



OTSC Quarterly Newsletter



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Dr. Makkar of the FAO visits the OTSC

Dr. Harinder Makkar of the Food Agriculture Association (FAO) visited OTSC/TAMU AgriLife and presented a seminar entitled "An Overview of FAO's Animal Feed and Feeding Program" on May 10, 2017. The presentation was well attended by faculty from the Soil and Crop Sciences and Animal Sciences Departments, as well as OTSC personnel. In his presentation, Dr. Makkar outlined FAO's four pillars of animal nutrition, which leads to sustainable livestock production and includes:

1. Efficient Use of Available Feed Resources
2. Enlargement of the Feed Resource Base
3. Strengthening Quality Control in Feed Analysis Labs
4. 360 degrees of Animal Nutrition Understanding

Dr. Makkar discussed a variety of projects implemented at the FAO, which assists farmers in developing countries implement new technologies that enhance animal productivity and health while conserving the environment, natural resources and biodiversity. Dr. Makkar emphasized the important role private industry plays in facilitating and sustaining the transfer of technology and the need for quality data from feed analysis labs. He also discussed the impact of feed-food competition on food security and safety.

Current projects at the FAO include:

- Development of the Livestock Environmental Assessment and Performance Partnership
- Development of a Laboratory Internal Audit Tool for Testing Laboratories compliant with ISO/IEC17025: 2005

- Strengthening of Quality Control Systems for feed analysis laboratories through proficiency testing and laboratory personnel training

About Dr. Makkar

Harinder P.S. Makkar works as an Animal Production Officer at FAO, Rome. He joined FAO in 2010, before which he was Mercator Professor at University of Hohenheim in Stuttgart, Germany. He has published over 300 scientific articles which have over 16,000 citations. He has planned, implemented and monitored national and international projects in over 45 countries. He is an animal biochemist by training.



Dr. Makkar discusses FAO projects with OTSC personnel.



Dr. Herrman with Dr. Makkar during his visit to College Station, TX.

To learn more about Dr. Makkar and FAO's projects related to animal food, visit the OTSC Website (<http://otscweb.tamu.edu>)

Validation of Mycotoxin Rapid Test Kits for the One Sample Strategy

In an effort to improve and expand the scope of the One Sample Strategy to include fumonisin, the Office of the Texas State Chemist (OTSC) conducted a 2016 pilot study to assess the suitability of the One Sample Strategy (OSS) to manage fumonisin risk in whole corn. As a result of the study, OTSC determined that quantitative rapid test kit technologies, under guidance provided by the U.S.D.A. Grain Inspection, Packers and Stockyards Administration (GIPSA) Rapid Test Kit Evaluation (TKE) certification program (www.gipsa.usda.gov/fgis/rapidtestkit), have advanced to yield fumonisin measurements that closely mirror OTSC's verification results.

Fumonisin measurements generated in 2016 by Texas grain operators using rapid test kits approved by GIPSA were highly correlated with OTSC's Ultra-high Performance Liquid Chromatography/Mass Spectrometry (LC/MS/MS) results. Similarly, 2011-2016 aflatoxin measurements reported by firms participating in the One Sample Strategy are highly correlated with OTSC's High-Performance Liquid Chromatography (HPLC) verification results.

Based on these data, a new OTSC policy to describe the process, criteria and cost to validate GIPSA-approved aflatoxin and fumonisin test kits used by firms participating in the One Sample Strategy during 2017 and subsequent crop years has been drafted. Details of the policy were shared with the advisory committee in April 2017. An effective date for the policy is still to be determined.

