Regulatory Services News

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Division of Regulatory Services Strategic Plan 2005-2007

The program and lab coordinators listed on the front page of the Regulatory Services News have developed a strategic plan for the Division. This activity began in the fall of 2004 and was concluded in the spring of 2005. Now the harder part begins in assuring that we follow the strategic plan that has been laid out for us and to modify the plan as new issues and circumstances are addressed in the management process. The coordinators in establishing goals for the Division had the objective of enhancing its overall service and role to the regulated industries, agricultural producers, urban consumers and homeowners, and general citizenry of Kentucky. The Division's programs and services are broad based touching in some manner all Kentuckians and with a national reach through food safety, environmental, and homeland security aspects.

The coordinators were initially faced with the prospect of defining "Our Mission". This brief statement had to set forth the mission of four regulatory programs and two service testing programs. Secondly, the coordinators had to define "Our Vision". Thirdly, the group defined in more detail "Who We Are" as a Division based on mandated regulatory programs, service programs and the philosophy of working with all parties to achieve the highest level of service and compliance utilizing cooperative approaches, training, leadership, education and science.

I believe you will find the consensus of the coordinators in defining these components of the strategic plan to accurately represent the division's longstanding tradition for commitment to excellence with

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What's inside....

Strategic Plan

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an eye toward the future. The following describes who we are, our mission and our vision for the future and form the foundation for six strategic goals that will be reported on in subsequent issues:

E. Miller
Director

Our Mission

Regulatory Services is committed to service and consumer protection of Kentucky citizens, businesses, and industries. Our programs monitor and analyze feed, fertilizer, milk, seed and soil and are administered using a cooperative, science-based approach.

Our Vision

Regulatory Services will be a model of excellence. Our vision is to:

- set high standards of leadership excellence in each of our programs
- apply effective principles and philosophies that promote collaboration with our clientele at the local, state, and national levels
- focus on opportunities to improve service to all Kentuckians
- operate model programs that readily achieve voluntary compliance

Who We Are

The Division of Regulatory Services administers four state laws that regulate the distribution of feed, fertilizer, and seed, and the marketing of raw milk; and operate two service programs for testing seed and soil. Through these programs, we afford consumer protection, fair markets, and services for all Kentuckians.

We accomplish our responsibilities of consumer protection and service by:

- operating statewide agricultural monitoring programs in the areas of livestock feed and pet food; agricultural and home-use fertilizer; and crop, vegetable, and lawn/turf seed as well as the raw milk marketing system.

- providing analytical support based on scientific principles for each regulatory and service program in modern laboratories to analyze in an unbiased manner feed, fertilizer, milk, seed, and soil samples and provide impartial recommendations.

- administrating effective programs and support functions that promote a fair market for sale and distribution of monitored products.

- achieving compliance through leadership, outreach, and enforcement to ensure agriculture and urban market consumers are purchasing accurately labeled products.

Regulatory Services holds a unique position within the College of Agriculture and contributes to the Land-Grant values of learning, discovery, and engagement.

Seed Sampling Basics

All seed that moves in commerce is required to be labeled with a guaranteed analysis that reflects component guarantees as required by the laws that govern seed distribution in the area of distribution. These components usually are divided into purity, noxious weed and germination.

The purity consists of pure seed, inert matter, crop seed and weed seed. Common weeds are not noxious weeds and they are placed in the weed seed category. The noxious weed determination consists of separation of weed seed that the law identifies as being noxious in the area of distribution and determining their rate of occurrence that is usually stated as a number per pound. The germination consists of determining the germination and or hard seed/dormant seed. The total of the germination and hard seed / dormant seed is often referred to as total germination.

These determinations are arrived at in the seed laboratory and their accuracy is based on proper sampling techniques and following specified standard testing procedures in the laboratory. Most seed laboratories use procedures for testing that are specified in "Rules for Testing Seed." The rules specify standard testing procedures for the seed kinds being tested.

