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QUALITY ASSURANCE WITH MICROTRACERS FS

PRINCIPLE

Microtracers FS consist of Stainless Steel grit coated with FD&C dyes. Microtracers FS are easily identifiable harmless markers used to assure the quality of mixed formula animal and poultry feeds. When formulated in vitamin, mineral or medicated premixes, a Microtracer serves to mark the presence of the premix in the finished feeds. The tracer is available in a variety of colors.

Microtracer FS may be retrieved magnetically with a Rotary Detector magnetic separator for quantitative analysis (retrieval with the Mason Jar yields only qualitative results).

When assayed quantitatively, Microtracers FS can be used to document efficacy of mixing as well as adequacy of cleanout of mixers and other feed manufacturing equipment.

SPECIFICATIONS

Microtracers FS consist of uniformly sized stainless steel particles, a minimum of 99% passing 35-mesh and a maximum of 3% passing 200-mesh screens (USA Standard Sieves).

Microtracers FS have a specified count of 50,000 particles per gram. In practice, the tracer count will fall in the range 45,000 to 65,000 particles per gram.

Tracer recovery from feeds averages 100% from a mixer to which they have been directly added, 80% from finished mash feed at loadout, and 70% for pelleted feed at loadout. These recoveries assume use of a Rotary Detector to retrieve the magnetic particles from the feed.

Tracer recovery with the Mason Jar procedure will be qualitative only.

APPLICATIONS AND AMOUNT TO USE

I. Routine Identification of Premix in Finished Feeds

These tracers should be formulated to yield a minimum of 2.5 grams per metric ton of final feed. This will yield a theoretical count of 8 tracer particles per 65 grams of feed, an amount that can

be conveniently analyzed utilizing a Mason Jar with magnetic lid. If tracer recovery for pelleted feed is 70%, then on an average test one would find 5 tracer particles. If a feed is completely mixed and one expects to find ten tracer particles, the likelihood of finding none based on the Poisson statistics would be less than 1 in 100 tests.

For greater confidence and to measure "carryover" of premixes coded with Microtracer FS, one should use a Rotary Detector to test for microtracers. This permits complete tracer recovery and analysis of larger feed samples (i.e. 500 grams). The chances of obtaining a "false negative" (coded premix present at formulated level but no tracer found) will be nil. The likelihood of finding at least one tracer particle if 10% "carryover" of the premix to a non-target feed occurs will be better than 95%.

II. Mixer Efficiency

To determine completeness of mix, formulate Microtracer FS at 25 grams of tracer per metric ton of feed. One must use a Rotary Detector to obtain quantitative information. Usually, one will analyze 150 gram feed samples obtaining tracer counts of about 125 particles. A series of such counts from a "perfectly" mixed feed will yield a coefficient of variation (CV) of about 10%. If 10 samples are taken from a batch and one finds a 20% coefficient of variation, this will evidence a "statistically significant" deviation from complete mixing. Please refer to *Literature Item P - The Use of Microtracers to Determine Completeness of Mix.*

III. Product Identification

Microtracer FS may be formulated at 2.5 grams per metric ton to code a feed as proprietary. This is useful in protecting patent or distribution rights, in servicing improper product liability claims or requests for services and in controlling use of proprietary feed (i.e. misuse of feed by contract growers).

DETECTION PROCEDURE - Rotary Detector Technique

Retrieval (from mash or pelleted feeds)

Materials

a) Coffee mill, or equivalent, for grinding pelleted samples to a fine consistency

b) Rotary Detector^{J} magnetic separator, for isolating the tracer from premixes or ground feed samples.

c) Scale

Procedure

Weigh 500 g to 1.0 kg coarse or pelleted samples and grind in the coffee mill. Pour the finely ground feed through the Rotary DetectorJ twice to isolate very nearly 100% of the retrievable iron from the feed. Brush this magnetically retrieved material into a weigh scoop and "demagnetize" it using a bulk tape eraser. The tracer is now prepared to be developed (alternatively, you may just directly brush the tracer particles onto a large filter paper).

Development

Materials

a) E & K Scientific 601 Grade filter paper or similar, 15 cm circles (or larger).

b) 50 % Ethanol/DI water

c) A hot plate (a household griddle will do) in a laboratory hood.

Procedure

1. Wet a 15 or 24 cm E & K Scientific 601 Grade filter paper (or equivalent) filter paper with the tracer developer (using a spray bottle is useful in uniformly wetting the filter paper). Wipe excess moisture with a paper towel. For most feeds, the paper must be uniformly wetted but not too wet. Certainly, no beads of moisture should be present.

2. Carefully sprinkle the magnetic material (including the microtracer) from the scoop onto the wetted paper so that the material is evenly distributed on the paper. This is the most difficult part of the analysis. Even distribution of the material may be achieved by moving the scoop in a circular pattern over the filter paper, slowly increasing the angle of incline of the spout of the scoop until tracer falls from the scoop to the paper. It is also helpful to tap the scoop. This may assist in Abouncing@ the magnetic material from the scoop to the paper.

3. As soon as any color is visually apparent, transfer the wetted filter paper to a hot plate pre-heated to no more than 100°C or to a pre-heated oven. Dry the paper, being careful not to burn it.

4. When the paper is dry, mark it for identification. When time is available, count the colored spots by circling all the spots of one color and making hash marks next to all spots of a second color. If one wants to count three colors, it is often best to count the first two colors on one side of the paper and the third color on the opposite side.

5. Employ Poisson statistics and chi-squared calculations to interpret the results of the test. Please refer to *Microtracer Literature Item P - AThe Use of Microtracers to Determine Completeness of Mix@*.

`DETECTION PROCEDURE - Mason Jar Technique

Materials

a) A scale suitable for weighing 65 grams of feed (if this is unavailable, feed may be measured volumetrically in the Mason Jar itself; 1/2 Jar roughly equals 65 grams).

b) E & K Scientific 601 Grade filter paper or similar, 7.0 cm circles.

c) For pelleted feeds, a coffee mill or grinder.

d) A dropper bottle or transfer pipette.

e) A 50% Ethanol/DI water solution

f) A Mason Jar with a magnetic lid (supplied by Microtracers, Inc.).

g) A mug warmer or hot plate.

Procedure

1. Prepare pelleted feeds for analysis by grinding them to mash.

2. Transfer 65 grams of feed to Mason Jar.

3. Insert one sheet of filter paper into special magnetic lid and screw lid onto Mason Jar.

4. Shake the jar for one minute, exposing all feed to the magnetic lid.

5. Remove the lid, placing it upside down with filter paper fully exposed.

6. Place five to ten drops of developer in the center of the exposed filter paper so the developer diffuses through the ring of FS particles on the filter paper. When color begins to develop (or after one minute) the paper can be transferred to a mug warmer or hot plate and dried.

Total elapsed time: Less than 2 minutes

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