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Items of Interest in Seed

April 2009

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EDITOR'S NOTES

While it has been a long time since Americans heard the term "victory garden" most of us would agree that during tough economic environments, Americans seem to naturally fall back to growing their own vegetables. During World War II, Americans planted vegetable victory gardens, in part, to guarantee their families would have adequate food for the year. Not only did the gardens provide the people with fresh vegetables, many people preserved their food through canning methods. Today, millions of people throughout the U.S. and the world are again facing tough economic hardships. Will we see a return of the victory gardens? If so, what can each of us do to help our customers? How do we provide the highest level of service to them when they purchase seed for their garden?

The Seed Regulatory and Testing Branch (SRTB) protects consumers by enforcing the Federal Seed Act (FSA):

- The FSA regulates the interstate shipment of agricultural and vegetable seeds.
- The FSA requires that seed shipped in interstate commerce be labeled with information that allows seed buyers to make informed choices.
- Seed labeling information and advertisements pertaining to the seed must be truthful.
- The FSA helps promote uniformity among State laws and fair competition within the seed trade.

The SRTB staff works closely with State seed control officials, seed organizations, and seed company representatives. Each State maintains a cooperative agreement with the Agricultural Marketing Service for participation in regulatory matters regarding interstate shipments of seed. In addition to enforcing their seed laws, each State may forward regulatory cases to SRTB for further investigation and possible action. These cases concern complaints about seed lots shipped in interstate commerce that are suspected of being in violation of the FSA. Members of the SRTB staff also attend organizational meetings, provide training, and answer questions related to FSA labeling requirements regarding seed shipped in interstate commerce. The subject matter of each article in the Items of Interest in Seed (IOI) also represents the many ways we strive to improve our efforts of providing our customers a quality product.

These combined efforts ensure a high quality, accurately labeled product of a high monetary value to a farmer whose livelihood may be threatened by losing a crop in a single growing season. Quality seed is also important to your neighbor next door who plants a modern day victory garden.

This issue of the IOI includes scientific articles written by SRTB Botanist Todd Erickson and Plant Physiologist Yujia Wu. Dr. Wu's article describes the development of a new testing method for identification of bluebunch and thickspike wheatgrass. Mr. Erickson's article describes the visual identification of the two species. Other features include Seed Marketing Specialist Roger Burton's article on maintaining chain of custody and integrity of seed samples. Office Automation Clerk Carolyn Camidge's article explaining timelines in seed testing may help companies in their own planning efforts. And, finally, Biological Science Laboratory Technician Anitra Walker's article discussing certified seed analyst and registered seed technologist designations, explains the knowledge, training, and benefits that these titles represent in the laboratory.

When all of us work together for the well-being of the customer, we can ensure that the final seed product meets or exceeds the customer's expectations.

Please let me know if you have suggestions for topics to be covered in the future by sending an e-mail to linda.vanderhoof@ams.usda.gov.

On behalf of the SRTB staff, I hope you enjoy these articles and continue to find them informative.

Linda Vanderhoof
IOI Editor

(Note: New Agriculture Secretary Tom Vilsack recently introduced USDA's The People's Garden project at a ceremony in Washington, DC, commemorating the 200th birthday of Abraham Lincoln. Per a USDA News Release of February 12, 2009, implementation of the project includes "…creating a community garden at each USDA facility worldwide. The USDA community garden project will include a wide variety of garden activities including Embassy window boxes, tree planting, and field office plots." In addition, energy and water conservation practices will be part of the project.)

SECRETARY OF AGRICULTURE TOM VILSACK

Tom Vilsack was sworn in as the 30th Secretary of the U.S. Department of Agriculture (USDA) on January 21, 2009. Appointed by President Barack Obama, Vilsack received unanimous support for his confirmation by the U.S. Senate.

Secretary Vilsack has served in the public sector at nearly every level of government, beginning as mayor of Mt. Pleasant, IA, in 1987, and then as state senator in 1992. In 1998, he was the first Democrat elected Governor of Iowa in more than 30 years, an office he held for two terms.

Throughout his campaign for Governor, Vilsack articulated a vision for making Iowa the Food Capital of the World and focusing on creating economic opportunity in rural communities and small towns through value-added agriculture. As Governor, he created the Iowa Food Policy Council to advance local food systems, enhance family farm profitability, and combat hunger and malnutrition. He led trade missions to foreign countries to market agricultural products and attended the Seattle meeting of the World Trade Organization (WTO) to push for expanded agricultural trade negotiations. In addition, he worked to support independent farmers and ranchers by enacting livestock market reform and mandatory price reporting legislation in 1999.

Vilsack was a leader among his colleagues. In addition to serving on the National Governors Association Executive Committee, he also served as chair of the Governors Ethanol Coalition, chair of the Democratic Governors Association, and founding member and chair of the Governors Biotechnology Partnership. As chair of the National Governors Association Committee on Natural Resources, Vilsack promoted private lands conservation and advanced the concept of tying farm payments to conservation commodities. Vilsack's national *Private*

Lands, Public Benefits conference focused attention on the need to address conservation challenges by providing incentives to private landowners to implement conservation practices resulting in clean air, clean water, and enhanced wildlife habitat. He also created a comprehensive conservation program in Iowa to encourage and assist landowners in installing buffer strips, restoring wetlands, and rewarding good conservation practices.

During his tenure as Governor, Tom Vilsack initiated a comprehensive effort to increase economic opportunity and create good-paying jobs. He started Vision Iowa, a program to invest in cultural and recreational infrastructure throughout the state. A combination of venture capital initiatives created an entrepreneurial environment for innovation and new ideas to get started; and the Iowa Values Fund provided an economic growth strategy focused on creating and retaining jobs in targeted sectors including life sciences, financial services, and advanced manufacturing. Each of these initiatives created under Vilsack's administration contributed to the rebuilding of local economies in small towns and rural communities across the state.

In addition to state economic investment, Vilsack's leadership and vision were instrumental in transforming Iowa to an energy state. His policies led to the construction of Iowa's first power facility in two decades and made Iowa a leader in alternative energy and renewable fuels. Vilsack created a regulatory and financial environment in Iowa for wind energy to develop to the point that it now makes up 5.5 percent of the state's generation, the largest percentage of any state. Iowa also emerged as a leader in the production of ethanol and biodiesel during his tenure.

Throughout his public service, Tom Vilsack has pursued an agenda dedicated to the principles of opportunity, responsibility, and security. He is recognized as an innovator on children's issues and education, economic and healthcare policy, and efforts to make government more efficient and accessible. Iowa is known for its strong K-12 education system in part due to Vilsack's initiatives. He developed aggressive early childhood programs, reduced class sizes, created a first-in-the-nation salary initiative to improve teacher quality and student achievement, and enacted a more rigorous high school curriculum. His leadership also led to Iowa becoming a national leader in health insurance coverage, with more than 90 percent of children covered.

A native of Pittsburgh, PA, Vilsack was born into an orphanage and adopted in 1951. He received a bachelor's degree from Hamilton College in Clinton, NY, in 1972 and earned his law degree from Albany Law School in 1975. He moved to Mt. Pleasant – his wife, Christie's, hometown – where he practiced law. The Vilsacks have two adult sons, Jess and Doug, who both grew up in Mt. Pleasant, and a daughter-in-law, Kate, who's married to Jess.

For information regarding this article, please contact USDA, Office of Communications at (202) 720-4623; http://www.usda.gov.

NEW SEED REGULATORY AND TESTING BRANCH WEB SITE ADDRESS

The Seed Regulatory and Testing Branch Web site address has changed to http://www.ams.usda.gov/seed. Please be sure to make this change to any of your computer bookmarks, favorites, and Web page links.

NEW E-MAIL ADDRESSES FOR SEED REGULATORY AND TESTING BRANCH EMPLOYEES

The Seed Regulatory and Testing Branch employee e-mail addresses have changed. Please refer to the Staff Directory on page 32 to update your address books.

UPCOMING FEDERAL SEED SCHOOLS IN GASTONIA, NC

The Seed Regulatory and Testing Branch will host two Federal Seed Schools this year in Gastonia, NC, May 11-15, and August 10-14, 2009. The first three days of both of these seed schools will focus on purity and identification of similar crop and weed species, with emphasis on identification of noxious-weed seeds. Other topics such as the uniform blowing procedure and ryegrass fluorescence will be covered. The last two days of the week will focus on variety testing, including trait testing, and seed health testing such as detection of seed treatments by bioassay methods, depending upon the interest of the participants.

These seed schools are open to seed analysts from private and government seed testing laboratories. Presentation of topics will be on a level appropriate for experienced seed analysts. Enrollment at each of the seed schools will be limited to 20 participants due to the hands-on nature of the topics and one-on-one attention from the instructors. Participants from non-government laboratories will be charged a fee of $160.

For more information about these seed schools or to request pre-registration, please contact Botanist Pattsy Jackson at pattsy.jackson@ams.usda.gov or Laboratory Supervisor Susan Maxon at susan.maxon@ams.usda.gov.