The seed analysts can only test what is in the sample container received in the laboratory. Following the proper procedures for splitting and analyzing the sample a result will be arrived at. This result is based on the content of the sample received. In order for this result to be valid, the sample itself must be representative of the seed lot that the sample was taken from.

Seed triers are the most common tool used to sample seed. A trier long enough to reach all parts of the container should be used to sample seed in containers or bulk bins. When sampling free flowing seed in bags, the trier should be inserted from corner to corner on a diagonal plane. Triers that have an open slot should be inserted with the slot down and turned up when the trier is fully inserted. Double sleeved triers should be inserted in a closed position and opened at full insertion with the slot openings on top of the trier. The slotted openings on the trier should be at least twice as wide as the length of the seed being sampled to allow the seed to flow freely into the trier. The following table specifies the number of containers that should be sampled to obtain a representative sample.

Number of bags which must be sampled

Number of Bags in Lot	Minimum Number to Sample	Number of Bags in Lot	Minimum Number to Sample
1 to 6	*		
7 to 14	6	135 to 144	19
15 to 24	7	145 to 154	20
25 to 34	8	155 to 164	21
35 to 44	9	165 to 174	22
45 to 54	10	175 to 184	23
55 to 64	11	185 to 194	24
65 to 74	12	195 to 204	25
75 to 85	13	205 to 214	26
85 to 94	14	215 to 224	27
95 to 104	15	225 to 234	28
105 to 114	16	235 to 244	29
115 to 124	17	245 to 254	30
125 to 134	18	255 or more	30

* *at least 5 triers. The same number of triers should be obtained from each container to avoid sample bias.*

A larger trier, commonly a double sleeved grain probe should be used to sample mini-bulk containers. The same sampling intensity, based on the number of containers should be utilized. This trier is inserted from the top of the contained in the closed position at a slight angle, opened when fully inserted, closed and withdrawn. Care has to be exercised in closing this sampler as some seed may be crushed if the trier is completely closed. This recommendation will result in a bigger sample because the diameter of the grain probe is larger. This recommendation will probably be changed in the future to accommodate a smaller sample size.

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Seed Sampling
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Samples obtained from open face bins should be obtained using a trier that will reach to the bottom of the bin if possible. Where this is not applicable or not possible a smaller trier is usually used. The number of triers to obtain is based on an estimate of the number of bags (commonly 50lb bags or bushels) the bin has in it and applying that number to the sampling chart.

Seed that is extremely chaffy (commonly native grasses that are not well cleaned) and will not flow freely into a sample trier must be sampled by hand. The same sampling intensity as described in the chart is applicable. The hand should be inserted with the fingers held closely together and inserted into the bag, closing the hand and removing the seed. If it is necessary to get more than one hand sample from a container, a different path should be followed.

Samples should be obtained randomly over the seed lot. One should never obtain all of the triers from a single location in the lot as this will probably bias the result. The labeling or lot identification should be checked on each container that is chosen to avoid sampling a different seed lot. This is a very easy mistake to make because of the way seed is handled. Sometimes, different lots end up on the same pallet and they all look the same. You have to check the lot number on the analysis tag or the stenciled bag identity. It has to be the same.

Sampling a seed lot is not a complicated process. One does have to use the appropriate sampling equipment, exercise care in making sure the seed to be sampled is all the same lot, and obtain the appropriate number of triers randomly. A valid laboratory result begins at the point of sampling. A representative sample will produce a valid laboratory result. This result is the basis used to label the seed lot.

D. Buckingham
Seed Regulatory Program

Seed Program Personnel Update

Karen Nichol joined the Division of Regulatory Services as the staff assistant for the Seed Program. Her duties for the Regulatory Program involve industry contact through maintaining a current address and phone list, registration and permit lists, tag orders and mailing correspondance in regard to regulatory matters. Karen's duties for the Service Testing Program involve data entry, faxing and mailing sample reports, shipping service envelopes as well as answering questions about samples in the lab for testing.

