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USDA LTAR Common Experiment measurement: Cereal crop mycotoxin concentration

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We use this protocol and it's working

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Abstract

Crop pests and diseases can reduce crop yields, but they can also worsen crop quality via reduced grain density or accumulation of toxins produced by fungal diseases. Several mycotoxins are known to harm crop quality, with deoxynivalenol (a.k.a. Vomitoxin or DON) being one of the most common, especially in corn and cereal grains. Subsequently, deoxynivalenol concentration can be correlated with disease severity. This protocol describes a process for measuring DON in cereal grains harvested from LTAR plots and fields.

Sample collection, processing, and analysis

1 Collect a representative subsample of grain from each experimental unit in the study that contains grains produced by grass species possibly infected with DON, including plots and fields.

> **Note**
>
> This grain sample can be a representative subsample from the whole plot/field harvest or subsampled from the individual plant sample utilized for aboveground biomass.

2 If using the whole plot/field harvest, combine multiple subsamples from each plot or field to accurately represent the entire plot or field.

3 Dry grain samples to a stable moisture content and then submit them to a laboratory for analysis of deoxynivalenol (a.k.a. Vomitoxin or DON).

4 Sites may choose to submit samples to a commercial laboratory or analyze them on-site.

5 Several devices are available for on-site DON testing. For on- site analysis, follow the protocol suggested by the manufacturer of your device .

Covariate metrics to be sampled concurrently

6 Other mycotoxins may be quantified at the same time, including aflatoxin, ochratoxin, zearalenone, fumonisin, or ergot alkaloid.

7 Analyze non-grass crops for other mycotoxins that are expected and specific to that crop.

8 Note observations of diseases and pests, including presence and abundance, by crop scouting exercises. These data will be important covariates to consider when evaluating mycotoxin concentrations.

Calculations

9 Determine mycotoxin levels as a concentration (e.g., ppm) and report them in the database using those units.

Quality assessment

10 Be sure to dry grain to stable moisture quickly after harvest and store at Room temperature until analysis.

11 Representative subsamples are critical from each experimental unit analyzed.

Archiving

12 Grain samples should already be archived based on the crop productivity protocols.

Note

- Information/guidance regarding labor and time requirements, equipment/supplies, QA/QC considerations (e.g., missing data, expected numeric bounds, precision, and cross-lab standards), and potential pitfalls of assessments will be helpful for sites unfamiliar with the metric. Teams should tailor these sections to reflect their collective knowledge/expertise.
- Commercial laboratories may charge $25-50 per sample for DON concentration.

Recommendations for data collection

13 Table 1. Summary of recommendations for measuring mycotoxins.

	A	B	C	D
	Attribute	Preferred	Minimum	Comments
	Spatial scale	Plot and field	Plot and field	Only measure specific mycotoxins for grain species commonly infected. For example, legume crops do not commonly have DON concentrations worth measuring.
	Frequency	Once per harvest	Once per harvest	
	Covariate metrics	Other mycotoxins (aflatoxin, ochratoxin, zearalenone, fumonisin, or ergot alkaloid). P	Pest and disease observations during the growing season	

	A	B	C	D
		est and disease observations during the growing season.		

Protocol references

Neogen Reveal Q+ protocol for DON:
https://www.neogen.com/globalassets/pim/assets/original/10000/8385_pro_en-us_raptor.pdf