SEED GRADER PROGRAM UPDATE

The Seed Grader Program is a voluntary program intended to make the trade of seed more efficient between the United States and Canada. Individuals who meet program requirements are accredited to assign a Canadian grade name to seed in the United States for marketing in Canada. The program officially began on December 19, 2007, when representatives of the Agricultural Marketing Service (AMS) and the Canadian Food Inspection Agency (CFIA) signed a Memorandum of Understanding that implemented the program. The agreement authorizes AMS to provide the training for accreditation of seed graders in the United States for seed exported into Canada.

Today, approximately 16 months later, 29 individuals have attended 4 training sessions. There are now six seed graders working in AMS-recognized laboratories in the United States with the accreditation to assign Canadian grades to U.S. seed for shipment and marketing in Canada. The program's advantages include the ability of U.S. companies to ship directly to the Canadian consumer, to reduce costs, and to eliminate duplicate testing—all of which benefit both the consumer and the producer.

A training session is tentatively scheduled for May 13, 2009, at the Seed Regulatory and Testing Branch in Gastonia, NC, with the examination to be given May 14. Future training sessions will be arranged based on demand. Anyone may participate in the training, but to become an accredited seed grader an individual must work in an Accredited Seed Laboratory or

AMS-recognized facility, be a Registered Seed Technologist or Certified Seed Analyst in purity and germination, and pass the Seed Grader examination.

For more information or to register for the training, please contact Perry Bohn at perry.bohn@ams.usda.gov.

SEED REGULATORY AND TESTING BRANCH EXPANDS AVAILABLE TESTING SERVICES

The Seed Regulatory and Testing Branch (SRTB) service testing options have expanded to include tests for accelerated aging; variety by laboratory, field, or greenhouse methods; and Canadian seed grading. SRTB has achieved additional International Seed Testing Association (ISTA) accreditation in accelerated aging, variety (laboratory and field), and seed health testing. These test options are offered in addition to the purity, germination, noxious-weed seed, moisture content, seed count, conductivity, pathology, and bioassay tests previously listed.

Additional information concerning these tests is available by calling (704) 810-8870 or visiting http://www.ams.usda.gov/Seed. Charges for service tests reflect the actual hours required to complete the test.

For specific information on bioassay or variety testing, please contact Agronomist Mike Lovelace at michael.lovelace@ams.usda.gov or (704) 810-7261 or Plant Physiologist Yujia Wu at yujia.wu@ams.usda.gov or (704) 810-7267.

For specific information on conductivity testing, accelerated aging testing, or Canadian seed grading, please contact Botanist Pattsy Jackson at pattsy.jackson@ams.usda.gov or (704) 810-8881.

For more information on this article, please contact Plant Pathologist Sandra Walker at (704) 810-7268 or sandra.walker@ams.usda.gov.

USA ACCREDITED SEED LABORATORY REPORT OF ANALYSIS NOW AVAILABLE

As of January 2009, the newly approved USDA Process Verified Report of Analysis and user's guide are available. The report of analysis is for use only by the Accredited Seed Laboratory (ASL) Program offered by the Audit, Review, and Compliance (ARC) Branch.

This standardized ASL report of analysis is for reporting laboratory analysis in a uniform format. The distinct report of analysis is green in color and printed on water-marked safety paper for easy recognition in domestic and international marketing of seed. Registered Seed Technologists or Certified Seed Analysts who work in USA Accredited Seed Laboratories may use this report of analysis for results of testing within their scope of accreditation.

The ASL report of analysis was developed by the Society of Commercial Seed Technologists in cooperation with AMS and seed trade organizations. An example of the ASL report of analysis user's guide are available on pages 4-5 of the following AMS Web site: ASL Program.

For information regarding this article, please contact OECD Seed Schemes Program Manager Perry Bohn at (704) 810-7262; perry.bohn@ams.usda.gov.

USDA PROCESS VERIFIED PROGRAM FOR SEED

Beginning January 9, 2009, three accreditation programs are combined under one comprehensive umbrella program: the USDA Process Verified Program for Seed. The affected programs are the Accredited Seed Laboratory (ASL) Program, the Accredited Seed Sampling Program (ASSP), and the Accredited Field Inspection Program (AFIP). This arrangement puts the three-accreditation programs under a single quality management system.

The ASL Program was initiated in 2005, while the AFIP and the ASSP became effective in 2006. Each of these programs remains voluntary and unique in their identity in that interested parties may participate in one or more as they wish. All of them were, and still are, based on the Process Verified Program as developed and administered by the Audit, Review, and Compliance (ARC) Branch. Their objective is to provide uniformity of procedures and methodology, consequently improving the efficiency of trade in seed both domestically and globally.

Individuals or entities meeting the requirements for the relevant accreditation and successfully passing a USDA Process Verified Program audit will be accredited for the specific area or areas desired. The AFIP and ASSP may apply to individuals or organizations; the ASL Program applies only to seed testing laboratories. Approved entities may be entitled to make USDA Process Verified claims on laboratory certificates or documents, provided the ARC Branch approves the wording.

The Seed Regulatory and Testing Branch and the ARC Branch cooperate in the administration of the USDA Process Verified Program for Seed. Through this program, accredited agricultural suppliers have the ability to assure customers that they are capable of consistently providing quality products or services. The audit-based Process Verified Program provides assurance that participants have created and implemented a quality management system that complies with the program requirements.

For more information see Accredited Seed Programs or contact ARC Branch Program Manager Diana Young at diana.young@ams.usda.gov

NOXIOUS-WEED SEED LIST FOR 2009

The Seed Regulatory and Testing Branch (SRTB) staff is revising the State Noxious-Weed Seeds Recognized in the Administration of the Federal Seed Act publication. The SRTB staff is grateful to the State seed control officials and contacts for submitting State seed law changes to this office.

SRTB will post the 2009 issue on the branch Web site this spring. To receive an e-mail notification when SRTB posts new or revised publications, click on http://www.ams.usda.gov/seed for the Web site, choose “Subscribe to Publications” under the Resources heading, and follow the instructions.

For information regarding this article, please contact Seed Marketing Specialist Jeri Irwin at jeri.irwin@ams.usda.gov.

TROPICAL SODA APPLE LAW CHANGE IN FLORIDA

The Florida Department of Agriculture and Consumer Services recently revised their noxious-weed seed law. As of November 26, 2008, seed lots containing no more than one tropical soda apple (*Solanum viarum*) seed per pound may be sold in Florida, if correctly labeled. This rule change is an attempt to avoid the destruction of thousands of pounds of seed within the State of Florida contaminated with only a single tropical soda apple seed.

The Federal Seed Act (FSA) regulations apply once the seed is shipped in interstate commerce. The FSA Regulations, Section 201.16(b), lists tropical soda apple as one of the federally prohibited noxious-weed seeds for which no tolerance is applied. This means that agricultural and vegetable seed containing one or more tropical soda apple seeds are prohibited from shipment in interstate commerce. This FSA regulation remains in effect. The purpose of this provision in the FSA regulations is to help control the spread of this highly destructive noxious-weed by curtailing its transport across state lines.

Photo by Pattsy Jackson, USDA, AMS, 2008 2008

Tropical Soda Apple Seeds

For information regarding this article, please contact Seed Marketing Specialist Kevin Robinson at (704) 810-7264; kevin.robinson2@ams.usda.gov.

QUESTIONS AND ANSWERS

Q. Are there Federal Seed Act (FSA) penalties for seed treatment contamination in feedstock supply?

A. The FSA regulates agricultural and vegetable seed shipped in interstate commerce. Since feedstock is not seed for planting, it is not regulated by the FSA.

Q. Does the kind name need to be listed on a seed packet?

A. The labeling of vegetable seed is covered in Sections 201.25 through 201.31 of the FSA Regulations. Section 201.26 states, in part, “The label shall bear the name of each kind and variety present…. If any one kind or variety named on the label is “hybrid” seed, it shall be so designated on the label.”

This means, in order to be in compliance with the FSA, the seed packets must be labeled with both the kind (e.g., tomato) and the variety (e.g., Beefsteak). If Beefsteak were a hybrid, it would have to be labeled as such on the packet.

For information regarding these questions and answers, please contact Branch Chief Richard Payne at (704) 810-8884; richard.payne@ams.usda.gov.

SEED SAMPLES: CHAIN OF CUSTODY, HANDLING, STORAGE, AND SHIPPING

When submitting seed samples to a laboratory for testing, the seed inspector or sampler is responsible for several important aspects of the process, including chain of custody, proper handling, storage, and shipping of the samples. This ensures the integrity of the seeds so that the laboratory receives a representative sample. The following guidelines provide some helpful steps.

Chain of custody:

- The inspector/sampler must always maintain control of the samples.
- When the company is handling the shipping, the inspector/sampler should ensure that the samples are properly sealed and packaged prior to leaving them with the company representative.
- Seal the samples in a manner that precludes opening and closing without leaving evidence of tampering.