The Case Against Plant "Food"

Introduction

"Food" is defined by Encyclopedia Britannica as*: "material consisting essentially of protein, carbohydrate, and fat used in the body of an organism to sustain growth, repair, and vital processes and to furnish energy"*[1] . Early in the use of fertilizers the term "plant food" was coined to describe the nourishment of plants with the idea that plants utilized "fertilizer" in the same way animals utilize "food". The objective of this article is to argue that this is a misnomer arising out of a misunderstanding of how a green plant grows and that this misunderstanding still exists today.

The Green Plant-Misunderstood

Green plants do not need animals. Animals cannot survive without green plants. The next time you sit down at your favorite eating place take a moment to contemplate these facts. Green plants which are able to convert energy from the sun into energy rich organic compounds are called "autotrophs". The other living organisms (that includes you and me) which utilize and depend upon the organic compounds "manufactured" by the green plants are called "heterotrophs". This significant difference between plants and animals was not well understood until the middle of the 19th century.

Early observers probably noted that animal manures and the remains of decomposing animal and plant tissues increased plant growth. It was logical to apply anthropomorphic characteristics to the plants and conclude that somehow they "ate" or "consumed" whatever was in the "manures". This led early scientists or experimenters to began a search for the "principle" of vegetation or the one thing that causes a plant to grow. Various ideas were proposed including, salt, spirit (air), earth, water, oils, and fire in a fixed state. The search for the principle of vegetation led Jan Baptiste van Helmont (1577-1644), a Flemish physician, to conduct his famous "willow tree" experiment. He carefully weighed dry soil and placed it in a tub and planted a small willow tree, carefully weighed. He then covered the soil surface to keep out dust and carefully weighed the water he added to keep the plant growing. At the end of five years he again carefully weighed the soil and the willow tree. He accounted for all the soil except two ounces which he concluded was experimental error. His conclusion was that the weight gained by the plant was due solely to the water; therefore, water must be the "principle" of vegetation. Several years later Robert Boyle, known for his work with gases, confirmed van Helmont's conclusion.
While van Helmont's conclusion was erroneous it spurred more experimental work on plant growth. Many experiments were conducted during the 1700's and early 1800's in search of the principle of vegetation and here are some of the conclusions: (a) terrestrial matter (soil) mixed with water is taken up by plants and constitutes plants, (b) the roots and the body of the plant are similar to the stomach and intestines of an animal, and (c) fine particles of soil are forced into the plant roots by the pressure caused by the swelling to the growing roots. This latter conclusion was put forth by Oxford educated Jethro Tull (1674-1741) who invented a "cultivator" which he believed would pulverize the soil so it could be more easily "eaten" by the roots of the plants. His book, *Horse Hoeing Husbandry*, was a best seller in England.

The Green Plant-Vindicated

As the search for the "principle" of vegetation intensified, scientists accumulated much data but not much progress was made until Theodore de Saussure in 1804 developed the quantitative experimental method, the scientific method of investigation. However, no less than Joseph Priestley, before he discovered oxygen had noted in the late 1700's that plants improve the air vitiated by animals. De Saussure 's work laid the foundation for modern scientific inquiry and he later showed experimentally that a plant needed carbon dioxide to survive and that plants also generated oxygen. This result confirmed what Jean Senebier of Geneva had found in 1782. Senebier argued that the increased weight of Van

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Plant "Food"
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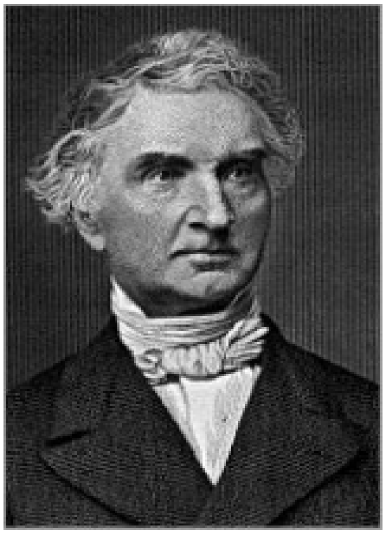
Helmont's willow tree came from the air! De Saussure's work was near the beginning of unraveling the mystery of the green plant. Old ideas die hard. Even Sir Humphry Davy who is known for his application of chemistry to agriculture did not accept De Saussure's conclusion and insisted that plants get their carbon through their roots, even promoting use of "oil" as a fertilizer.

