

Agri *Resource*

Testing Cereal Grains for Prolamin *Frequently Asked Questions*

Why test for prolamin?

Prolamin is a storage protein found in cereal grains such as wheat, barley, rye, sorghum, oats and corn.

Researchers have found that feed materials such as dry corn grain have a negative correlation with the rate of starch digestibility and milk yield of lactating cows. Prolamin proteins form a water-tight matrix that makes the starch granules less degradable in the rumen environment. Research by the University of Wisconsin has shown a negative correlation between the prolamin of a feed grain and starch digestibility. The study found that starch digestibility...

was decreased 0.86 percentage units for each percentage unit increase in the grain prolamin content when prolamin was expressed on a percent starch basis. Floury, opaque and well fermented high moisture corns generally have less than 4 grams of prolamin per 100 grams of starch, while highly vitreous dry corns have greater than 7 grams of prolamin per 100 grams of starch (Hoffman, 2009).

What crops can I have tested for prolamin?

We offer prolamin testing on all cereal grains (e.g. wheat, barley, rye, corn, sorghum).

What sample size do I need to send to have prolamin tested?

In order to perform these tests, we require half a pound of cereal grain per sample with the exception of corn grain. **If testing corn grain for prolamin, we require 1.5 pounds of corn grain per sample.**

How do I request that my corn grain be tested for prolamin?

Our prolamin tests can be found on page 6 of our fee schedule. We offer prolamin as an individual analysis, and can report either the Prolamin % or the Prolamin % as % of starch. These tests can be requested through the following test codes:

PROL	Reported as Prolamin %
PROS	Reported as Prolamin % as % Starch

Prolamin is offered on cereal grains only: Barley, Corn, Oats, Rye, Sorghum, Wheat.
This test requires a sample size of 1.5 lbs.

What kind of turn-around time can I expect?

Currently, you can expect to get your prolamin results back in 5 to 10 business days.

How is prolamin reported?

Sample ID	Dry Matter (DM)	Prolamin % of DM	Starch % of DM	Prolamin % of starch
Corn grain	88.22	3.24	70.86	4.57

How do I interpret my results?

Prolamin % of Starch	Classification
Greater than 10	Extremely High
10.0	
9.0	Very High
8.0	
7.0	High
6.0	
5.0	Moderate
4.0	
3.0	Low
2.0	
Less Than 2.0	Very Low

What do my results mean?

Rather than being located inside starch granules, prolamin proteins are primarily located on the exterior of the starch granules. There they encapsulate starch in a water tight matrix, making the starch less degradable in the rumen environment.

Prolamins can be degraded in the fermentation process, and thus lower levels of prolamin can be found in fermented corns, such as high moisture corn. Starch in vitreous (yellow, glassy), dry corn grain is less degradable in the rumen as compared to floury, opaque, or high moisture corn. The lower the percent of prolamin in starch, the more degradable the corn will be in the rumen fluid.

Tell me more about prolamin!

All seeds are equipped with nutrients that serve metabolic and structural roles. In addition, seeds contain a group of proteins that store the amino acids to be used during germination and seedling development. These seed storage proteins are present in all cereal grains. The seed is made up of three primary parts: the pericarp, the germ, and the endosperm. The pericarp is essentially the seed coat and primarily functions to protect the seed from pathogens. The germ is the reproductive portion of the seed. The endosperm represents 75-80 percent of the seed by weight and contains primarily starch. While the endosperm is practically void of ADF and NDF, it contains an abundance of storage proteins (albumins, globulins, glutelins, and prolamins). The seed protein Prolamin is a storage protein found in cereal grains such as wheat, barley, rye, sorghum, oats and corn. Prolamin proteins are associated with starch and have specific scientific names depending on the cereal grain:

Cereal Grain	Prolamin Protein Scientific Name
Wheat	Gliadin
Barley	Hordein
Rye	Secalin
Corn	Zein
Sorghum	Kafirn

Why doesn't new corn silage feed well?

Initial fermentation lasts for 3 to 4 weeks. After that time, the new silage stabilizes through the production of acids and the drop in pH. Aerobic conditions change to anaerobic conditions, even though ensiling in its entirety has not stopped. All digestibility measures continue to improve and appear to plateau at or around 6 months (Hoffman, 2009). Research has shown that the degradation of prolamin proteins occur as the fermentation process continues.

So what are the choices when feeding corn silage?

While the most obvious choice is to wait 3 to 6 months for the fermentation process to complete, this approach is not very feasible. The second option is to formulate dairy rations using more haylage than corn silage. The third option, and the increasingly popular one, is to utilize corn hybrids that are naturally lower in prolamin protein. A low prolamin content to start will increase the likelihood that the prolamin proteins will dissolve as time passes during fermentation.

What's Next?

Relative Grain Quality (RGQ)

While Agri Analysis does not currently offer this quality index at this time, we are looking to add this in the near future. RGQ was developed on the basis of the RFQ index of forages. The RFQ index is based on feed quality and is a ranking tool used to sell forages. Remember, the RFQ index is not intended to predict animal performance. The RGQ was designed under the same premise as the RFQ index it serves as a ranking tool for feed grains, and can be used to assign grains to animal production groups.

References:

Hoffman, P. (2009): New Grain Testing Procedure Available. *Agri-View*, December 2009.
http://www.agriview.com/articles/2009/12/28/dairy_news/dairy06.txt