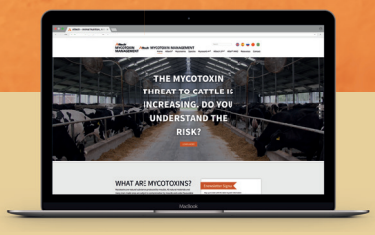
Best Practice Sampling Techniques for Mycotoxin Testing



Farm and Feed Mill

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The importance of sampling in mycotoxin testing

The starting point in ensuring the best possible accuracy in mycotoxin testing is the collection of the sample from the farm or in the feed mill. Moulds and mycotoxins are rarely distributed homogenously throughout a load of grain or a silo of animal feed, highlighting the importance of ensuring the correct steps are taken in obtaining a representative sample (Diaz, 2020).

Errors in mycotoxin testing can occur at all points in the mycotoxin testing process from sample collection to final analysis with either rapid test kits or more advanced laboratory techniques. However, as Whitaker (2006) notes, it is the first step, the collection of the sample that represents the vast majority of the error in this procedure. The table below, indicates that in this particular aflatoxin test, 75% of the error is attributed to sample collection

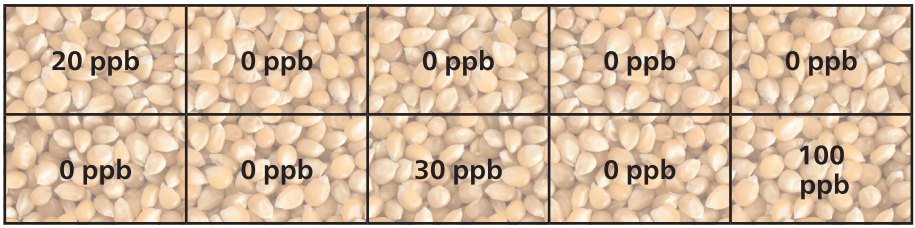
	Variance	Ratio %
Sample = 0.91kg	268.1	75.5
Sub S^2, 50g	56.3	15.9
Immunoassay, 1 aliquot	30.4	8.6
Total	354.8	100

Source: Whitaker 2006: Sampling, sample preparation and analysis errors account for approximately 75.5%, 15.9% and 8.6% of the total error, respectively*.

*This represents a lot of shelled corn at 20ppb aflatoxin.

Alltech Mycotoxin Management have produced this booklet to help producers reduce the potential errors associated with sampling and ensure sample collection forms part of an overall successful mycotoxin management program on farm or in the feed mill.

Sampling for mycotoxins in incoming loads of grain



Hypothetical distribution of an incoming load of corn with an average aflatoxin level of 15 parts - per billion)ppb)

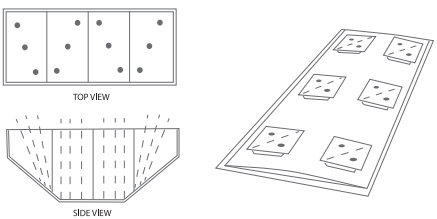
The distribution of mycotoxins in incoming loads of grain can be sporadic in a lot or load of feedstuff. To properly sample for mycotoxins, a uniform sample must be collected, giving a true representation of the entire load or lot.

Static Grain Load

To collect a representative sample, the proper sampling tool must be used correctly. Long probes which at a minimum reach the core of the load are necessary for accurate sample collection.

Note: Adhere to safety guidelines when mounting trailers to collect samples.

A single probe will not produce a sufficient sample. It is necessary to take multiple probes throughout the entire lot in order to catch hidden mycotoxin contamination. The chart below is a reference to the appropriate number of probes to sample per compartment.



Multiple Limited Access Compartments

Probes Per Compartment	
Compartment	Probes
1	10
2	5
3	4
4	3
5	2
6	2
7	2
8	2
9	2
10	1

ain in a feed mill

Stream cutting

For falling streams of grain, use a stream cutter to collect at least 10 subsamples evenly throughout the entire load or lot being sampled. When stream cutting is done correctly, it is a very effective way of sampling, but may not be possible when sampling to reject loads before receiving a truck or railcar.

Collecting a composite sample

While the grain is flowing, use a sample cup or specific stream cutter to take, at least, 10 subsamples from the incoming load. When the subsamples are collected and placed in a container, turn the container over at least 3 times to thoroughly mix the subsamples and ensure a homogenous representation.