A. Process for Validation (Figure 1)

- i. Grain operator selects a GIPSA Performance Verified Test Kit (https://www.gipsa.usda.gov/fgis/metheqp/GIPSA_Approved_Mycotoxin_Rapid_Test_Kits.pdf);
- ii. Grain operator submits One Sample Strategy Sampling & Testing Plan to OTSC with request to evaluate test kit and confirmation that no certificates of analysis will be issued for crop insurance purposes;
- iii. AAS requests/receives GIPSA data package from Test Kit Manufacturer;
- iv. Grain operator analyst passes qualification exercise;
- v. During the validation period, grain operator analyst runs high and low OTSC control samples daily and retains a file sample for each sample analyzed;
- vi. Texas Feed & Fertilizer Control Service (FFCS) collects records and file samples for verification by AAS;
- vii. AAS completes statistical data analysis and notifies the Texas Feed & Fertilizer Control Service (FFCS) upon completion of the validation;
- viii. Results that deviate from the performance criteria in Table 1 and 2 may be removed from the One Sample Strategy as an approved test kit. *(continued)*

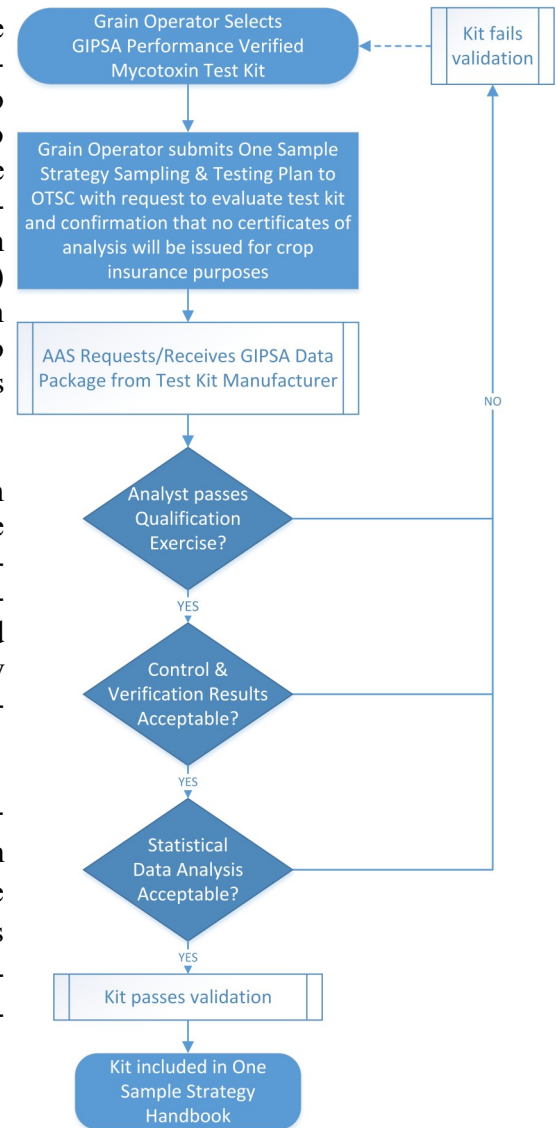


Figure 1. Test Kit Validation Process.

Validation of Mycotoxin Rapid Test Kits (continued)

B. Criteria for Validation

- i. *Qualification Exercise:* Analyst correctly follows GIPSA official instructions to produce four test results within the acceptable range of duplication (Tables 1 & 2):
 - a) Two analyses of a low concentration control sample; and
 - b) Two analyses of high concentration control sample.

If the Aflatoxin control is:	≤ 25 ppb	> 25 to ≤ 50 ppb	> 50 to ≤ 100 ppb	> 100 ppb
The Acceptable Duplication Limit is:	± 40 %	± 34 %	± 25 %	± 20 %

Table 1. Aflatoxin duplication limits.

If the Fumonisin control is:	> 5 to ≤ 60 ppm
The Acceptable Duplication Limit is:	± 30 %

Table 2. Fumonisin duplication limits.



Samples awaiting testing.

C. Cost for Validation

- i. OTSC does not charge for test kit validation. Control sample material is provided free of charge to licensed firms participating in the One Sample Strategy.

Regulating Waste Products Distributed as Fertilizer

The recycling of waste products as fertilizer or fertilizer material for land application is not uncommon. Land application includes all forms of applying bulk or bagged sewage sludge to land for beneficial uses at agronomic rates (rates designed to provide the amount of nitrogen needed by the crop or vegetation grown on the land while minimizing the amount that passes below the root zone). These beneficial uses include application to: agricultural land such as fields used for the production of food, feed and fiber crops, pasture and range land; non-agricultural land such as forests; public contact sites such as parks and golf courses; disturbed lands such as mine spoils, construction sites and gravel pits; and home lawns and gardens.

