

Feed needs to be produced with a CV of less than 10%.

Feed mixing - closer to perfection with dry-methionine



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BALACHANDAR JAYARAMAN, PRADEEP KRISHAN and JOO PHIOW ANG* focus on the impact of supplemental liquid methionine hydroxy analogue-free acid (MHA-FA) versus dry DL-Methionine (DL-Met) on mixing homogeneity.

High quality feed is an essential component for meeting the well-balanced nutritional needs and cost-effective production of livestock. Variation in nutrient composition between formulated and processed feeds could have a big influence on the performance of animals. Very specific and concentrated components like pure amino acids (AA) are also increasingly being supplemented. A small shortfall in the desired macro ingredients in feed will probably have little influence

because the macro-ingredients itself has most of the nutrients of the end mix. A specific component like an AA instead alters the content of the end product, and probably the performance outcomes at the farm.

Accurate dosing and homogenous mixing of the feed ingredients is crucial when producing good quality animal feed or premix. It's worth continuously asking ourselves, do our existing practices live up to the demands of modern-day animal genetics? If not, let's take the time to

test theories and ideas before going with our own beliefs when it comes to mixing homogeneity.

Sources of mixing errors

- Insufficient mixing time
- Improper sequence of ingredient additions to the mixer
- Over- or underfilling of the mixer
- Poor mixer design and/or installation
- Improper timing of liquid addition
- Ingredient build-up on the shaft and ribbons or paddles
- Leaking mixer gates
- Leaking liquid systems
- Missing or bent ribbon pieces

Mixing homogeneity evaluation using amino acid as markers

To determine mixing homogeneity, different nutrients (crude protein, chloride, and phosphorus) and feed additives (supplemental AA, DL-Met, L-Lys) have been used as markers. The basic requisites for selection of markers include, accuracy of the analytical assay, ease of handling and low cost. Previous studies indicated that analysis of free supplemental DL-Met from feed samples may best indicate livestock diet homogeneity and validate the diet formulation. It has been concluded that supplemental DL-Met (99%) and L-Lys HCl (78%) were the only markers that statistically reduced over time and had a coefficient of variation (CV) <10% after 5 minutes of mixing (Table 1).

AminoBatch is a unique tool to get comprehensive data of the mixing homogeneity of all amino acid and its analogues in one single test. The test provides a broader analysis of the quality of the feed mixture. Analysing compound feeds or premixes for DL-Met, and liquid MHA-FA gives the feed mixers a powerful one-two punch. Firstly, feed millers can verify that feeds or premixes contain the actual supplemented level of these additives in the diet. At the same time, can also test the accuracy of the mixing homogeneity.

Mixer homogeneity tests comparing dry DL-Met to liquid MHA-FA

A total of 73 (63% MHA-FA and 37% DL-Met diet samples) and 55 (65% MHA-FA and 35% DL-Met diet samples) mixer homogeneity tests

Figure 1: Mixer homogeneity (CV) for dry DL-Methionine in comparison to liquid MHA-FA.