Preparing the laboratory sample

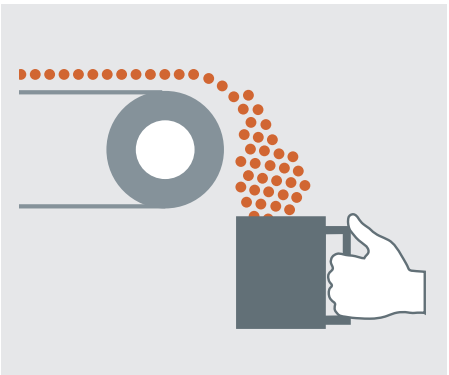
When mixed, follow the quartering method (as is demonstrated on page 16 of this booklet) to prepare a sample for the laboratory. Samples of grain to be sent to the Alltech 37+® mycotoxin analytical services laboratory should weigh in the range of 0.45–0.9 lbs. (200–400 g) and be correctly sealed and labeled with the necessary information.

What to do

While the grain is in motion, use a sample cup or specific stream cutter to cut the grain stream at equal intervals.

Cut the stream at least 5 times, or as many times as is necessary to collect the required sample.

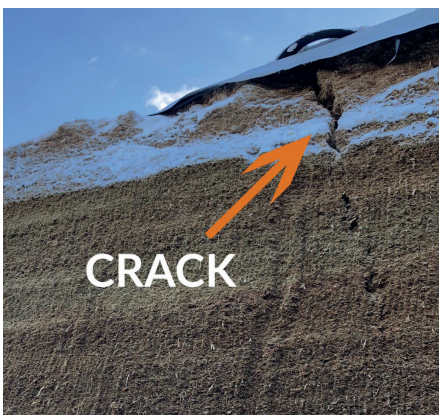
Once the correct sample quantity is gathered, place the sample in an airtight bag, complete the relevant information, and send for testing.



Sampling for mycotoxins in forages

Safety tips when sampling forage clamps

1. Sampling equipment must reach the top of the bunker safely.
2. Maintain average bunker density over 18 lbs. (8 kg) dry matter/ft^3 to ensure adequate density.
3. Inspect bunker daily for visible cracks or overhangs on the face of the bunker. (See photos for example)
4. Always work in pairs to ensure safety in an emergency situation.
5. Do not remove plastic cover or tires where overhangs exist.
6. Do not sample directly from the bunker face.
7. Collect a silage sample from the pile at least 3 times the pile height from the silage face.
8. Consider posting a warning sign "Danger! Bunker Face Collapse Potential".
9. All employees should be trained on bunker safety.



Crack in Silage Clamp

Overhang on Silage Clamp

Sampling forage clamps

Collecting the samples and preparing composite sample

To collect a composite sample, pull 8 subsamples throughout the freshly faced silage clamp. The most effective method to collect an appropriate forage sample is to use a hand drill, as can be seen in the image below.

In the same manner as preparing a TMR composite sample, place the subsamples in a bucket or plastic container and cover.

Using hand drill to sample clamps

Preparing the laboratory sample

Mix the composite sample on a clean tarpaulin or concrete surface. Thoroughly turn and mix the material to ensure you capture a homogenous sample. Once fully mixed, quarter the composite sample (as described on page 16 of this booklet). The sample to be sent to the laboratory should weigh in the range of 0.45–0.9 lbs. (200–400 g). For forages, the upper limit is recommended. Samples should be properly labeled and delivered in a well-sealed plastic bag. Where possible, vacuum-packing of the sample for delivery is ideal.

Sampling for mycotoxins in forages

Sampling of round and square bales

For round or square bales, remove the sample using a cordless or hand drill and hay probe. Core between 5–10 bales in the butt end of the bales.

When sampling is complete, combine the core samples and mix thoroughly to produce a representative and homogenous composite sample.

Depending on the length of the forage, the same steps as preparing the clamp forage should be followed when preparing the final sample for the laboratory.

Sampling for mycotoxins in total mixed rations (TM

Collecting subsamples and preparing the composite sample

Always sample within 5 minutes of the delivery of the TMR to ensure a representative sample. Maintain a safe distance as the feed truck or tractor is unloading.

To prepare a composite sample, 10 individual samples are recommended. These subsamples should be taken at predetermined points throughout the entire feed face. The recommendation is to collect 10 samples per bunk by inserting a latex-gloved hand wrist-deep into the pile. Avoid shaking or squeezing the individual samples. When you are finished collecting the required number of samples, place the material in a bucket and cover to prevent moisture loss.

