AAFCO LM&SC Fat Soluble Vitamins Working Group

Vitamin A Team & Vitamin E Team

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Review from Midyear Meeting

- Measurement of the particle size of the vitamin premixes to guide on theoretical sample weight needed
- MN Dept. of Ag. Laboratory Services examined the premix particle size and distribution under a microscope.
- Particles size varied with a wide range, additional particle analysis needed

Particle Size Measurement

 Microtrac Particle Analysis Laboratory performed the particle size distribution analysis on the vitamin premixes using the appropriate technique.

 Instrument used - PartAn 3D Image Analyzer.

Calculations

- According to the GOOD Test Portions document available on AAFCO website: https://www.aafco.org/Publications/ GOODTestPortions
- Equations based on theory of sampling have been developed to relate the variance of fundamental sampling error (FSE) to sample mass

FSE Relation to Sample Mass

Calculations based on liberated vitamin beadlets

• Example

Premix A, 1037000 IU/g, 31.11 % of Vit A in product,										
particle size 405um										
Conc. of Vit A in feed	Sample portion	S ² _{FSE}	FSE (%)							
	m _s (g)									
10000 IU/lb	100	0.0061518	7.8							
(0.000661%)	10	0.0615183	24.8							
100000 IU/lb	100	0.0006151	2.5							
(0.006614%)	10	0.0061517	7.8							

Sample weight selection for experiment

The particle size of the vitamin premixes were used to guide the theoretical sample weight needed
Theoretical weight is highly dependent on the Vitamin A particle size
How high and low to go on sample weight
What number of weights to examine

Samples Selected for Experiment

- Three commercial feed samples with vitamin A levels of 10,000 IU/lb, 12,500 IU/lb and 100,000 IU/lb were purchased
- Samples were split into sixteen portions of 100g and sixteen portion of 10g by Lawrence Novotny, SD

Single–Laboratory Vitamin A Determination

 Single-laboratory Vitamin A testing will be performed at the MN Department of Agriculture

 Data and more details about the experiment will be presented at the Midyear Meeting

Acknowledgements

- Microtrac for performing the particle size determinations at no charge
- Nancy Thiex and Chuck Ramsey for assistance with GOOD Test Portions calculations and advice on experimental design for subsampling
- Lawrence Novotny for the acquisition, splitting, and shipping of study samples
- Michele Swarbrick, MN Dept. of Ag. Laboratory Services for performing the experiment

Data from Microtrac -example

Product A, 1037000 IU/g, 31.11 % of Vit A in product,



Figure 1. X-Y Graph, Table and Summary Data Display – Da (Area Equivalent Diameter), FThickness, FWidth, and FLength data in a volume % distribution by channel. The tabular data for each distribution is shown in the XY-Table. A D10, D50, and D90 using the Da measurement is shown in the summary data along with some shape information. Summary Data can be chosen to be reported for all parameters shown, and for many more data choices.

Data from Microtrac -example

Product A, 1037000 IU/g, 31.11 % of Vit A in product,

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Figure 2. Image File – Segment of image in random order. Any of the 30 parameters can be used to sort the images in ascending or descending order. Each horizontal row shows a single particle in multiple orientations as it falls through the sensing zone.

Calculations

 $s^{2}_{FSE} = cfgd^{3}/m_{s}$

- s standard deviations
- FSE fundamental sampling error
- c mineralogical factor
- f particle shape factor
- g granulometric factor
- d largest particle diameter
- m_s mass of selected portion