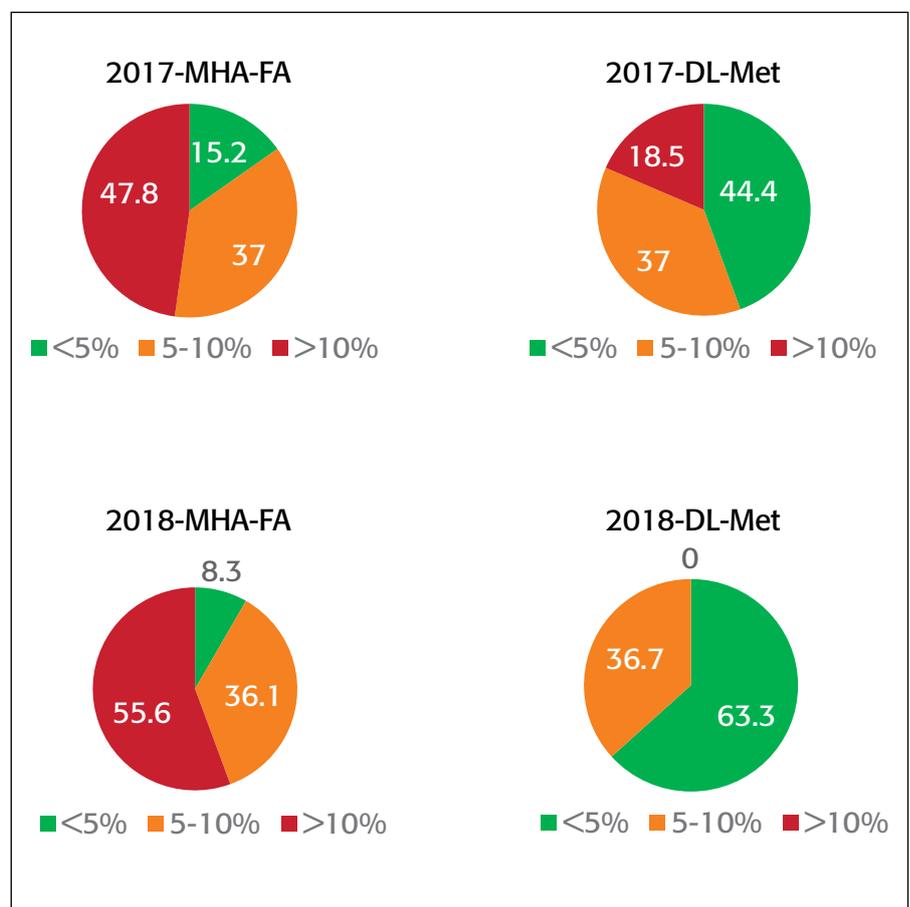
Marker, CV%	Mix time (minutes)		
	0.5	2.5	5.0
DL-Met (99%)	23.86	14.56	9.47
L-Lys HCl (78%)	19.75	16	8.70
Crude protein	7.73	7.29	6.86
Chloride ion	20.26	12.75	15.08
Phosphorus	13.72	6.46	6.27
Manganese	36.25	20.80	17.59
Microtracer 1	21.77	11.72	10.43
Microtracer 2	21.13	20.52	16.88
Microtracer 3	32.49	20.09	18.64
Roxarsone	30.42	25.15	25.54
Semduramicin	27.40	16.11	11.23

Adapted from Clark et al. (2007)

using AminoBatch were conducted during 2017 and 2018, respectively in Asia (Figure 1). These tests were carried out under commercial feed milling conditions with different mixer sizes, equipment designs, filling levels,

feed types and feed additive (DL-Met or MHA-FA) supplementation rates. The study revealed serious weakness in mixing homogeneity in over 50% of the test samples, where MHA-FA was supplemented. On an

Figure 1: Mixer homogeneity for dry DL-Methionine in comparison to liquid MHA-FA



* CV of 0 to 10% considered acceptable by most feed industry standards

average, addition of liquid form of MHA-FA resulted in lower recovery of the product in the final feed, and poor mixing homogeneity. The lower mixing homogeneity observed with MHA-FA may be due to different factors including too-short mixing time, poor placement of the liquid inlet, simultaneous dosing of dry and liquid products, or suboptimal mixer technology. Conclusively, it is evident that dry DL-Met gives better mixing homogeneity as compared to liquid MHA-FA.

Inaccuracy in making feed mix can be expensive

Based on the nutritional value, let's assume the diet formulation pulls 0.2% (2 kg on a 1,000 kg batch) of DL-Met and 0.33% (3.33 kg on a 1,000 kg batch) of MHA-FA to meet the Met+Cysteine requirement. With a CV of >10 % in over 50% of the MHA-FA feed mix (Figure 1), in order to guarantee that we achieve the same mixing homogeneity as dry DL-Met, either we increase the mixing time or we increase the safety margin of MHA-FA dosing. Assuming dosing accuracy as the factor and applying

extra 50 g safety margin (1.5%), the inaccuracy makes the mixture around USD0.10 more expensive at the price simulations of MHA-FA around USD 2,000 per tonne. That's one ingredient, per batch, every batch, every tonne. Calculate that for a year!

The same holds true for increased mixing time and reduced throughput. If feedmillers are producing 12 batches per hour using a ribbon mixer, which is 5 minute per batch, in order to improve the mixing homogeneity, one of the solutions is to increase the dry mixing time before liquid spraying and extending the final mixing time. With every batch, if feedmillers need to increase the mixing time by 30 seconds, that means feedmillers are going to produce less number of batches with the same number of working hours or need to run feedmill for longer time to compensate for the lost throughput. This directly impacts efficiency and economics of the feed milling operations.

Dry versus liquid – mixing homogeneity matters!

Feed is becoming more and more

detailed, sophisticated, and better balanced for the needs of the animal. The first demand in feed milling clearly must be dosing accuracy and mixing homogeneity. Mixing homogeneity, determined by CV of the feed or premix, ultimately indicate the quality of your feed mix. But we live in a production environment, which means that at the end of the day we also need to produce our tonnage. In other words, accuracy is number one, but speed is a good second. We need to be both accurate and fast. This is where dry methionine beats liquid methionine analogues hands down. **AF**

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