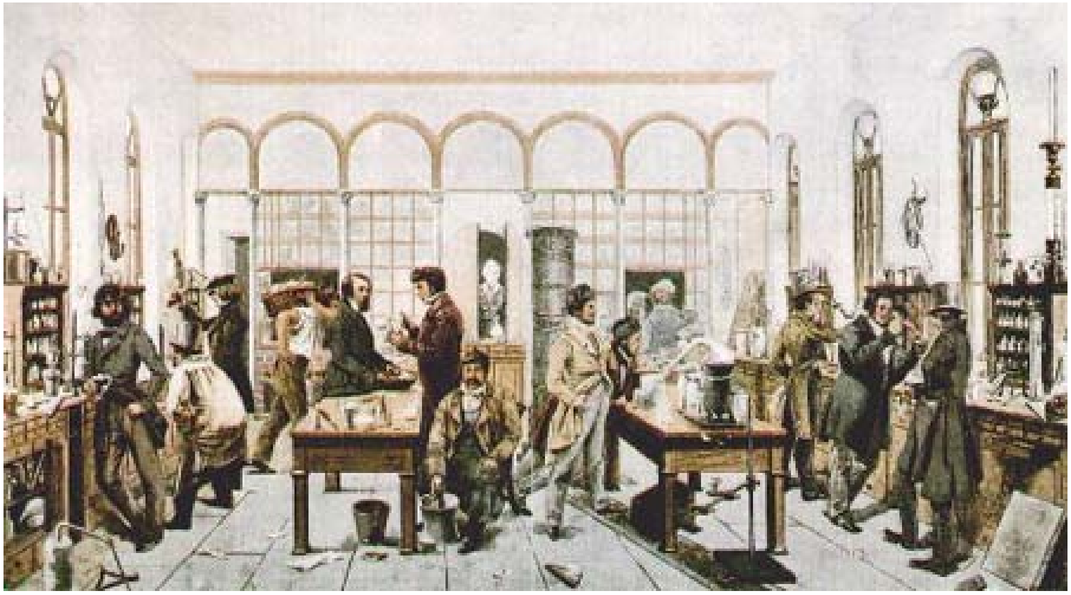

Justus von Liebig

The explosion came in 1840 when Justus von Liebig presented his "famous" report to the British Association for the Advancement of Science published as *Chemistry in its Application to Agriculture and Physiology*.
"With polished invective and a fine sarcasm he holds up to scorn the plant physiologists of his day for their continued adhesion, in spite of accumulated evidence, to the view that plants derive their carbon from the soil and not from the carbonic acid of the air. 'All explanations of chemists must remain without fruit, and useless, because, even to the great leaders in physiology, carbonic acid, ammonia, acids and bases are sounds without meaning, words without sense, terms of an unknown language, which awake no thoughts and no associations.' The experiments quoted by the physiologists in support of their view are all 'valueless for the decision of any question. These experiments are considered by them as convincing proofs, whilst they are fitted only to awake pity.' Liebig's ridicule did what neither de Saussure's nor Boussingault's logic had done: **it finally killed the humus theory.** (Emphasis my own.) Only the boldest would have ventured after this to assert that plants derive their carbon from any source other than carbon dioxide."[2]

Humus Theory-Is is Dead?