Preparing the laboratory sample

Once all 10 subsamples are collected, dispense the collected TMR onto a clean tarpaulin or clean concrete surface. A spatula can be used to thoroughly mix the material inward from the bottom to the top and ensure a homogenous sample. When you have a homogenous sample, use the quartering method (as demonstrated on page 16 of this booklet) to prepare the final sample to be sent to the laboratory.

Samples for sending to the laboratory should weigh in the range of 0.45–0.9 lbs. (200–400 g). For forages and TMRs, the upper limit is recommended.

Note: When sampling TMR, always wear latex gloves.

*Obtained from Robinson, 2010.

Preparing a homogenous TMR mix

* Obtained from Robinson, 2010.

Quartering the TMR sample

TMRs)

Sampling of finished feeds on-farm

Gathering samples on-farm can be a challenge, and if not done correctly, can be very inaccurate for mycotoxin testing. **Never pull a sample from a feeder where the species have already consumed feed.**

Preparing the composite sample

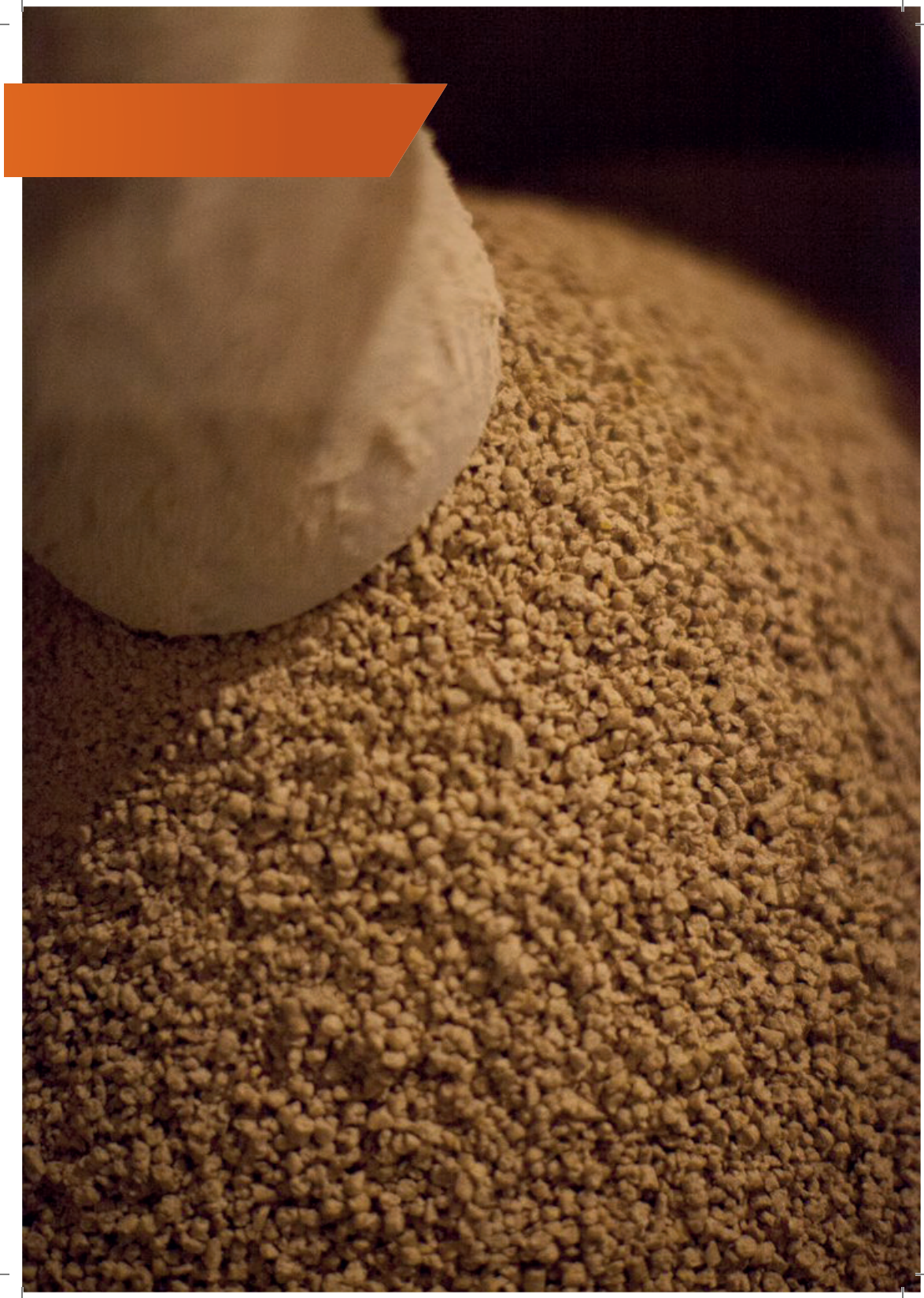
Many feeding systems have hoppers where feed is stored before it is distributed throughout the house. These areas are the best place to pull samples for a representative sample. Ten subsamples should be pulled in designated hoppers evenly distributed throughout the day. In most cases, there will be a small percentage of a load of finished feed in the barn hoppers. Taking samples in the same house after the hoppers have been refilled will give you a better representation of the feed made at the mill.