Sample Preparation:

- Seal and identify each sample in a manner that correlates with the sampling documentation.
- Initial and date each sample.
- Include the name of any seed treatment present on the seed. **NOTE**: Never place sampling documentation in the sample container with treated seed. Package the samples in a manner so that treated material does not contaminate other samples within the shipment.
- Submit the individual samples in moisture proof containers whenever moisture tests are requested.

Storage and handling:

- Samples must be maintained by the sampler in a manner that prevents exposure to the elements such as heat, cold, moisture, and direct sunlight. Many samplers store their samples in an insulated cooler prior to shipment to the laboratory.
- Keep handling to a minimum, as excessive handling is detrimental to seed samples in some instances.
- Never toss, drop, or place samples in a position of being crushed or smashed under heavy objects. Low germination rates are occasionally due to excessive handling during loading, transit, unloading, and storage.
- The samples should be forwarded to the laboratory as quickly as possible after sampling.

It is impossible to cover all of the situations that will be encountered in the field when sampling and submitting seed for laboratory testing. Seed characteristics, for instance, dictate that lima bean seed requires more careful handling than pea seed. The situation and the type of seed may vary, but the overall goal is to maintain accurate documentation and to handle, store, and ship the samples in a way that ensures they continue to be representative of the lot at the time of sampling.

For information regarding this article, please contact Seed Marketing Specialist Roger Burton at (704) 810-7265; roger.burton@ams.usda.gov.

TIMELINES FOR SERVICE TESTING

The Seed Regulatory and Testing Branch (SRTB) receives numerous customer requests for interim status reports for germination tests. The charge for this service is $13 for each preliminary report, in accordance with the Agricultural Marketing Act regulations. Since requests sometimes arrive shortly after planting, when little or no information is available, it may be helpful to give an overview of the process and service testing timelines.

The length of time to complete a service test and release the report depends on several factors. Each species has its own germination period as specified in the testing rules. For example, in the International Rules for Testing Seeds (International Seed Testing Association or ISTA rules), the germination period for pea (*Pisum sativum*) is 8 days; for tomato (*Lycopersicon esculentum*) it is 14 days. The germination period may be longer if a test extension is necessary. (See Sandy Dawson's article, How to Handle Ungerminated Seeds and Insufficiently Developed Seedlings on the Final Day of the Germination Test, in this issue, for information about extending germination tests.) Planting is scheduled so that the final count occurs on a regular workday, not a weekend or holiday.

SRTB strives for a turnaround time that includes one day for receipt and login of the sample, one day for purity testing, the specified number of days for the germination period, and one day for generating the certificate. Depending on workload, seed analysis certificates are usually prepared on the same day that the germination test is completed. Tests on samples are started in the order they are received. Every effort is made to ensure that testing begins no more than five business days after receipt of the sample.

Included below is a list of the first and final evaluation days for germination tests of various kinds of seeds.

References/Abbreviations:

ISTA rules: International Rules for Seed Testing, current version
AOSA rules: Association of Official Seed Analysts Rules for Testing Seeds, current version
FSA regulations: Federal Seed Act Regulations Part 201, current version

FIELD CROPS	FIRST EVAL. DAY*	FINAL EVALUATION DAY		
		ISTA	AOSA	FSA
alfalfa	4	10	7	7
barley	4	7	7	7
beet, field	4	14	14	14
beet, sugar	4	14	10	10
Bermudagrass	7	21	21	21
bluegrass, Kentucky	7	28	21	28
bahiagrass, Pensacola	7	28	28	28
clover, alsike	4	10	7	7
clover, Ladino and white	4	10	7	7

clover, red	4	10	7	7
corn, field	4	7	7	7
cowpea	5	8	8	8
fescue, red	7	21	21	21
fescue, tall	7	14	14	14
oat	5	10	10	10
pea, field	5	8	8	8
peanut	5	10	10	10
ryegrass	7	14	14	14
sorghum	4	10	10	10
soybean	5	8	8	8
sudangrass	4	10	10	10
sunflower	4	10	7	7
timothy	5	10	10	10
wheat	4	8	7	7
tobacco	7	16	7	14

VEGETABLE CROPS	**FIRST EVAL. DAY***	**FINAL EVALUATION DAY**		
		ISTA	**AOSA**	**FSA**
bean, fava (broadbean)	4	14	14	14
bean, garden	5	9	8	8
bean, lima	5	9	9	9
beet	4	14	14	14
broccoli and cabbage	5	10	10	10
carrot	7	14	14	21
cauliflower	5	10	10	10
celery	7	21	21	21
corn, sweet	5	7	7	7
cucumber	5	8	7	7
eggplant	7	14	14	14
kale	5	10	10	10
leek	7	14	14	14
lettuce	See rules	7	7	7
melon (cantaloupe)	5	8	10	10
okra	5	21	14	14
onion	7	12	10	10
parsley and parsnip	7	28	28	28
pea	5	8	8	8
pepper	7	14	14	14
pumpkin	5	8	7	7
radish	4	10	6	6
squash	5	8	7	7
tomato	7	14	14	14
turnip	4	7	7	7
watermelon	7	14	14	14

*First evaluation based on the experience of analysts in the SRTB Laboratory and ISTA recommendations.

For information regarding this article, please contact Office Automation Clerk Carolyn Camidge at (704) 810-7263; carolyn.camidge@ams.usda.gov or Laboratory Secretary Susan Haney at (704) 810-8870; susan.haney@ams.usda.gov.

IS THE NOXIOUS-WEED SEED EXAMINATION INCLUDED IN THE PURITY TEST?

The purity analysis and the noxious-weed seed examination are separate tests. The noxious-weed seed examination is not included in the purity test. The Federal Seed Act (FSA) Regulations, Section 201.7, regarding purity records states in part, "The complete record for any lot of seed shall include (a) records of analyses, tests and examinations including statements of weed seeds, noxious weed seeds, inert matter, other agricultural seeds, and of any determinations of kind, variety, or type and a description of the methods used…" to determine them.

The seed sample for purity analysis of a specific kind of seed consists of a designated minimum weight, which is based on an approximate number of seeds per gram. The purity analysis determines the percentage of pure seed present for the kind of seed tested. It also determines the percentage of weed seed, inert matter, and other crop kinds present. If weed seeds found in the purity analysis are noxious-weed seeds, the testing laboratory indicates this as part of the purity test results, but this does not constitute a complete noxious-weed seed examination.

The seed sample for the noxious-weed seed examination consists of a designated minimum weight that is usually ten times the amount of the working weight of the purity test. In a noxious-weed seed examination, any noxious-weed seeds found are listed on the test report. The regulations of the state or country into which the seed is shipped determine which species are noxious.

A company submitting a seed sample for service testing must request the tests desired, for example purity and noxious-weed seed examinations, and submit a sufficient amount of seed for the requested tests. For example, when requesting service tests per International Seed Testing Association (ISTA) rules, one should submit at least the amount of seed that the ISTA rules specify for the Determination of Other Seeds by Number (ISTA's terminology for the noxious-weed seed examination). It is a good idea to send extra seed to offset weight loss due to humidity changes or spillage. This amount is sufficient for the purity and germination tests as well.

For information regarding this article, please contact Botanist Charlene Burton at (704) 810-8880 or charlene.burton@ams.usda.gov.

TOLERANCES AND THE FEDERAL SEED ACT REGULATIONS - PART III

Two previous Items of Interest in Seed articles (April and October 2008) introduced and discussed the concept of tolerances and specific applications of tolerances for germination and pure seed labeling and testing. This article addresses the application of tolerances to the noxious-weed seed test result.

As expressed in the previous articles, the concept of tolerance concerns how much variability is permissible from a stated value for that value still to be recognized as acceptable. More formally, there are statistically acceptable limits within which the value must fall in order for the

labeled value to be within tolerance. In other words, there is a certain amount of variation allowed from a labeled value to allow for normal statistical deviation. If a regulatory test value falls outside that acceptable range, then the seed would be out of tolerance with the labeled value.

In the enforcement of the Federal Seed Act (FSA), which is a truth-in-labeling law, tolerances and their correct application are of considerable importance. Regulatory testing will show a labeled value to be either in tolerance or out of tolerance. A finding of within tolerance indicates the labeled value is accurate or was likely to have been at the time of shipment. A value out of tolerance indicates the seed was mislabeled.

To begin the subject of noxious-weed seed in interstate seed shipments, it might first be pointed out that there is one category of noxious-weed seed for which no tolerance is permissible. Federal noxious-weed seeds are prohibited in seed regulated by the FSA that are shipped in interstate commerce and for these species, no tolerance is applied (see FSA Regulations Section 201.16(b)). The finding of even one seed of these species requires regulatory action of a serious nature. For other noxious-weed seeds, the concept of tolerance is applicable.

