



Seed Regulatory and Testing Division

# ITEMS OF INTEREST IN SEED

2017



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## EDITOR'S NOTES

*"I have great faith in a seed. Convince me that you have a seed there, and I am prepared to expect wonders"*

- Henry David Thoreau

*The Dispersion of Seeds (1860-1861)*

The staff at the Seed Regulatory and Testing Division (SRTD) understand the amazing impact that seeds have on our lives and the importance of our industry. It is incredible how quickly some noxious-weed seeds can spread and impact the yield of a farmer's crop, which is why testing for noxious-weed seeds is a large part of what we do at SRTD. This issue of the Items of Interest in Seeds features articles on problematic seeds such as Palmer Amaranth and an article describing noxious weeds listed under the Federal Seed Act.

This issue also goes into detail of the problems faced while testing bahiagrass, such as determining pure seed units and how to use sulfuric acid to help scarify bahiagrass for germination. Another article describes issues of determining annual and perennial ryegrass through esterase banding techniques.

Outside the laboratory, our Seed Marketing Specialists enforce the Federal Seed Act and support State regulatory programs. A helpful article on properly labeling seed under the Federal Seed Act is in this issue as well as an article explaining the difference between the noxious weed list and noxious-weed seed list.

As always, please let me know if you have suggestions for future topics by sending an email to [elizabeth.tatum@ams.usda.gov](mailto:elizabeth.tatum@ams.usda.gov).

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

Elizabeth Tatum  
IOI Editor

## ACID SCARIFICATION METHOD FOR BAHIAGRASS VARIETIES OTHER THAN PENSACOLA

The standard method to germinate varieties of bahiagrass other than Pensacola is for seed analysts to remove the glumes, lemma and palea in order to reach optimum germination percentages. These structures are thick enough to inhibit water uptake by the bahiagrass seeds. Side by side comparative germination tests of caryopses that have been deglumed, versus intact bahiagrass seeds show that the degluming method achieves far superior germination.

Another bahiagrass germination method listed in the ISTA rules section 5.6.3.1 is acid scarification. Acid scarification takes less time and the embryo is less likely to be pierced and damaged. However, working with acid is extremely dangerous. The following figures outline SRTD's procedure for conducting this test.



Figure 1: Safety equipment



Figure 2: Seeds prior to acid-wash



Figure 3: Seeds during acid wash

Figure 1: Safety equipment needed for the procedure are acid resistance gloves, acid resistance lab coat/apron, and full face goggles/shield.

Figure 2: Seeds are placed in strainer in a deep petri dish with sulfuric acid.

Figure 3: The seeds are submerged in the acid and are continuously swirled.



Figure 4: Rinsing



Figure 5: Check pH

Figure 4 and 5: Once the allocated time is up, carefully remove strainer from acid, submerge in fresh water, and swirl gently. Multiple washes are required to remove all the acid. Monitor the waste wash with the pH strip. Once the strip reaches pH 7, it is generally safe to pour the waste water down the drain.



Figure 6: Disposing of acid



Figure 7: Seeds Drying

Figure 6: Dispose of the concentrated acid. It is best to add acid to water. Carry waste in an acid resistance container. Be careful not to splash.

Figure 7: Once the seeds are washed, spread them on paper to dry. Seeds can be planted when they are completely dry.

SRTD is currently working on finding the optimum concentration and time in which to soak the seeds in sulfuric acid that would not damage the embryo. This method is not currently used in AOSA or FSA rules for testing seed.

#### **Reference:**

S.H West and F. Marousky, "Mechanism of Dormancy in Pensacola Bahiagrass." *Crop Science* , p. 787–791.

For information regarding this article, contact Botanist Patsy Jackson (704) 810-8870; [patsy.jackson@ams.usda.gov](mailto:patsy.jackson@ams.usda.gov).

#### **ASSOCIATION OF OFFICIAL SEED ANALYSTS – SOCIETY OF COMMERCIAL SEED TECHNOLOGISTS ANNUAL MEETING**

The 2017 Joint Annual Meeting of the Association of Official Seed Analysts (AOSA) and the Society of Certified Seed Technologists (SCST) was held June 14- June 22 in Denver, Colorado. The meeting was held in conjunction with the International Seed Testing Association's annual meeting. SRTD staff represented the USDA's Agricultural Marketing Service at the meeting.

The purpose of the annual meetings is to update and vote on proposed changes for the AOSA rules. These rules are used by testing laboratories and State departments of agriculture around the country and help keep seed testing methods uniform in the United States. The meetings also provide an opportunity for members, which include regulatory agencies, universities, certification entities, and private seed companies, to collaborate and discuss current issues important to the seed industry.

As requested by AOSA/SCST, staff from SRTD gave several presentations, moderated committee meetings, and participated in other activities throughout the meeting. SRTD Director Ernest Allen gave a presentation consisting of an update of SRTD activities over the past year. He also participated in a panel discussion addressing various issues facing the seed industry. Livestock, Poultry, and Seed program's former Deputy Administrator, Dr. Craig Morris, provided the keynote speech at the meeting which outlined USDA, AMS's vision for the industry.