Many of Liebig's conclusions were also faulty, such as, that leguminous plants do not get their nitrogen from the air and that plant roots secrete acetic acid; but, his conclusion that plants get their carbon from carbon dioxide of the air has withstood all assertions to the contrary. Recently, there has been a quasi resurrection of the humus theory with the increased popularity of "organic" food and its production. Fertilizers approved for "organic" food production must meet certain criteria as if the plant can utilize composted chicken manure (eat the organic material?) better than the nitrogen from ammonium nitrate. Fertilizers are now being registered and sold with humic acids, amino acids, bacteria, and vitamins as if the plant needs these organic compounds. This is an insult to the legacy of the green plant!
Even some scientists in an attempt to explain the value of fertilizers to lay persons have regressed to comparing fertilizer nutrients, such as, nitrogen, phosphorus, and potassium to "food" that animals consume; and, the micro-nutrients to "vitamins" that animals utilize in their growth process[3]. Again, this is an insult to the green plant! Plants are NOT like animals, thankfully, and to be fully appreciated, anthropomorphic characteristics should not be attributed to them.

Of course, animals require "organic" food and with the exception of mineral supplements all food animals consume is "organic". Plants on the other hand do not require and cannot utilize "organic" food. Any "organic" material added to the soil as fertilizer must be mineralized before a plant can utilize it. That is, the complex organic compounds manufactured by plants (organic matter) must be "disassembled" back into its original inorganic state before the plant can absorb it and again manufacture the organic compounds needed by animals.



Justus von Leibig's laboratory in Giessen around 1840, drawn by Wilhelm von Trautschold. 1

The Green Plant-A Miracle

The green plant is as close to a miracle as most of us will ever get. It starts usually from a seed (which is another fascinating story) utilizing food (as defined above) stored from the previous generation and, with no help from any "animal", grows into a mature organism. It uses inorganic materials extracted from its surrounding environment including water and inorganic compounds from the soil; carbon dioxide from the atmosphere; and, energy from the sun to manufacture first simple organic compounds and subsequently more complex fats, carbohydrates, and, proteins. Photosynthesis is the name of this complicated process and plant scientists have only recently extracted a cursory understanding of it.

Summary

Let us all pause for a moment of silence in honor of our source of sustenance and link to Mother Earth, **The Green Plant**.

D. Terry
Fertilizer Regulatory Program

Other References:

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Tisdale, Samuel L. , Werner L. Nelson, and James D. Beaton. 1985. Soil Fertility and Fertilizers, 4th Ed. Macmillan Publishing Co. New York

[1] http://www.britannica.com/search?query=food&submit=Find&source=MWTEXT

[2] Russell, Sir E. John. 1950. Soil Conditions and Plant Growth. Longmans, Green and Co. New York. Page 12

[3] NUTRIENTS FOR LIFE FOUNDATION, 2005, Union Center Plaza, 820 First St. NE, Suite 430, Washington, DC 20002 (See-Fertile Minds ProAction Kit)

Milk Program to Participate in Homeland Security Project

The Kentucky Homeland Security University Consortium conducts research and development work on projects intended to improve US security systems. Eight universities and the Kentucky Community and Technical College System make up the consortium. Research primarily focuses on products that may be useful to the Department of Homeland Security. The University of Kentucky, University of Louisville and Western Kentucky University submitted a collaborative proposal relating to dairy industry security. The project was approved for $1.5 million in total funding over the three-year project period.

The project will involve researchers and staff from the UK College of Agriculture's Department of Biosystems and Agricultural Engineering, Department of Animal and Food Sciences and the Division of Regulatory Services. Collaborating with UK will be researchers from the U of L's Industrial Engineering Department and WKU's Applied Physic's Institute. Dr. Fred Payne of UK's Biosystems and Ag Engineering will be the primary investigator on the project.

The goal of the project is to develop a security system for ensuring the safety of milk during transport from the farm to the processor. An additional benefit of the security system will be an enhanced dairy record-keeping system. The prototype system will incorporate biometric sensors with a Global Positioning System (GPS). Biometrics are automated technological methods of recognizing individuals based on features such as fingerprints, handwriting, etc. GPS is a radio-navigation system that utilizes satellites to calculate receiver positions. Both are becoming more affordable and more readily recognized by the public. Biometrics is currently used with secure entry systems and in the banking industries. GPS use has many widespread applications and has been extensively utilized with precision agriculture.