In enforcement of the Federal Seed Act, the Seed Regulatory and Testing Branch (SRTB) is guided by Sections 201.59 through 201.66 of the FSA Regulations in regard to tolerance. Specifically, Section 201.65 is concerned with tolerance of noxious-weed seeds in seed shipped in interstate commerce. This section includes a formula that determines the maximum number of noxious-weed seeds within tolerance. Any number of seeds beyond this number would consequently be considered out of tolerance.

The above-mentioned formula is:

> $Y=X+1+1.96\sqrt{X}$, where Y is the maximum number of noxious-weed seeds in tolerance, and X is the number of noxious-weed seeds represented by the label or test.

For example, a label reports 90 noxious-weed seeds per pound in a container of Kentucky bluegrass seed. A regulatory test subsequently found 4 noxious-weed seeds in 10 grams, the minimum working sample size for a Kentucky bluegrass noxious-weed seed examination. In order to apply the tolerance, the labeled rate per pound must be converted to the equivalent number of seeds found in the minimum working sample weight for the noxious-weed seed examination. Section 201.46, Table 1 of the FSA Regulations gives the minimum working sample size required for a noxious-weed seed examination for a given crop kind.

With the conversion rate of 453.6 grams per pound, a labeling of 90 noxious-weed seeds per pound in Kentucky bluegrass is equivalent to 2 noxious-weed seeds per 10 grams. This number can then be inserted into the previous formula to determine the maximum number of noxious-weed seeds (Y) within tolerance.

$Y=X+1+1.96\sqrt{X}$

$Y=2+1+1.96\sqrt{2}$

$Y=3+1.96(1.414)$

$Y= 5.77$

$Y=6$

The number found in regulatory testing, 4, would be within tolerance. It must be noted that for this formula to work, the original labeled value given per pound must be converted into an equivalent figure per working sample amount. Had the regulatory testing found 7 or more noxious-weed seeds rather than 4, then the labeled value would have been out of tolerance.

In the example above we have referred in general to noxious-weed seeds, rather than naming a particular species. Some states limit the total number of noxious-weed seeds, but most states place limits on particular noxious-weed seed species or combination of similar noxious-weed seed species.

The correct determination of the tolerance regarding noxious-weed seeds can be a matter of importance. The presence of noxious-weed seeds in an amount that exceeds the tolerance allowed for the labeled figure can be a very serious matter for the interstate shipper, possibly leading to lost sales, regulatory action, or even destruction of the seed. At the very least, a finding that the amount of noxious-weed seed in a lot of seed is out of tolerance with the labeled value may be indicative of ineffective sampling procedures, a lack of uniformity within the lot, or possibly other reasons.

For information about this article, please contact Seed Marketing Specialist Gene Wilson at (704) 810-8888; e-mail gene.wilson@ams.usda.gov.

FEDERAL SEED ACT CASES SETTLED

The following cases were settled administratively under the Federal Seed Act between September 1, 2008, and March 9, 2009. Under the administrative settlement procedure, the Seed Regulatory and Testing Branch and the firms agreed to settle the cases for the amount specified, with the firms neither admitting nor denying the charges. Official program announcements on each of these cases are accessible on the following Web site under the "Latest Releases" link: http://www.ams.usda.gov/news/newsrel.htm.

Allied Seed, LLC, Nampa, ID, has paid $3,250 for cases involving three seed shipments into Georgia, Missouri, and Virginia. Seed regulatory officials in Georgia, Missouri, and Virginia cooperated in the initial sampling and inspection. The alleged violations, while not the same for all shipments, were:

- false labeling of pure seed and other crop seed percentages and test dates; and
- failure to label the presence of noxious-weed seeds.

Allied Seed, LLC, Nampa, ID, has paid $8,450 for cases involving eight seed shipments into Georgia, Missouri, and Tennessee. Three shipments into Tennessee were subsequently shipped into Georgia where they were officially sampled. Seed regulatory officials in Georgia and Missouri cooperated in the initial sampling and inspection. The alleged violations, while not the same for all shipments, were:

- false labeling of pure seed, weed seed, other crop seed, inert matter, germination, and hard seed percentages and test dates;
- failure to label the presence of noxious-weed seeds; and
- failure to test for germination prior to interstate shipment.

Ferry-Morse, Fulton, KY, has paid $2,025 for cases involving three seed shipments into Indiana. Seed regulatory officials in Indiana cooperated in the initial sampling and inspection. The alleged violations, while not the same for all shipments, were:

- false labeling of germination percentages and test date;
- failure to properly label vegetable seed germinating "less-than-standard"; and
- failure to keep and/or supply required records.

Gerard Seed Company, Washington, NC, has paid $2,100 for cases involving four seed shipments into Georgia. Seed regulatory officials in Georgia cooperated in the initial sampling and inspection. The alleged violations, while not the same for all shipments, were:

- false labeling of germination percentages;
- failure to label the presence of noxious-weed seeds and shipper's name and address or code designation; and
- failure to test for germination prior to interstate shipment.

Lesco, Inc., Cleveland, OH, has paid $1,050 for cases involving three seed shipments into Missouri, Ohio, and Pennsylvania. A portion of the shipment into Ohio was subsequently shipped into Indiana where it was officially sampled. Seed regulatory officials in Indiana, Missouri, and Pennsylvania cooperated in the initial sampling and inspection. The alleged violations, while not the same for all shipments, were:

- false labeling of pure seed and inert matter percentages; and
- failure to show required information for a seed component.

Olean Seed, Olean, MO, has paid $1,050 for cases involving three seed shipments into Georgia and Texas. Seed regulatory officials in Georgia and Texas cooperated in the initial sampling and inspection. The alleged violations, while not the same for all shipments, were:

- false labeling of noxious-weed seeds; and
- failure to label the presence of noxious-weed seeds.

Pennington Seed, Inc., Madison, GA, has paid $14,675 for cases involving 14 seed shipments into Georgia, Kentucky, Maryland, and Virginia. The shipments into Maryland and Virginia were subsequently shipped into Pennsylvania where they were officially sampled. Seed regulatory officials in Georgia, Kentucky, and Pennsylvania cooperated in the initial sampling and inspection. The alleged violations, while not the same for all shipments, were:

- false labeling of pure seed and germination percentages, noxious-weed seeds, test date, and kind and variety name; and
- failure to label the presence of noxious-weed seeds.

Plantation Products, Inc., Norton, MA, has paid $4,225 for cases involving six seed shipments into Illinois and Indiana. The shipment into Illinois was subsequently shipped into Indiana where it was officially sampled. Seed regulatory officials in Indiana cooperated in the initial sampling and inspection. The alleged violations, while not the same for all shipments, were:

- false labeling of germination percentages;
- failure to properly label vegetable seeds germinating "less-than-standard"; and
- failure to keep and/or supply required records.

Seed Research of Oregon, Corvallis, OR, has paid $1,800 for cases involving four seed shipments into Missouri and Nebraska. Seed regulatory officials in Missouri and Nebraska cooperated in the initial sampling and inspection. The alleged violations, while not the same for all shipments, were:

- false labeling of pure seed, inert matter, and germination percentages, and kind name.

The Scotts Company, LLC, Marysville, OH, has paid $2,250 for cases involving five seed shipments into Georgia, Indiana, Kentucky, and Texas. Seed regulatory officials in Georgia, Indiana, Kentucky, and Texas cooperated in the initial sampling and inspection. The alleged violation for all shipments was:

- false labeling of germination percentages.

For information regarding this article, please contact Branch Chief Dr. Richard Payne at (704) 810-8884; richard.payne@ams.usda.gov.

TRUENESS-TO-VARIETY OVERVIEW

Each year the Seed Regulatory and Testing Branch (SRTB) conducts trueness-to-variety (TTV) field tests to determine if seed lots are properly labeled for variety, as required by the Federal Seed Act (FSA) and State seed laws. Field testing is conducted by crop experts at State universities and State departments of agriculture, in cooperation with SRTB. SRTB relies on State seed control programs to submit samples for inclusion in the TTV tests.

This spring, SRTB plans to test **sweet corn** at Southern University and A&M College, Baton Rouge, LA; **tomato**, **pepper**, and **eggplant** at the Piedmont Research Station, Salisbury, NC; **grain sorghum** and **sorghum sudangrass** at the Texas Department of Agriculture, Giddings, TX; **grain sorghum** at Clemson University, Clemson, SC; and radish, turnip, and onion in the SRTB greenhouse. We encourage all State seed control programs to submit seed samples of the above mentioned kinds (in bold) for TTV testing.

Currently, SRTB is conducting a small legume (alfalfa and clovers) TTV test at the Sandhills Research Station, Jackson Springs, NC. Last year, about 700 TTV samples were planted: summer squash and southern pea at Southern University and A&M College, Baton Rouge, LA; tall fescue at North Carolina State University Sandhills Research Station, Jackson Springs, NC; pumpkin and winter squash at North Carolina State University Piedmont Research Station, Salisbury, NC; and millets at Texas Department of Agriculture, Giddings, TX.