The SRTD Laboratory Supervisor, Todd Erickson, serves as the voting representative for SRTD at the meetings and is a member of the AOSA rules committee. The rules committee receives submissions for rule change proposals to ensure that they contain all of the necessary information before submitting them to the membership for review and vote. This year, there were 27 proposals for changes to the AOSA rules for testing seeds. Several proposals involved adding new species to Table 2A of the AOSA rules. There were also several proposals recommending the addition of new rules for germination, purity, or the assignment of species to pure seed definitions that best characterize their morphological characteristics. Other proposals were intended to clarify existing testing procedures. All of the submitted proposals were accepted by the membership to be added to the AOSA rules. None of the proposals submitted are expected to conflict with the Federal Seed Act or its regulations.

A complete listing of the 2017 rule proposal voting results can be found on the AOSA and SCST websites at <http://www.analyzeseeds.com/annual-meeting-proceedings/>.

For more information on this year's AOSA/SCST joint annual meeting, please visit [www.analyzeseeds.com](http://www.analyzeseeds.com). The 2018 AOSA/SCST annual meeting is scheduled for June, in Raleigh, NC.

For information regarding this article, contact SRTD Laboratory Supervisor Todd Erickson at (704) 810-887; [todd.erickson@ams.usda.gov](mailto:todd.erickson@ams.usda.gov).

## **BRAND NAMES VS. VARIETY NAMES**

There have been several issues in the past regarding distinctions between brand names and variety names. The Federal Seed Act (FSA) Regulations enforce proper seed labeling that is consistent and help the consumer accurately identify the products they are purchasing.

A brand designation is generally used to identify the owner or seller of the seed. Brand labeling is not specifically regulated under the FSA. However, section 201.8 of the FSA Regulations state in part, "The label may contain information in addition to that required by the Act, provided such information is not misleading." In addition, section 201.36b(e) of the FSA Regulations deals with advertising and states in part, "Brand names and terms taken from trademarks may be associated with the name of the kind or variety of seed as an indication of source: Provided, that the terms are clearly identified as being other than a part of the name of the kind or variety." This means that when advertising seed by a brand name, the brand name must be clearly identified as such. This section also states, "Seed shall not be advertised under a trademark or brand name in any manner that may create the impression that the trademark or brand name is a variety name." Thus in advertising, a variety name cannot be used as a brand name or as part of a brand name.

A variety is the name and/or numbers provided or assigned by the owner or developer of the variety. If the owner or developer fails to name the variety or chooses not to name the variety, the variety name then becomes the designation used when the seed is first introduced into channels of commerce (including advertising) in the United States. If a variety is advertised by an experimental designation, that experimental designation (with few exceptions) becomes the variety name and is the name that must be used by all parties advertising and labeling the seed. Once a variety name is used for a specific kind of seed, that name can never be used again by anyone for another introduction of the same kind of seed. Varieties of different kinds of seed may have the same variety name if the kinds are not closely related. Once assigned to a variety, the name remains exclusive forever, even if seed of that variety is never sold again.

For information relating to brand and variety names, please visit our website at [www.ams.usda.gov/rules-regulations/fsa](http://www.ams.usda.gov/rules-regulations/fsa) and go to the “variety names.”

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

### COMMON MISTAKES WHEN LABELING SEEDS

SRTD often receives regulatory samples with incomplete or abbreviated labeling, which are violations of the FSA. These small infractions can easily be averted simply by applying proper labeling practices. The label may contain information in addition to that required by the Act, provided such information is not misleading. Remember, one word abbreviations could have several different meanings, so complete labeling is recommended. This is an example of a correct label:

KENTUCKY 31 TALL FESCUE			
<b>PURE SEED:</b>	98.00%	<b>GERMINATION:</b>	85%
<b>OTHER CROP SEED:</b>	0.62%	<b>HARD SEED:</b>	0 %
<b>INERT MATTER:</b>	1.05%	<b>LOT NUMBER:</b>	RBM1023
<b>WEED SEEDS:</b>	0.33%	<b>ORIGIN:</b>	SC
<b>NOXIOUS WEED SEEDS / PER LB:</b>	NONE	<b>TEST DATE:</b>	01/17
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> <b>J-ROD FARMS</b>            ONE SEED AT A TIME         </div>		<b>AMS #:</b>	XOXO

To help better understand labeling as specified in the FSA Regulations, listed below are some basic requirements.

**VARIETY NAME:** The name shall not have words or terms that create a misleading impression as to the history or characteristics of the kind or variety.

**Note:** K31 or KY-31 is not correct under FSA Regulations. The correct variety name is “Kentucky 31.”

**OTHER CROP SEEDS:** Seeds other than those included in the pure seed percentage(s) for the kind, or variety should be expressed as “other crop seed(s).”

**Note:** Many of the seed labels encountered have shortened the “other crop seed” declaration to just read “crop” or “crop seed.” This wording is not correct under FSA Regulations.

Inert Matter: The label shall show the percentage by weight of Inert Matter.

