



Micro-Tracers Inc.

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Quality Assurance With Microtracers RF

Principles:

Microtracers® 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. When assayed quantitatively, Microtracers can be used to document efficacy of mixing as well as adequacy of batch to batch "cleanout" of mixers and other feed manufacturing equipment. Microtracers are isolated from feed or premix samples either utilizing a Mason Jar with a magnetic lid or a Microtracer Rotary Detector magnetic separator. With the Rotary Detector™ samples as large as 500 grams may be assayed routinely.

Microtracers RF are iron powder colored with water soluble FD&C colors, designed to be used feeds or premixes with maximum 14% moisture. Microtracers RF may be assayed qualitatively using a Rotary Detector or the Mason Jar technique (two minutes). In addition to qualitative analysis, Microtracer RF may be assayed quantitatively from premixes and mash feeds by eluting the dye from the tracer, reading its absorbance at a specific wavelength, and comparing it to a set of standard curves. In practice, 8 to 12 mash feed samples can be assayed quantitatively per hour.

Specification:

Microtracers RF consist of fine hydrolytic iron particles (99% passing 40 mesh, USA Standard Sieves), one or more artificial food colors and/or natural colors, and a trace of sodium carbonate. Colors include Blue, Red, Orange, Yellow, Green, and various combinations. Microtracers RF are not intended to be counted as the particles are too small to yield clearly distinct spots. They yield a ring of color on the Mason Jar or Rotary Detector test paper.

Microtracers RF are designed to avoid loss to magnetic separators in feed mills with about 1% lost to each magnet.

Quantitative dye recovery from feeds typically averages 100% from a mixer to which they have been directly added and 90% from finished mash feed at loadout (these recoveries assume using a Rotary Detector with special "rare earth" magnetic platform). Quantitative recovery from pelleted feeds is not possible.

Applications and Amount of Use:

1. Routine Identification of Premix in Finished Feeds

Premixes should be formulated to yield approximately 5 grams of tracer per ton of finished feed. If a premix is added to the feed at 500 g per ton, then 10 grams of tracer should be formulated per kilogram of premix.

For greater confidence and to measure "carryover" of premixes coded with Microtracer RF, 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 color found) will be nil. The likelihood of finding some visual color on the test paper if 10% "carryover" of the premix to a non-target feed occurs will be greater than 95%.

2. Product Identification

Microtracers RF may be formulated at 5 grams per ton or sometimes less 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 - Mason Jar Technique (Qualitative)

Materials:

- a. A scale suitable for weighing approximately 100 grams of feed.
- b. Whatman #1 filter paper, 7.0 cm circles.
- c. For pelleted feeds, a coffee mill or osterizer.
- d. A dropper bottle or transfer pipette.
- e. A 50 % ethanol in water for tracers with pure FD&C colors, 7% sodium carbonate solution for tracers formulated with "lake" colors.
- 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 100 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 (50 % ethanol in water) in the center of the exposed filter paper so the developer diffuses through the ring of RF particles on the filter paper.
7. Transfer the paper to a mug warmer or hot plate and dry it. color will develop as the paper dries.

Total Elapsed Time: Less than 2 minutes

Detection Procedure - Rotary Detector Technique (Qualitative):

(Retrieval from mash or pelleted feeds)

Materials:

- a. Coffee mill, or equivalent, for grinding pelleted samples to a fine consistency
- b. Rotary Detector 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 Detector two times to isolate very nearly 100% of the retrievable iron from the feed. The tracer is now prepared to be developed.

Development:

1. Carefully lift the filter paper with the retrieved RF particles from the magnet in the Rotary Detector and place it on a flat surface.
2. With an eye-dropper or spray bottle, thoroughly wet the filter paper with the developer (50% ethanol in water). Wait for a few seconds for the developer to penetrate the filter paper. A ring of tiny colored spots will appear.
3. 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.
4. When the paper is dry, the color of the ring will indicate the nature the tracer.

Detection Procedure - Rotary Detector Technique (Quantitative):

(Retrieval from mash or pelleted feeds)

Materials:

- a. Coffee mill, or equivalent, for grinding pelleted samples to a fine consistency
- b. Rotary Detector 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 Detector two times to isolate very nearly 100% of the retrievable iron from the feed. The tracer is now prepared to be developed.

Development:

1. Carefully lift the filter paper with the retrieved RF particles from the magnet in the Rotary Detector and place it on a flat surface.
2. Weigh out 25.00 to 50.00 milligrams of dye standard and record weight. Quantitatively transfer the dye to a 100 ml volumetric flask using de-ionized water.
3. Weigh out approximately 1.00 to 2.00gm of finished product and record weight. Transfer the product to a 100 ml volumetric flask using de-ionized water and agitate for at least 15 minutes by a magnetic stirring bar to dissolve the dye on the tracer.
4. Transfer 5.00 mls of the dye standard solution to a 500 ml volumetric flask. Bring the flask to volume using de-ionized water.
5. Transfer 5.00 mls of the finished product solution to a 200 ml volumetric flask. Bring the flask to volume with de-ionized water.
6. Read the absorbance on the Spectronic 20 at the specified wavelength. Use a deionized water blank and a one centimeter cell.

Note: For Turmeric (curcumin) bearing products the above procedure must be done entirely in ethyl alcohol. For Annatto Bixin bearing products the above procedure must be done entirely in acetone.

Dye:	Common Name:	Wavelength Maxima:
Red #3	Erythrosine	525nm
Red #2	Amaranth	520nm
Red #40	Allura Red	510nm

Blue #1	Brilliant Blue	630nm
Blue #2	Indigo Blue	610nm
Patent Blue		630nm
Yellow #6	Sunset Yellow	482nm
Yellow #5	Tartrazine	425nm
Turmeric (Curcumin)	Natural Yellow	420nm
Green #3	Fast Green	620nm
Green Supra		634nm
Black Pn (Dark Violet)		570nm
Brown HT		458nm
Sodium Copper Chlorophyllin	Natural Green	406nm
Annatto Bixin	Natural Orange	487nm

Calculation of Dye Concentration:

$$\frac{(\text{Absam})(\text{WStan})(\text{DPur})40}{(\text{AbStan})(\text{WSam})} = \text{Dye in Product}$$

Adsam	Absorbance of sample solution
WStan	Weight of dye standard
DPur	Purity of dye standard in decimal form.
40	Dilution factor
AbStan	Absorbance of dye standard solution.
WSam	Weight of product sample

Note: The number 40 represents the sample dilution factor; it is calculated as follows.

$$\frac{\text{Volume of sample dilution flask in mls}}{\text{Volume of sample aliquote in mls}} = \text{Sample Dilution Factor}$$

Example: 200 ml/5.0 ml= 40

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