SRTB thanks the seed control programs in Alabama, Arizona, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Kansas, Kentucky, Louisiana, Maryland, Minnesota, Mississippi, Missouri, Nebraska, New York, North Carolina, Ohio, Pennsylvania,

South Carolina, South Dakota, Texas, Utah, Vermont, Virginia, West Virginia, and Wisconsin for participation in last year's TTV program. Information about potentially mislabeled seed is still being gathered and evaluated. Once TTV results and information have been compiled, participating States will be notified of any mislabeling.

If there are any questions concerning the TTV program or directions for submitting samples, please contact Agronomist Mike Lovelace at (704) 810-7261; michael.lovelace@ams.usda.gov.

SRTB GREENHOUSE IS OPERATIONAL

The new Seed Regulatory and Testing Branch (SRTB) greenhouse is complete and operational. The state-of-the-art greenhouse contains over 1000 ft^2 of growing space and a number of unique features to optimize growing conditions. An integrated weather station provides data for internal greenhouse environment control. The weather station coordinates with the heating, cooling, and shading system to maintain optimal growing conditions within the greenhouse. An external light meter detects sunlight and activates the supplemental full spectrum lighting system when the light intensity drops below a preset point or in response to programming that accommodates requirements of certain tests. Furthermore, the computerized irrigation system can deliver a predetermined amount of water or fertilizer to plants over a twenty-four hour period through multiple applications.

Photo by Mike Lovelace, USDA, AMS, 2008

SRTB Greenhouse

SRTB will predominantly use the greenhouse for varietal verification testing in support of the varietal labeling provisions of the Federal Seed Act. Currently, SRTB coordinates with state university personnel to grow samples in field plots for the purpose of varietal verification on a fee per sample basis. Field testing is subject to delays due to dependence on planting seasons and samples may be subject to variable field conditions. Greenhouse testing is not dependent on planting seasons like field testing, and tests for certain crops can be conducted year round resulting in more rapid test completion. Also, the controlled uniform greenhouse conditions will eliminate environmentally induced variation encountered in field testing and result in more uniform test results. In addition, conducting tests in the greenhouse by SRTB staff will reduce costs.

Photo by Mike Lovelace, USDA, AMS, 2008

Sandra Walker with tobacco plants

SRTB also plans to offer greenhouse fee-for-service testing such as trait identification and small-scale seed increase trials. Another function is the production of customer-requested reference seed and plant samples for use in variety and trait testing. For

example, SRTB utilized the greenhouse to grow pesticide-free tobacco samples for use as untreated reference material in a USDA analytical laboratory.

If there are any questions concerning the greenhouse or potential greenhouse fee-for-service testing, please contact Agronomist Mike Lovelace at (704) 810-7261; michael.lovelace@ams.usda.gov.

DISTINGUISHING BLUEBUNCH AND THICKSPIKE WHEATGRASS
PART 1: PHYSICAL CHARACTERISTICS

Bluebunch wheatgrass (*Pseudoroegneria spicata*) and thickspike wheatgrass (*Elymus lanceolatus* subsp. *lanceolatus*) are two closely related species, both belonging to the barley tribe (Hordeae) and previously to the genus *Agropyron.* While mature seeds of these two species are generally easy to separate due largely to extensive hairs on the thickspike wheatgrass seeds, immature seeds lacking pubescence are more difficult to identify. Recently, analysts have found these two species together in bulk samples from western states, prompting the need for definitive identification methods.

Two methods have proved useful in identifying these species: classical morphological comparisons and gel electrophoresis analysis of proteins. In studies conducted at the USDA Seed Regulatory and Testing Branch on a number of submitted bluebunch/thickspike mixtures, analysts determined that gel electrophoresis confirmed the results of physical separations, suggesting that both methods can accurately identify these species. This article summarizes the physical characteristics that distinguish these two species; Part 2 outlines the methods used in gel electrophoresis.

As mentioned previously, the hairs on the mature seeds allow for easy identification. Thickspike wheatgrass seeds have a villous or pubescent lemma and villous rachilla (Fig. 1) while bluebunch wheatgrass seeds have a smooth lemma and glabrous or short pubescent rachilla. Unfortunately, on immature or highly conditioned thickspike wheatgrass seeds, these hairs are often not apparent (Fig. 2). The thickspike lemma may have a slightly more coarse or granular appearance than the lemma of bluebunch seeds, though on immature seeds this is not always easy to detect. Seeds of both species are similar in size, 10-12 mm long for bluebunch wheatgrass and 9-10 mm for thickspike wheatgrass. The sinus can be U-shaped in both or sometimes V-shaped in bluebunch.

A main feature for distinguishing seeds of the two species comes from their respective shapes, especially towards the callus end. Bluebunch is linear-oblong, while thickspike is lanceolate, giving it a slightly more rounded appearance. This difference is most apparent at the callus end, where the two sides of the bluebunch lemma remain approximately parallel, while the sides of thickspike taper inward towards the callus (Fig. 3). Another important feature of the bluebunch wheatgrass seed is the ledge found on either side of the rachilla. This ledge gives the two sides of the lemma a slightly pinched look (Fig. 4), and also gives the seed a more linear appearance.

Photo by Todd Erickson, USDA, AMS, 2009

Fig. 1.—Hairs of mature thickspike wheatgrass

Photo by Todd Erickson, USDA, AMS, 2009

Fig. 2.—Lanceolate shape of immature, hairless thickspike wheatgrass

Photo by Todd Erickson, USDA, AMS, 2009

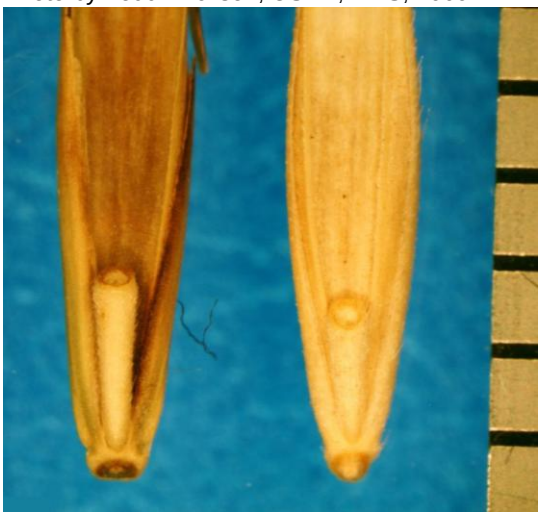

Fig. 3.—Bluebunch (left) vs. thickspike (right) wheatgrasses, callus end; linear-oblong shape of bluebunch vs. lanceolate shape of thickspike

Photo by Todd Erickson, USDA, AMS, 2009

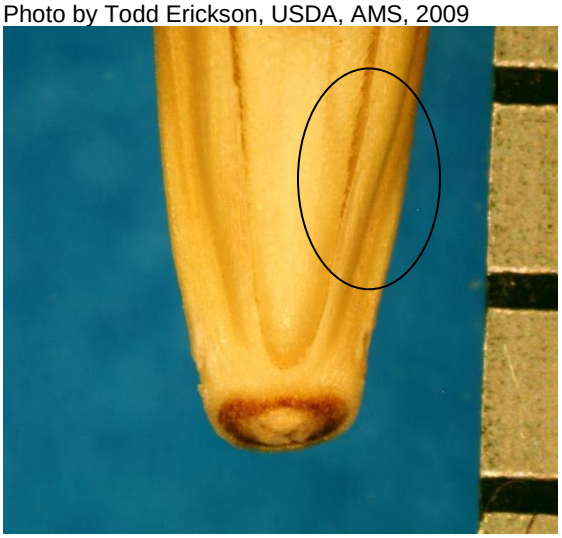

Fig. 4.—Bluebunch wheatgrass ledge

Note: Ruler marks indicate 1 mm increments.

The analyst will need to spend some time becoming familiar with seed characteristics of the two species before being able to confidently distinguish immature thickspike and bluebunch seeds. Part 2 explains how gel electrophoresis can confirm identification.

For more information on this article, please contact Botanist Todd Erickson at (704) 810-7266; todd.erickson@ams.usda.gov.

DISTINGUISHING BLUEBUNCH AND THICKSPIKE WHEATGRASS
PART 2: PROTEIN ELECTROPHORESIS

Bluebunch wheatgrass (*Pseudoroegneria spicata*) and thickspike wheatgrass (*Elymus lanceolatus* subsp. *lanceolatus*) are perennial forage grasses, palatable to livestock and wildlife. Because these closely related species can be difficult to distinguish in a purity test, Seed Regulatory and Testing Branch (SRTB) Plant Physiologist Yujia Wu has developed a new method using isoelectric focusing (IEF) protein-gel separation technology. Three test samples and two thickspike wheatgrass check samples (IEF gel samples 1 and 2) and two bluebunch wheatgrass check samples (IEF get samples 3 and 4) were used in the study. Each test sample was separated into bluebunch wheatgrass (IEF gel samples 6, 8, and 10) and thickspike wheatgrass (IEF gel samples 5, 7, and 9) using morphological seed characteristics. Previous studies determined that wheatgrass protein from seedlings was more suitable than that from seeds for an IEF gel protein separation procedure.

