



Managing weather damaged grain in Ruminant rations

The challenge for ruminant nutritionists dealing with the massive amount of weather damaged grain likely this year falls into two main areas for the ruminant sector:

1- Change in nutritional value

This arises when the grain commences the shot + sprung phase. We see metabolism of the starch in the grain initially to simple carbohydrates and sugars, and rapidly then into a shoot that basically increases protein and NDF fibre content of the grain, but sees a rapid decrease in starch content.

We normally also see a drop in bulk density of the grain at this point.

Importantly, a simple ME test may not immediately show a drop in ME. That is because ME is a derived estimated figure, and incorporates several predictive parameters including ADF and protein and oil to predict ME.

With shot and sprung grain we may not see more ADF in spite of increased NDF, and the protein content raising will still tend towards a positive ME.

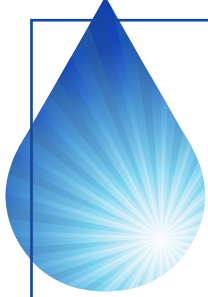
From a cows perspective though, the form of the energy is almost as important as the total energy content. We want our energy to be in the form of fermentable ME. That FME drives rumen microbial yields, and starch is also an important glucose precursor via propionate or direct post ruminal digestion. Another way of terming this form of energy is NON FIBRE CARBOHYDRATE or NFC.

That NFC value is often greatly diminished if the form of the ME is no longer as it was.

Predicting how “far gone” a shot and sprung grain has progressed is sadly really hard .

But, we can best predict a total non fibre carbohydrate fairly easily if we know the protein and NDF of a grain. From that we can predict NFC as:

$$\text{NFC} = 100 - \text{NDF}\% - \text{protein}\% - \text{Ash}\% - \text{fat}\%$$



Ash and fat will be fairly standard in grain at around 2% each, so the variation in protein and NDF will drive how much NFC will remain.

Eg. an ASW sample at 11% protein 12% NDF 2% fat and 2% ash will have a NFC of 73%.

That same sample that suffers weather damage and has a protein of 16% and a NDF of 20% will now have a NFC of 60%. That is a big change in how a grain behaves, even if the predicted ME may move little.

As a really fast, but not super accurate, predictor you may consider bulk density as a guide. Normally that falls noticeably with grain that under goes the initial process of shooting. Compare samples with what you would normally expect.

Eg Wheat may normally run 700-720g/ltr. What is the weather damaged running? Barley is normally around 650-700g/ltr. What is the weather damaged? Fill a 1 litre milk container and weigh it for a reasonable estimate of density.

2- Fungal degradation of weather impacted grain

The second aspect of the weather damaged grain this season that is more unusual is that of the fungal impact. We see S+S grain in small amounts fairly regularly, and we know roughly how we manage that.

This year will also bring a more uncommon impact of fungal growth and likely toxin risk from grain. This is uncommon in Australia . It is more common in maize in the USA, where we at Feedworks have some experience over the last 18 months with Fusarium in maize .

In Australia grain is rarely ever a significant mycotoxins contributor, especially our winter cereals. This year looks different.

The major fungi likely to be involved in this challenge are Fusarium species, and these guys produce a few possible toxins depending on the variety of Fusarium sp. The likely culprit Fusarium toxins are:

- DON (also called Vomitoxin) is the most likely
- Zearalenone is possible
- Other Trichothecene toxins possible
- Fumonisin possible

In the ruminant sector we face reasonably regular mycotoxins challenges based on our forage base...our silage and hay are often sources of challenge, and even our fresh pasture in conditions that favours fungi can throw up toxins...it sure will this year!

It is often said that ruminants can break down toxins via the rumen bugs. That is partially true. Monogastric species are more prone to many toxins than ruminants (DON for instance, the likely main issue this year), but the ruminant natural defenses are based around the protozoa fractions in the rumen. Lose the protozoa and you lose a lot of natural defenses. Many modern cows are fed rations and managed in ways that reduce protozoa numbers. Don't assume your cows/lambs are not an issue.

So, let's assume we should invoke risk management approaches for cows as much as monogastrics! How can we do this in practice?

Here are a few suggested ways. I don't actually suggest going directly to a full on lab scan for "mycotoxins". That can take time, and is also often costly either at labs here or overseas. Better and cheaper initial options stand out to me.

Total mould counts:

If you have grain or forage that looks of concern, a cheap and reasonable early step is a total mould count.