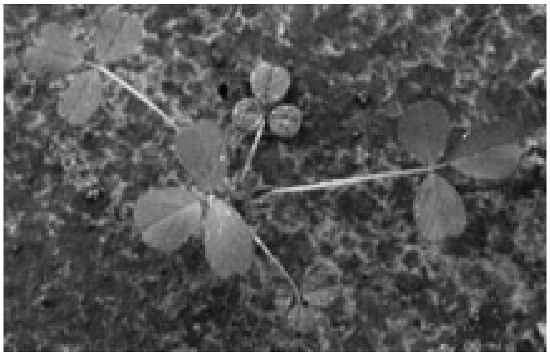
The prototype security system will be installed on a standard designed milk truck and be tested on different milk hauling routes. The project will incorporate input from several dairy groups including producers, processors, milk haulers, milk tank truck manufacturers as well as the USDA and FDA. Dairy-related Kentucky collaborators will be assisting with this project. Regulatory Services' personnel will assist in the project in an advisory capacity concerning dairy regulatory matters, serve as a liaison with dairy industry representatives and assist in progress reporting, document preparation and applied training regarding the new security system. Dairy industry questions regarding this project may be directed to Chris Thompson at cthompso@uky.edu or (859) 257-2785.

C. Thompson
Milk Program Coordinator

To learn more about the dairy security project, go to www.rs.uky.edu and click on Milk.

Glyphosate Tolerant Alfalfa Approved for Public Release

USDA/APHIS announced on June 27, 2005 that Monsanto Company in conjunction with Forage Genetics International has been granted approval to market glyphosate tolerant(commonly referred to as "Roundup Ready") alfalfa. The actual release date for this new trait was not a part of the USDA announcement, but it can be expected to appear in the marketplace this fall or next spring. Use of this product will allow use of the herbicide glyphosate on the forage to control undesirable plants in the stand.



www.alfalfa.okstate.edu

This release was discussed during the latter part of July at the annual meeting of the Association of American Seed Controls in Austin, Texas. The association consists of seed control officials from the United States and Canada. Seed Control officials from a number of states expressed concern as to the manner in which this new product will be labeled.

Information from Monsanto/Forage Genetics indicates the product will be 90% trait specific. In common terms, this means that only 90% of the seed in the bag will be tolerant to glyphosate. Spraying this crop with glyphosate shortly after stand establishment will result in a 10% stand loss. The concern expressed by the seed control officials group was based on information that the label on this new product would not clearly call attention to this stand loss on the seed analysis tag.

Information received on the product labeling as of this writing indicates that the trait specific information is to be included in the technology protection agreement in a section called the "Technology Use Guide"on pages 31-33 of the agreement. Current information available to the seed control officials indicates that this information will not be included on the seed tag. All of this may change as no actual labeling for the product was made available for review.

Consumers and dealers that do have intentions of using or distributing this new technology for alfalfa do need to be aware of this issue. It is uncertain at this point as to what, if any trait specific information, will be presented on the seed analysis tag. Please keep this information in mind if you plan to distribute or use this new technology.

D. Buckingham
Seed Regulatory Program

www.alfalfa.okstate.edu

Understanding Seed Vigor

Seed Vigor describes qualities of a seed lot that favor stand establishment. Quick, uniform emergence of normal seedlings is especially important when field conditions are less than favorable. The concept was first noted as "germination energy" in the late 1800s and within the last 40 years, seed vigor tests have been used in seed testing laboratories to determine seed lot quality and to provide information for management decisions.

A vigor test (adverse conditions) should always be conducted with a standard germination test (optimal conditions) to provide the most information about the seed lot being tested. Please note that conditioning and seed treatments can affect vigor without a noticeable change in germination. Vigor tests should be valid for several months for seeds held under appropriate storage conditions. Common vigor tests, also called stress tests, conducted at the University of Kentucky laboratory include the Cold Test and Accelerated Aging Test.