The sample seeds were germinated on wet filter paper in 6 x 9 inch germination boxes at 15-25°C alternating temperature with 8 hours light/day for two weeks. Seedlings were extracted by grinding with extraction buffer (75 mM Tris pH 7.5 and 0.1% β-mercaptoethanol), and then centrifuged at full speed for 10 minutes at 4°C. Supernatants were loaded onto pH 3-10 (Fig. 5) and pH 5-7 IEF (Fig. 6) gels and electrophoresed. The resulting gels were stained with an esterase isozyme.

The results show different binding patterns in the pH 3-10 gel and the pH 5-7 IEF gel. In figure 5, pH 3-10 gel, there are two main bands near the bottom of the gel, and it is difficult to distinguish between the bluebunch and thickspike wheatgrass species.

Greater separation of the esterase proteins is obtained with the pH 5-7 IEF gel, figure 6, with more than seven main bands visible. The protein banding pattern clearly demonstrates that the top four bands are different between bluebunch wheatgrass and thickspike wheatgrass. Protein separation using a pH 5-7 IEF gel with esterase staining is a suitable method to distinguish between bluebunch and thickspike wheatgrasses.

Photo by Dr. Yujia Wu, USDA, AMS, Dec. 2008

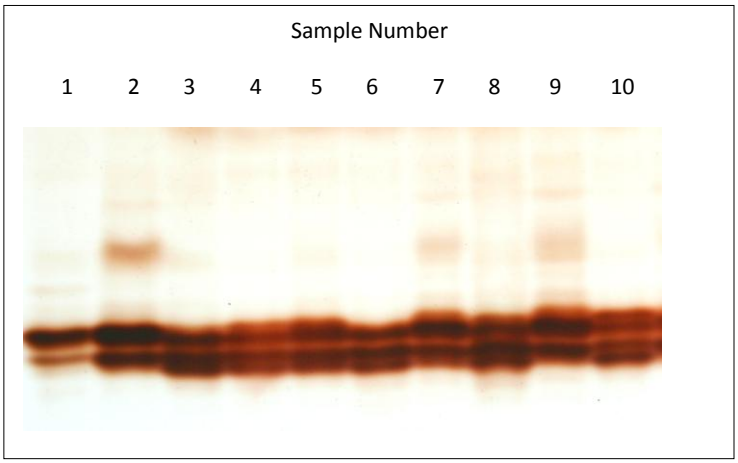

Fig. 5.—IEF gel, pH 3-10. A similar, un-separated banding pattern is visible in the thickspike wheatgrass check samples (1 and 2) and the bluebunch wheatgrass check samples (3 and 4). Samples 5/6, 7/8, and 9/10 are visually separated test samples.

Photo by Dr. Yujia Wu, USDA, AMS, Jan. 2009

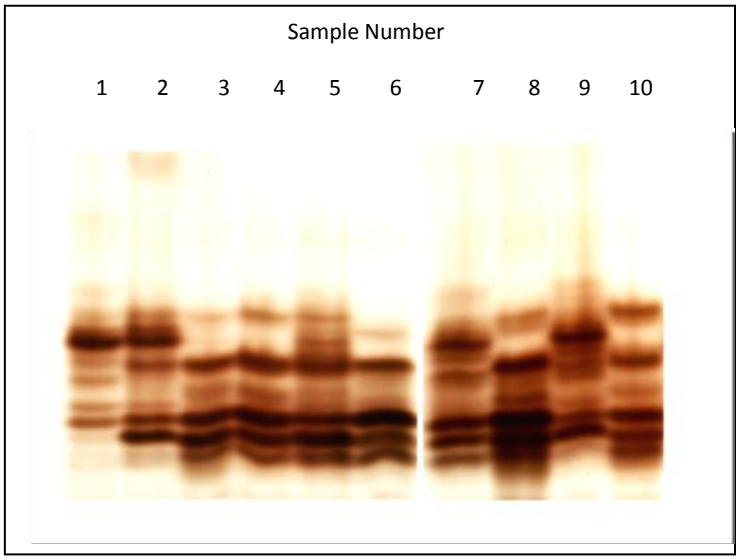

Fig 6.—IEF gel, pH 5-7. A different banding pattern is visible in the thickspike wheatgrass check samples (1 and 2) and bluebunch wheatgrass check samples (3 and 4). Samples 5/6, 7/8, and 9/10 are visually separated test samples. Test samples 5, 7, and 9 have a similar banding pattern to the thickspike check samples 1 and 2. Test samples 6, 8, and 10 have a banding pattern similar to bluebunch check samples 3 and 4.

For information regarding this article, please contact Plant Physiologist Dr. Yujia Wu at (704) 810-7267; yujia.wu@ams.usda.gov.

CLASSIFICATION OF PURE AND INERT BERMUDAGRASS SEED

The Federal Seed Act (FSA) regulations and the Association of Official Seed Analysts (AOSA) rules define a pure Bermudagrass (*Cynodon dactylon*) seed as a caryopsis or piece of broken caryopsis larger than one-half its original size. In order to determine if a broken seed is pure seed or inert matter, analysts commonly compare the broken seed in question to intact seeds.

This comparison method introduces subjectivity because of variations in seed maturity, size, shape, and type of break (diagonal, transverse, uneven).

In 1984, then Federal Seed Laboratory Botanist Rodney W. Young published a study in the AOSA Newsletter. His study focused on using the embryonic area to identify the "halfway" point of the Bermudagrass seed. The results of his study indicated an average embryo length of approximately 50.3 percent of total seed length with a standard deviation of approximately 4.5 percent. Based on these measurements, the following guidelines were developed as an aid to help evaluate seeds with transverse breaks:

1. A basal portion of the seed containing the entire embryo plus additional tissue (of any amount) beyond the tip of the embryonic area is considered pure.
2. A basal portion of the seed containing the entire embryo with no additional tissue or with part of the embryo missing would be classified as inert.
3. An upper portion of the seed containing embryo tissue would be considered pure.
4. An upper portion of the seed lacking embryo tissue would be classified as inert.

While these guidelines may not be applicable in all cases due to natural variation among seeds, the embryo area of a seed fragment is useful in determining the halfway point in a transverse break. If the break is uneven or diagonal, the embryo (if present) and the remaining portion of the seed fragment should be used to judge whether the fragment is greater than 50 percent of the original seed size (i.e., pure seed) or 50 percent or less than the original seed size (i.e., inert matter). See accompanying figures for examples. In Fig. 9 both seed pieces are classified as inert matter because neither piece was determined to be larger than half the size of the original seed.

Photo by Ernest Allen, USDA, AMS, 2009

Fig. 7.—Intact Seed = pure

Photo by Ernest Allen, USDA, AMS, 2009

Fig. 8.—Transverse break; Upper = pure. Lower = inert.

Photo by Ernest Allen, USDA, AMS, 2009

Fig. 9.—Even break; Upper = inert. Lower = inert.

Photo by Ernest Allen, USDA, AMS, 2009

Fig. 10.—Transverse break; Upper = inert. Lower = pure.

Photo by Ernest Allen, USDA, AMS, 2009

Fig. 11.—Diagonal break; Upper = pure. Lower = inert

Photo by Ernest Allen, USDA, AMS, 2009

Fig. 12.—Diagonal break; Upper = inert. Lower = pure.

Photo by Ernest Allen, USDA, AMS, 2009

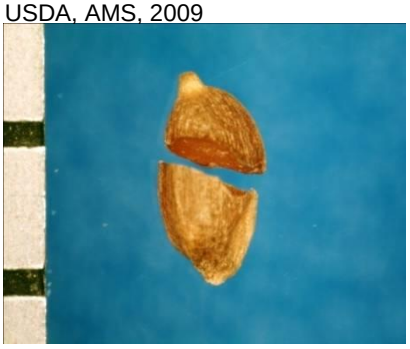

Fig. 13.—Uneven break; Upper = inert. Lower = pure.

Note: Ruler marks indicate 1 mm increments. The upper portion is the end containing the stylar tip. The lower or basal portion is the end containing the embryo, opposite the stylar tip.

Reference

Young, R.W. 1984. Bermudagrass, *Cynodon dactylon* var. *dactylon*, Classification of Pure Seed and Inert. AOSA Newsletter, Vol. 58, No. 1: 190-191.

For information regarding this article, contact Botanist Ernest L. Allen at (704) 810-8873 or ernest.allen@ams.usda.gov.