Ideally, a sampling probe would be used to gather feed in the core of the hopper. If using a sampling cup, consider gathering the sample while feed is flowing into the hoppers.

Preparing the laboratory sample

Once 10 subsamples have been collected, the composite sample should be quartered until the required sample size is obtained (this method is demonstrated on page 16). When sending finished feeds to the laboratory, samples should weigh in the range of 0.45–0.9 lbs. (200–400 g).

Note: Always keep your hands clear of any moving parts, such as feed chains and augers.

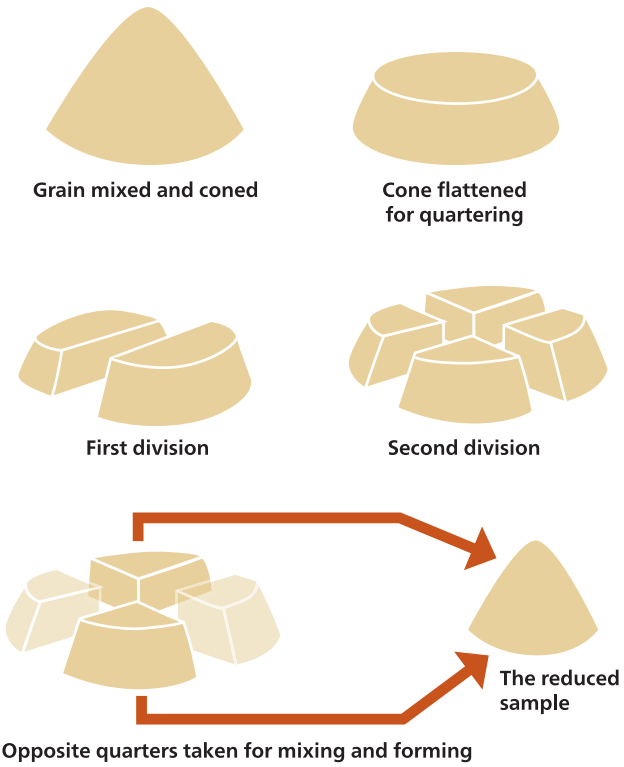


Preparing Samples for Storage and Testing

The Quartering Method

Place the subsample in a designated container large enough to mix the subsamples. Composite samples should be around 5-10 lbs (2.2kg - 4.5kg). Mix the composite sample by turning over at least 3 times. Quarter the sample until the desired sample size is obtained as demonstrated in the image below. The reduced sample for sending to the Alltech 37 + laboratory should weigh in the range of 0.45 to 0.9lb (200 - 400g). When sending forages for sampling, the upper limit is recommended.

Quartering method of sample preparation



Mechanical Splitting

A mechanical sample splitter is a more efficient and simpler method of splitting a sample. Properly operated, a mechanical sample divider will reduce the size of the sample without losing the integrity of the original representative sample. Simply pour the sample in the hopper and let the splitter evenly split the sample until you have the desired sample size.

Storage and Management of Grain Samples

Once a proper sample has been collected, place the sample in a sturdy container, label the sample clearly with all relative information, and store in a cool, dry, and organized environment.

References

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Diaz, D. 2020. *Mycotoxin mitigation: Linking feed quality and cow performance.* Alltech ONE Conference, 18 May, Lexington.

Notes

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