Cold Test

The cold test is commonly applied to corn seed lots, but is also used for sorghum and other crops. Seeds are planted on a tray lined with a moist material, covered with damp field soil and exposed to cold (10ºC/50ºF) conditions. After a week the tray is moved to optimal germination conditions, allowed to grow and is evaluated for germination and normal seedling development. The combination of field soil (provides microorganisms) and cold (low soil temperatures) measures the seeds' ability to withstand pressures of cold, wet conditions. A high cold test value (expressed as a percentage) generally indicates high vigor and suitability for early planting.

Accelerated Aging

In the accelerated aging test dry seeds are suspended on a screen over water in a plastic box and exposed to a high temperature (41ºC/105ºF), high relative humidity (100%) environment for a short period (72 hours). Seeds are removed from the stress treatment, planted under optimal conditions and evaluated. Germination (expressed as a percentage) after AA treatment is compared to standard germination and the difference is the relative vigor of the lot. AA results relate well to field emergence under stressful conditions. AA can also be used to predict storage potential of a seed lot. High vigor lots maintain viability in storage better than low vigor lots.

First counts (Germination Rate) in the germination test are often used as an indicator of vigor and measure how quickly seeds germinate and form normal seedlings. The most commonly conducted test of this kind in our lab is a three-day count on soybean. Other vigor tests include Conductivity Test (measures electrical charge of materials leaking out of deteriorating seeds); Cool Germination Test (similar to cold test, commonly used on cotton); and Saturated Salts Accelerated Aging (relatively new test, promising for small seeded crops like vegetables and tobacco). Less commonly used laboratory tests include the Brick Grit Test, Osmotic Stress Test, Seedling Classification Test and Seedling Growth Rate Test.

Vigor testing is not without limitations. While the AA and Cold Tests are reliable, some of the less commonly used tests can be subjective. Understanding the vigor test you are using can provide valuable information for management decisions in relation to planting, storage and marketing.

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Updated Milk Program Training Seminars

Quarterly training programs for milk sampler-weighers have been established for many years in Kentucky. The training programs, typically referred to as "milk hauler's school" are conducted cooperatively by Regulatory Services and the Milk Safety Branch. Materials associated with the training program have been updated and improved. Those attending future training programs will view an updated video production that provides an overview of Kentucky milk sampler-weigher requirements. The schedule for future "milk hauler schools" can be viewed at www.rs.uky.edu.

Additionally, a new training program has been developed for other specialized milk samplers and "sample handlers". This material was put together to provide more detailed training for individuals who are charged with milk evaluation, sampling and sample care at locations other than on farms. The program is appropriate for milk plant and transfer station receiving personnel and sample couriers.

Presentations from Regulatory Services and Milk Safety Branch personnel provide detailed information regarding dairy industry requirements as well as the importance of biosecurity and on the job safety. Several "hands-on" activities have been incorporated into the new training sessions. These training programs are conducted prior to administering a written examination required for new personnel to obtain the appropriate licenses and permits. However, each program can be modified to serve as a "refresher course" for experienced personnel.

Kentucky dairy industry groups including dairy processors, hauling companies and marketing organizations interested in scheduling "refresher courses" are encouraged to contact Chris Thompson at (859) 257-2785 or cthompso@uky.edu to request an on-site training program.

C. Thompson
Milk Program Coordinator

Seed Vigor
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Submitting samples for vigor testing is no different than samples submitted for other tests, just provide an additional 800 seed. Also, note on the package which vigor test you are requesting. A Cold Test extends sample completion by one week and AA by three days. The cost for either test is $9.00 and results are noted on the lab report as an 'Other Determination'. For more information about vigor tests or general seed testing questions , please contact the seed lab at 859-257-2785 or by email at cindy.finneseth@uky.edu.

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Seed Testing Coordinator

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