UNDERSTANDING THE SEED UNIT: RYEGRASS AND TALL FESCUE

The Federal Seed Act (FSA) Regulation, Section 201.47a, refers to the seed unit as "the structure usually regarded as a seed in planting practices and in commercial channels." What constitutes a seed unit can vary from species to species and can also vary according to which set of rules the analyst is following. Understanding where a given species is located within a certain set of seed unit rules is necessary before one can conduct a purity test. This article explores the differences in ryegrass and tall fescue seed unit definitions between the FSA regulations, the Association of Official Seed Analysts (AOSA) Rules for Testing Seed, and the International Seed Testing Association (ISTA) Rules for Seed Testing.

One main difference between the three sets of rules lies in their organization of the definitions. When analyzing a seed under FSA regulations, the analyst must consult Section 201.47a to determine the proper seed unit definition for the species in question, and then Section 201.48 to determine whether the seed is pure. The AOSA and ISTA rules combine the seed unit definitions and pure seed definitions into one table and assign each species a pure seed unit number.

Section 201.47a of the FSA regulations is essentially a hierarchy for determining the seed unit, beginning with the broadest definition – true seeds (Section 201.47a(a)). The botanical definition of a true seed is a ripened ovule and does not take into account any attached structures. From this starting point, the analyst proceeds through the list to determine if a more specific definition is given for the species in question. If not, the analyst then returns to the previous definition. Using the example of ryegrass and tall fescue, the analyst would begin with Section 201.47a(a), True seeds. Section 201.47a(b) refers to the grass family, to which these two species belong. The first definition under Section 201.47a(b)(1) states that caryopses and single florets are considered seed units. The analyst must then search through the remainder of Section 201.47a(b) to see if ryegrass or tall fescue is mentioned. Since they are not, the analyst would return to the previous applicable seed unit definition of ryegrass and tall fescue:
(1) Caryopses and single florets. Note that multiple florets are not included in this definition. If a ryegrass or tall fescue multiple floret is found in a purity test, the analyst would separate it into single florets, and each single floret would be considered a seed unit. The analyst would then proceed to Section 201.48 to determine whether each of those seed units should be considered pure seed or inert matter.

Under AOSA rules, ryegrass and tall fescue are assigned pure seed unit (PSU) #21. As in the FSA regulations, caryopses and single florets are considered seed units. However, multiple florets are treated differently. If the florets are all fertile, or if they extend beyond the tip of the basal fertile floret, then they are separated, just as they are by FSA regulations. However, if an empty floret is attached to a fertile floret and does not extend beyond the tip of the fertile floret, the two are left attached per AOSA rules. According to the FSA regulations, the empty floret must be separated and classified as inert matter, although the total weight of these empty florets is often negligible. Note that PSU #21 defines the pure seed as well as the seed unit, such as "piece of caryopsis larger than one-half of the original size."

The ISTA pure seed unit number for ryegrass and tall fescue is 33. The main difference between the ISTA definitions and the AOSA and FSA definitions, again, lies in the treatment of multiple florets. ISTA and AOSA rules are similar in that they define single and multiple florets

according to whether the tip of the attached floret extends beyond the tip of the basal floret. ISTA rules classify these structures as multiple seed units (MSU). The AOSA rules, however, require separation of these structures into single florets whereas per ISTA rules they remain intact. The analyst weighs the single units and multiple units separately, but includes both in the pure seed fraction of the purity test. The analyst will need to examine ryegrass or tall fescue multiple florets closely to determine if the tips of the attached florets extend beyond the tips of the basal floret. Note that awns are not included when considering the length of the floret. The analyst will also likely need to view the florets over a diaphanoscope to determine if the florets are fertile or sterile. A number of unique situations can arise when dealing with multiple florets, and the three sets of rules often treat each situation in a slightly different manner. The table below summarizes many of the ryegrass and tall fescue structures that may be found in a purity examination and how each set of rules views these structures.

Structure	**FSA**	**AOSA**	**ISTA**
Single floret	Leave intact	Leave intact	Leave intact
Empty floret extends beyond tip of basal fertile floret	Separate	Separate	Leave intact, Classify as MSU
Empty floret does not extend beyond tip of basal fertile floret	Separate	Leave intact	Leave intact
Fertile floret extends beyond tip of basal fertile floret	Separate	Separate	Leave intact, Classify as MSU
Fertile floret does not extend beyond tip of basal fertile floret	Separate	Separate	Leave intact
3 or more attached fertile florets	Separate	Separate	Leave intact, Classify as MSU
Attached glumes	Separate, classify glumes as inert	Separate, classify glumes as inert	Leave intact, Classify as MSU

While the bulk of a ryegrass or tall fescue purity test is usually straightforward, clearly, some situations require that the analyst pay close attention to certain seeds and refer back to the applicable rules. Doing so will help to ensure uniformity between analysts and seed laboratories.

For more information on this article, please contact Botanist Todd Erickson at (704) 810-7266; todd.erickson@ams.usda.gov.

HOW TO HANDLE UNGERMINATED SEEDS AND INSUFFICIENTLY DEVELOPED SEEDLINGS ON THE FINAL DAY OF THE GERMINATION TEST

Seed testing rules concerning evaluations at the end of the prescribed germination test period are sometimes confusing, especially rules concerning insufficiently developed seedlings and ungerminated seeds. A brief review of Federal Seed Act (FSA) regulations follows with

comparisons to the Association of Official Seed Analysts (AOSA) and International Seed Testing Association (ISTA) rules. Always consult the official rules when testing seeds.

FSA Regulations Part 201

1. Remove all **normal** seedlings from the substrate, count, and record. If insufficiently developed seedlings (seedlings in which the essential structures have not developed sufficiently for evaluation) remain, the test may be extended. See items 6 and 7 below.

2. Remove seeds that remain hard due to a lack of imbibition caused by impermeable seed coats. Count these and classify as **hard** seed according to FSA Regulations Section 201.57.

3. Remove, classify, count, and record all **abnormal** seedlings.

4. Remove, count, and record as **dead**, any seeds that are soft and moldy.

5. Test **imbibed ungerminated** (swollen or fresh) seeds for viability as required per FSA Regulations Section 201.57a. See the procedure for legumes, okra, cotton, and dichondra, item 7 below.

6. If insufficiently developed seedlings are present with the potential to mature further, it is possible to continue the germination test with the immature seedlings for two additional days, according to FSA Regulations Section 201.58(a)(1). At this point no other seeds or seedlings will remain on the substrate.

7. The rules concerning test extension are different for legumes, okra, cotton, or dichondra. According to FSA Regulations Section 201.57, if there are insufficiently developed seedlings or swollen seeds of these kinds present, remove and classify all of the other seedlings and seeds, including hard seeds, and then continue the test for 5 additional days with the insufficiently developed seedlings and swollen seeds. Extend swollen seeds of flatpea in test for 14 days when germinating at 15-25°C, or for 10 days when germinating at 20°C.

   References – FSA Regulations
   Interpretation of remaining seeds and seedlings: Section 201.56
   Hard seeds: Section 201.57
   Dormant seeds: Section 201.57a
   Retesting: Section 201.55

Association of Official Seed Analysts (AOSA)

The AOSA rules governing germination test evaluation are basically the same as the FSA regulations. Note that AOSA rules list families instead of common names of the groups that may be extended for 5 days, i.e. members of Convolvulaceae, Geraniaceae, Malvaceae, and Fabaceae, per the AOSA Rules for Testing Seeds 4.9 d.

References – AOSA Rules for Testing Seeds

Evaluation: 4.5
Definitions (normal, abnormal, hard, dormant): 4.2
Retesting: 4.6
Duration of test: 4.9 d

International Seed Testing Association (ISTA)

- The ISTA germination test extension procedure differs from that of the FSA or the AOSA. According to the International Rules for Seed Testing 5.6.4, the germination test may be extended for 7 days or up to half the length of the designated test period for longer tests, when necessary, such as in situations when some seedlings are insufficiently developed. Continue the test with the immature seedlings only. Remove all other seedlings and seeds from the substrate and classify or test further as indicated in section 5.6.5.3.

- When the remaining ungerminated, imbibed (fresh) seeds constitute 5% or more of the test sample, the analyst must determine their germination potential by tetrazolium, dissection, or embryo excision per the International Rules for Seed Testing, 5.6.5.3.

  References – International Rules for Seed Testing
  Evaluation: 5.6.5
  Duration of the test: 5.6.4
  Definitions, ungerminated seeds: 5.2.7, 5.2.7.1, 5.2.7.2, 5.2.7.3, 5.2.7.4
  Ungerminated Seed, procedures (hard, dormant, fresh): 5.6.5.3
  Retesting: 5.7

For information regarding this article, please contact Botanist Sandy Dawson; (704) 810-7270 or sandy.dawson@ams.usda.gov.