White moulds are not OK

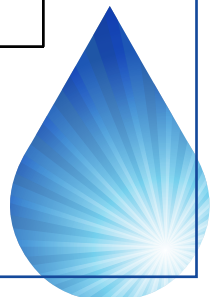
MOLD IDENTIFICATION			
MOLD	COLOR	TOXIN PRODUCER	COMMENTS
Penicillium	Green to green-blue	Yes - Ochratoxin, Citrinin, Patulin	Several potential toxins associated with certain species. Most common toxin producer in silage.
Aspergillus	Yellow-green	Yes - Aflatoxin, Ochratoxin	Found in drought, heat-stressed conditions or insect infested fields.
Fusarium	White to pinkish-white	Yes- Zearalenone, Vomitoxin (DON), T-2 Toxin, Fumonism	Common in cold, wet seasons. Certain strains produce extremely potent toxins.
Mucor	White/gray	None	Found especially in sealed corn. Grows at low temperatures. Also found in manures and soils.
Rhizopus	Black/white	None	Requires high moisture and an advanced decay mold. Common bread mold.
Cladosporium	White	None	Produces yeast like symptoms. Grows at low temperatures.



Mold Count	Guideline
10 - 10,000*	Relatively Safe
10,000 - 100,000*	Transition Zone
100,000 - 10,000,000*	Caution Advised
Over 10,000,000*	Feeding may not be recommended

* col/gm (colonies per gram)

A mould count can be done at labs for about \$20 (try Weston labs as one lab doing this I know of for certain). That's a cheap initial indicator of likely risk level.



Rapid tests

In grain especially, you must often decide acceptability (or not) of grain when it rolls up in a truck. A lab assay of any nature (even a cheap mould count) will always be retrospective after the grain is unloaded, the truck long gone, and the problem potentially in your silo.

We at Feedworks have identified a rapid and cheap “kitchen table” test kit that can tell you accurately if you have DON present or not. It has a limit of measure of 1ppm, but that is plenty low enough, as at less than 1ppm the risk is not high.

You can do the test on the grain prior to unloading at farm or feed mill, and a test costs around \$12. Over a truckload that is under 50cents/tonne of grain. They come in packs of 25 in a box. Call Feedworks if you want info or a test kit box 0354 296 458. They look like great value tools for a fast turn around result. It should limit the need for reliance on labs too much to be honest.

Full Mycotoxin assays

These are often done via HPLC, and are pretty costly and take a bit of time. They do give you an accurate idea of presence of a given toxin, and crucially a numerical level. i.e. is my DON there at 1.5ppm (maybe we can live with that) or is it 10ppm (that is a real hassle).

I would use such a test / scan if I had identified that grain (or forage) I already owned was a risk or was causing problems, and I wanted to quantify the extent of the problem. A full lab assay may not be my first port of call, but they are a great tool further down the track if needed.

Mycotoxin management with Elitox

A sensible approach this year is to consider whether the herds you are dealing with have a challenge from toxins, based either on the forage base, the grain component or both.

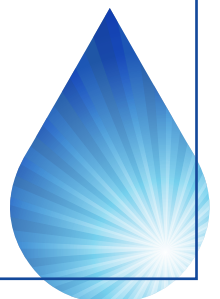
More herds than normal will probably fall into this category this year. The hay and silage crops are as least as badly impacted as the grain harvest, and are also risks this year.

If you are looking for a tool that you can implement to manage risk, then we urge you to consider **ELITOX**. It has the two main things that you need to make it a great choice this year.

- 1- Its price is sharp, and you can afford to use it widely if required without impacting badly on \$/t of feed cost, or cents/cow/day cost.
- 2- It has very solid research on DON specifically. That is a bit unusual. Many products have data and efficacy against Aflatoxin. Far fewer against DON, which is a far more challenging toxin to manage.

Elitox really is the pick of the toxin management products to meet the challenges of fusarium impacted grain cost effectively this year.

Below are the Dairy one lab (USA) guidelines for toxin levels in feedstuffs. I suggest heeding the “concern” levels rather than the “harmful” levels.



Potentially Harmful to:

Mycotoxin	Concern level (a)	Cattle	Swine
Aflatoxin, ppb			
Air dried	20	20 - 300	20 - 100
DM	22	22 - 333	22 - 111
Vomitoxin, ppm			
Air dried	0.50	4.5 - 11.0	0.7 - 1.3
DM	0.56	5.0 - 12.0	0.8 - 1.4
Zearalenone, ppm			
Air dried	0.50	5.0 - 9.0	1.0 - 5.0
DM	0.56	5.6 - 10.0	1.1 - 5.6
T - 2, ppm			
TRDM	0.25	0.7 - 1.5	0.7 - 1.5
Ochratoxin, ppm			
TRDM	0.25	5.9 - 9.0	0.7 - 1.5
Fumonisin, ppm			
Air dried	1.0 - 3.0	6.0 - 10.0	10.0
DM	1.1 - 3.3	6.7 - 11.1	11.1



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