200	2510
2025-23-231-3	<25	225	53	134	138	59	610	2630
2025-23-233-1	<25	<25	<25	<50	<25	<50	<200	441
2025-23-233-3	<25	<25	<25	<50	<25	<50	<200	123
2025-23-233-4	<25	<25	<25	<50	<25	<50	<200	36

Appendix Table 4. Results on mycotoxins (µg/kg) in individual samples of **complete feed for pigs** (19 samples) in 2025. DON=deoxynivalenol, 3-Ac-DON=3-acetyl-DON, 15-Ac-DON=15-acetyl-DON, DON-3-G=DON-3-glucoside, T-2=T-2 toxin, HT-2=HT-2 toxin, NIV=nivalenol, ZEA=zearalenone OTA= ochratoxin A, Fum B1=fumonisin B1, FumB2=fumonisin B2. The ergot alkaloids are given as a sum of two epimers, the -ine and -inine.

ID-nr.	Type of feed	DON	3-ac-DON	15-ac-DON	DON-3G	T-2	HT-2	NIV	ZEA	OTA	Fum B1	Fum B2	Ergo-novine	Ergo-sine	Ergot-amine	Ergo-cornine	α-ergo-criptine	Ergo-cristine
25-21-138-2	Format Laktasjon	308	<50	<51	128	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
25-21-139-4	Ideal 30	142	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
25-21-139-5	Ideal Die Ekstra	190	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	29	<25	<25	<25	<25
25-21-142-2	Format Vekst 120	188	<50	<51	111	<60	<50	<201	<50	<50	<100	<101	<25	<25	25	<25	<25	<25
25-21-144-1	Format Purke	288	<50	<51	134	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
25-21-144-2	Format Kvikk 2	157	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
25-21-145-1	Format Purke	345	<50	<51	147	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
25-21-146-1	Ideal 50	220	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
25-21-147-1	Format Trivsel	185	<50	<51	37	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
25-21-147-2	Format Vekst 105	294	<50	<51	103	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
25-21-225-1	Natura Svin Drektig	127	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
25-21-254-1	Opti Vital Pluss	823	<50	<51	163	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
25-21-254-2	Opti Norm	537	69	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
25-21-257-1	Opti Vital Pluss	252	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
25-21-258-1	Grensemelktilskudd	190	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
25-21-259-1	Format Vekst 120	465	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
25-21-260-1	Opti Vital Pluss	498	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
25-21-260-2	Opti Drektig	281	<50	<51	63	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
25-21-266-1	Ideal Junior	261	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25

Appendix Table 5. Results on mycotoxins in individual samples of **complete feed for poultry** (20 samples) in 2025. All concentrations in µg/kg. DON=deoxynivalenol, 3-Ac-DON=3-acetyl-DON, 15-Ac-DON=15-acetyl-DON, DON-3-G=DON-3-glucoside, T-2=T-2 toxin, HT-2=HT-2 toxin, NIV=nivalenol, ZEA=zearalenone OTA= ochratoxin A, Fum B1=fumonisin B1, FumB2=fumonisin B2. The ergot alkaloids are given as a sum of two epimers, the -ine and -inine.

ID-nr.	Type of feed	DON	3-ac-DON	15-ac-DON	DON-3G	T-2	HT-2	NIV	ZEA	OTA	Fum B1	Fum B2	Ergo-novine	Ergo-sine	Ergot-amine	Ergo-cornine	α-ergo-criptine	Ergo-cristine
2025-21-138-1	Kromat Verp Supergul	293	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	45
2025-21-139-1	Lovise-Lerstang 25-60	261	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	36	<25	<25	<25	<25
2025-21-139-2	Flemming Verpestabil	341	<50	<51	82	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	26
2025-21-139-3	Harmoni Kalkun 3-6	281	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
2025-21-140-1	ToppKylling 1	334	<50	<51	185	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
2025-21-140-2	ToppVerper 100K	381	<50	<51	80	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
2025-21-140-3	ToppKylling 3	304	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
2025-21-141-1	ToppKylling 2	173	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
2025-21-142-1	Kromat McKylling 1	293	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
2025-21-143-1	Kromat Verp 1	381	<50	<51	83	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
2025-21-187-1	Kromat Kylling 2	528	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
2025-21-187-2	Kromat Oppdrett 2	368	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
2025-21-187-3	Kromat Kylling 2	296	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
2025-21-225-2	Natura Verp Voksen	<100	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
2025-21-232-1	Kromat Verp 1	523	<50	<51	104	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
2025-21-232-2	Kromat McKylling 2	263	<50	<51	105	<60	<50	<201	65	<50	<100	<101	<25	<25	<25	<25	<25	<25
2025-21-233-1	Toppverper 3	557	<50	<51	52	<60	<50	<201	188	<50	<100	<101	<25	<25	<25	<25	<25	<25
2025-21-234-1	Harmoni Verpestabil	234	<50	<51	36	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
2025-21-234-2	Kalkun 2-6	277	<50	<51	<25	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25
2025-21-235-1	Toppverper 100 N Gul	1536	<50	<51	258	<60	<50	<201	<50	<50	<100	<101	<25	<25	<25	<25	<25	<25

Appendix Table 6. Results on aflatoxin B1, B2, G1, G2, and OTA /ochratoxin A) (all µg/kg) in 7 individual samples of maize in 2025

ID-nr.	Type	Aflatoxin B1	Aflatoxin B2	Aflatoxin G1	Aflatoxin G2	OTA
2025-21-10-1	Maize kernels	<0.16	<0.31	<0.31	<0.31	<1.25
2025-21-46-1	Maize kernels	<0.16	<0.31	<0.31	<0.31	<1.25
2025-21-71-1	Maize kernels	0.59	<0.31	<0.31	<0.31	<1.25
2025-21-72-1	Maize kernels	<0.16	<0.31	<0.31	<0.31	<1.25
2025-21-159-1	Maize kernels	<0.16	<0.31	<0.31	<0.31	<1.25
2025-21-159-2	Maize kernels	<0.16	<0.31	<0.31	<0.31	<1.25
2025-21-268-1	Maize kernels	<0.16	<0.31	<0.31	<0.31	<1.25

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