PROFICIENCY TEST ON BARLEY SEEDS

Seed Regulatory and Testing Branch (SRTB) Plant Pathologist Sandra Walker participated in a proficiency test from the International Seed Testing Association (ISTA). Nine samples of barley were evaluated for the presence of the pathogen *Ustilago nuda* using ISTA method 7-013. The method involves soaking seeds in sodium hydroxide which softens the seed coat and endosperm. Softening permits separation of the embryo from the rest of the seed by washing. After clearing the cells by boiling the embryos in a solution containing lactic acid, the fungal mycelium in the embryo is visible under microscopic examination. The mycelium, if present, appears as golden-brown strands in the embryo.

SRTB is an ISTA accredited laboratory and participation in proficiency tests is a part of maintaining that accreditation in seed health testing. Proficiency tests evaluate the ability of the participating laboratory to perform the designated tests in a timely manner and to achieve the expected results.

For information regarding this article, please contact Plant Pathologist Sandra Walker at (704) 810-7268 or sandra.walker@ams.usda.gov.

SOUTHERN ASSOCIATION OF AGRICULTURAL SCIENTISTS MEETING

Seed Regulatory and Testing Branch Agronomist Mike Lovelace, Plant Pathologist Sandra Walker, and Plant Physiologist Yujia Wu attended the Southern Association of Agricultural Scientists (SAAS) meeting in Atlanta, GA, February 1-3, 2009, which consisted of joint meetings of various plant science disciplines. Plant Pathologist Sandra Walker attended the Southern Division meeting of the American Phytopathological Society (APS). APS provided updated information on Asian soybean rust and wheat stem rust Ug99. Agronomist Mike Lovelace attended the Southern Branch of the American Society of Agronomy meeting where he listened to presentations and read posters pertaining to new traits that recently became commercially available for new varieties. Plant Physiologist Yujia Wu also attended the Southern Division meeting of the American Society of Agronomy as well as the Biochemistry and Biotechnology Southern Division meeting. Dr. Wu shared information and ideas with other scientists and attended seminars concerning molecular cloning techniques and the natural distribution of noxious-weed seeds in the southern United States.

For more information about this article, please contact michael.lovelace@ams.usda.gov, sandra.walker@ams.usda.gov, or yujia.wu@ams.usda.gov.

NEW SCST INTERNATIONAL COMMITTEE

The Society of Commercial Seed Technologists (SCST) has formed a new "International Committee." The committee chair is Pat Brownfield, President of BioDiagnostics West, LLC. The committee consists of members from private and public seed testing laboratories, seed trade organizations, and a representative from the Seed Regulatory and Testing Branch.

The committee's mission is to "promote and preserve the global relevance and stature of the Society of Commercial Seed Technologists (SCST), the Registered Seed Technologists (RST), and further the use of the Association of Official Seed Analyst (AOSA) Rules for Testing Seeds to facilitate the movement of seed internationally." Brochures explaining the committee's mission, principles, and objectives are available from Pat Brownfield at pat.brownfield@bdwtesting.net or through Anita Hall, the Executive Director of SCST.

For information regarding this article, please contact the OECD Seed Schemes Program Manager Perry Bohn at (704) 810-7262; perry.bohn@ams.usda.gov or Anita Hall, Executive Director of SCST at www.seedtechnology.net.

CSA OR RST! WHAT IS THE DIFFERENCE?

Are you a Certified Seed Analyst (CSA) or a Registered Seed Technologist (RST)? Do you know the difference between the two? Maybe the two are the same but are acknowledged by a different name. Only a few differences separate the two although they share the same purpose in seed testing.

Certified seed analysts are from official laboratories of government regulatory agencies and institutions such as State, Federal, and university laboratories; registered seed technologists are traditionally from commercial or private seed testing laboratories, but in recent years also may include analysts in government laboratories. The Association of Official Seed Analysts (AOSA)

sponsors the CSA program, whereas the Society of Commercial Seed Technologists (SCST) sponsors the RST program. Both share the purpose of promoting uniformity and harmonization among purity and germination testing laboratories and among seed analysts. CSAs and RSTs contribute beneficially to the level of quality assurance for customers by providing quality service and uniformity in testing.

Two years of experience are required prior to taking the examination for certification or registration. Potential RSTs must accumulate 100 points from workshops, college courses, and/or additional work experience. Prior to examination, potential RSTs are required to organize a seed collection (herbarium) with a minimum of 150 species. The seed collection helps the potential RST prepare and study for the seed identification section of the examination and is presented to the board of examiners at the time of the examination. A qualified person such as a supervisor or RST from the training laboratory helps plan and implement a tutorial program. When complete, the tutor must sign the program to verify the RST training. Potential CSAs perform on-the-job training for a minimum of two years and must have supervisory approval to take the examination.

Both tests consist of written and laboratory practical examinations in purity and germination. The written portion tests the analyst's knowledge of the work performed in the laboratory on a daily basis, for example calculating the working weight of a mixture or demonstrating knowledge of the parts of a seed. The purity practical portion focuses on seed separation procedures and seed identification, while the germination practical exam focuses on seedling evaluation. Both RSTs and CSAs participate in proficiency tests, seed schools, and workshops to maintain certification or registration.

Registered seed technologists must also sign a contract for the use of their acquired title, the seal, logo, and society's name. There are no contractual agreements that CSAs have to sign as an affiliate member of AOSA.

The two programs, although separate, are designed to represent an equivalent level of knowledge and expertise. The title of Certified Seed Analyst or Registered Seed Technologist represents a significant amount of training, on-the-job experience, and study that helps insure the quality and consistency of analyses performed by seed industry, commercial seed testing laboratories and seed regulatory personnel.

All Seed Regulatory and Testing Branch (SRTB) botanists, as well as Laboratory Supervisor Susan Maxon, are CSAs in both purity and germination. SRTB's most recent employee to attain CSA status is Biological Science Laboratory Technician Anitra Walker. In addition, SRTB Seed Marketing Specialist Perry Bohn is an RST (inactive).

For more information regarding this article, contact Biological Science Laboratory Technician Anitra Walker at (704) 810-7269; anitra.walker@ams.usda.gov.

NEW CERTIFIED SEED ANALYST

Photo by Dr. Yujia Wu
USDA, AMS, 2008

Anitra Walker

Congratulations to Seed Regulatory and Testing Branch (SRTB) employee, Anitra Walker, who recently achieved the designation of Certified Seed Analyst (CSA) in both purity and germination. Through conscientious work and study along with training and support from the SRTB staff, Anitra has earned the distinction of being the first Biological Science Laboratory Technician in SRTB to acquire this status. She passed the Association of Official Seed Analysts CSA examination for germination in 2007 and the examination for purity in 2008.

See Anitra's article, "CSA or RST! What is the Difference?" in this issue of the Items of Interest in Seed.

For information regarding this article, contact Laboratory Supervisor Susan Maxon at (704) 810-8877; susan.maxon@ams.usda.gov.

RYEGRASS FLUORESCENCE LIST

Open the pdf file below to view the current ryegrass fluorescence list by the National Grass Variety Review Board. Access the Association of Official Certifying Agency's Web site for additional reports and information at http://www.aosca.org/VarietyReviewBoards/Grass.html.

VFL0309.pdf

PLANT VARIETY PROTECTION CERTIFICATE STATUS

Check the status of certification and search for expired certificates by accessing the Plant Variety Protection Office's Web site and entering their Public Access Databases at http://www.ams.usda.gov/science/pvpo/PVPindex.htm or http://www.ars-grin.gov/cgi-bin/npgs/html/pvplist.pl.

CALENDAR OF EVENTS

Federal Seed School **Gastonia, NC**	**May 11-15, 2009**
Seed Grader Training and Examination	***May 13-14, 2009**
Association of Official Seed Analysts (AOSA) Annual Meeting Fort Collins, CO	May 30-June 5, 2009
Organization for Economic Cooperation and Development (OECD) Seed Schemes Annual Meeting Paris, France	June 8-13, 2009
International Seed Testing Association (ISTA) Annual Meeting Zurich, Switzerland	June 12-20, 2009
American Seed Trade Association (ASTA) Annual Meeting Scottsdale, AZ	June 20-24, 2009
Association of Official Seed Certifying Agencies (AOSCA) Annual Meeting Portland, OR	June 28 –July 1, 2009
Association of American Seed Control Officials (AASCO) Annual Meeting Scottsdale, AZ	July 19-23, 2009
Federal Seed School **Gastonia, NC**	**August 10-14, 2009**

Seed Regulatory and Testing Branch (SRTB)-sponsored training is shown in **bold**.
*Tentatively scheduled

For further information regarding the Calendar of Events, contact Branch Secretary Winston Robinson at (704) 810-8871; winston.robinson@usda.gov.

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"Seeds provide more food for the human race than any other plant or animal.… About one-fourth of the human energy demands of the United States are provided by cereal seeds, and seeds account for nearly three-quarters of the human diet in the rest of the world."

From the Introduction: "Seeds: The Definitive Guide to Growing, History & Lore"
Peter Loewer, Timber Press, 2005

(Contributed by Seed Regulatory and Testing Branch Botanist Sandy Dawson)