To mitigate pollutant concerns, the OTSC enforces Commercial Fertilizer Rule §65.13 Waste Products Distributed as Fertilizers which states “no person shall sell, offer or expose for sale, or distribute in this state, any industrial or municipal product originally designated as a waste by any governmental agency – federal, state, or local – intended for, promoted or represented, advertised as or distributed as a fertilizer defined in the Texas Agriculture Code, Chapter 63, §63.002 prior to registering the same as specified in §63.031.” In addition to other requirements of the Law and the Rules, applications for registration of sewage, sludge, and septage or mixed fertilizer containing same shall be accompanied by the following:

1. a detailed description of the facilities, equipment, and method of manufacture to be used in processing, manufacturing, and testing of the product;
2. a sampling schedule, full description of all tests made, and the results of such tests which include, but are not limited to, the pollutants and pathogens required to be tested by the United States Environmental Protection Agency Code of Federal Regulations, Title 40 CFR: Protection of Environment, Part 503 Standards for the Use or Disposal of Sewage Sludge;
3. a schedule for periodic testing which initially shall be conducted on each production run no less than once per each calendar quarter; and (*continued*)

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Protects consumers & enhances Agri-Business through its Feed & Fertilizer Regulatory Compliance Program, surveillance & monitoring of Animal-Human health & environmental hazards, & preparedness planning.

Regulating Waste Products Distributed as Fertilizer (continued)

4. a statement that any product consisting in whole or in part of sewage, septage, or sludge meets the CFR Part 503 and specifically meets the requirements of 503.32(a) and one of the vector attraction reduction requirements in 503.33(b)(1) through 503.33(b)(8).

The OTSC plan of work includes sampling and analysis of these products to determine conformance to the Texas Commercial Fertilizer Rules, Chapter 65 and EPA CFR Title 40, Part 503.

Mineral Contaminants in Premixes and Complete Feed

From 2011 to 2016, the OTSC analyzed 962 mineral premixes and complete feeds samples for ten minerals (see Table 1) to assess the risk of mineral contamination in feed. Maximum tolerable levels (MTL) for minerals (Table 1) are set by the National Research Council (Mineral Tolerances of Animals, NRC, 2005). MTL are an upper limit that is considered safe for animals, but not human health. Since MTL apply only to complete feeds, mineral premixes were treated as complete feeds for this study. Similarly, essential nutrients, such as copper, selenium, and molybdenum, were considered contaminants in some mineral premixes. The MTL for the most sensitive species was chosen, because of species variation.

The only two minerals that were of concern were copper and molybdenum, specifically the copper:molybdenum ratio. Copper concentrations in 10 out of 122 (8%) of cattle complete feeds was greater than 40 ppm MTL for cattle. Prolonged exposure greater than 25 ppm can cause copper toxicity in dairy cattle, especially with low molybdenum in the diet. Approximately 54 out of 122 (44%) of the cattle complete feeds contained copper greater than 25 ppm. The molybdenum concentration was less than 1.5 ppm in 435 out of 635 (66%) in all premixes and complete feeds. Most complete feeds have a molybdenum concentration less than 1 ppm. The ideal copper:molybdenum

ratio is about 8:1 for cattle complete feed. The calculated copper:molybdenum ratio is greater than 40:1 in cattle complete feed. This indicates that the copper content in cattle complete feed is excessive. Molybdenum cannot be added to the diet because it is not an approved food additive. Even if molybdenum could be added to the ruminant diet, it is not enough to offset the excessive copper level in current cattle complete feeds. Therefore, the copper level in complete feeds for cattle should be reduced to at least 25 ppm, while avoiding the creation of a copper deficiency. Overall, the mineral premixes and complete feeds were very clean of the ten minerals as contaminants.

Table 1. Mineral Contaminants Tested with MTL.

Mineral	MTL
Arsenic	30 ppm
Cadmium	10 ppm
Chromium	100 ppm
Copper	15 ppm
Lead	10 ppm
Mercury	0.2 ppm
Nickel	50 ppm
Molybdenum	5 ppm
Selenium	ppm
Thallium	Assigned MTL: 1 ppm