**Note:** Many of the seed labels encountered have shortened the “inert matter” declaration to just read “inert”. This wording is not correct under FSA Regulations.

Germination: The label shall show the percentage of germination for each kind and variety.

Hard Seed: The label shall show the percentage of hard seed, if any is present.

**Note:** Many of the seed labels encountered have combined the germination and hard seed percentages to read as “Total Germ”. This declaration is misleading. The percentage of hard seed shall not be included as part of the germination percentage.

Noxious-weed seed: Shall be labeled at the rate of occurrence and shall not exceed the rate permitted by the State where the seed is offered for sale.

**Note:** Many of the seed labels encountered have shortened the “noxious-weed seed” declaration to read “Noxious weeds” or “Noxious.” This wording is not correct under the FSA Regulations.

For information regarding this article, contact Seed Marketing Specialist Rodney McNeace (704) 810-8879; [rodneyB.mcneace@ams.usda.gov](mailto:rodneyB.mcneace@ams.usda.gov).

## **DETERMINING PURE AND INERT SEED FOR BAHIAGRASS VARIETIES OTHER THAN PENSACOLA**

The procedure for determining the pure seed from the inert seed for bahiagrass varieties other than Pensacola can be difficult. It consists of performing a series of successive blowings at increasingly higher gate settings. After each blowing, the light fraction is examined. All seeds gapping with ergot are removed and classified as inert matter, then seeds gapping with no visible ergot are removed and checked. Using pointed forceps use light pressure and draw the forceps across the keel near the callus. The caryopsis of a pure seed will resist light pressure, while those seeds that do not will be considered inert. This procedure is followed until arriving at the light fraction containing only pure seeds. At this point, all seed remaining in the heavy fraction of the blowings can be considered pure seed.

The pure seed will contain a caryopsis which is hard, translucent, and has a well-defined embryo. The appearance of an inert floret with protruding ergot will be spongy and blackened. The color can range from orange to brownish black. As the ergot takes over, the caryopsis will lose the definition of the embryo. This fungal growth inside the seed pushes the palea and lemma apart. As soon as this gap between palea and lemma is detected, the fungus is already well established and the seed should be considered “gapping with ergot” and classified as inert.





Figure 1: Left: Good caryopsis showing embryo. Right: Pure seed with attached glumes, lemma, and palea.



Figure 2: Inert seed showing lemma and palea slightly open, by definition gaping with ergot.

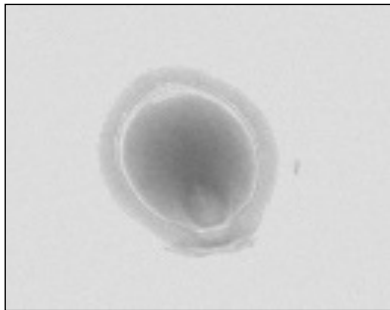


Figure 3: X-ray pure seed with lemma, palea & glumes; inside shows intact caryopsis

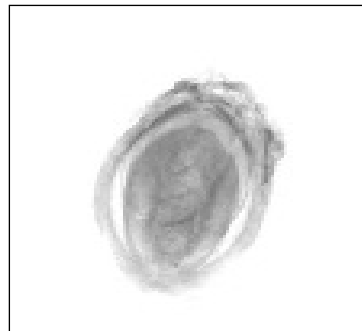


Figure 4: X-ray of seeds gaping with ergot.

#### References:

Baxter, Doris, and Lawrence O. Copeland. *Seed Purity and Taxonomy - Application of Purity Testing Techniques to Specific Taxonomical Groups of Seeds*. Michigan State University Press, 2008.

*Manual for Testing Agricultural and Vegetable Seeds, Agriculture Handbook No. 30*. U.S. Government Printing Office, 1952.

For information regarding this article, contact Botanist Charlene Burton (704) 810-8880; [charlene.burton@ams.usda.gov](mailto:charlene.burton@ams.usda.gov).

## **DNA TECHNIQUES AND VARIETY IDENTIFICATION WORKSHOP**

Dr. Yujia Wu, SRTD Plant Pathologist, attended a workshop on DNA techniques and variety identification on May 8 -10, 2017, at Naktuinbouw in Amsterdam, Netherlands. More than 40 people from 20 countries participated in the training program.

The workshop explored the developments in applying DNA techniques through UPOV (The International Union for the Protection of New Varieties of Plants), ISTA (International Seed Testing Association), and OECD (Organization for Economic Cooperation and Development). The training course consisted of theoretical lectures and lab practices and was mainly focused on DNA techniques, DNA marker types and functions, DNA marker application, using DNA in genotype description of a crop variety, and looking into the future of DNA marker techniques.

The DNA technique workshop was geared toward governments that develop policy around international seed trade. The workshop also reviewed future policy direction, new techniques suitable for crop variety testing, and provided USDA Agricultural Marketing Service with the information necessary to update and train U.S. shippers of seed in the global market.

For information regarding this article, contact Plant Physiologist Yujia Wu (704) 810-7267; [yujia.wu@ams.usda.gov](mailto:yujia.wu@ams.usda.gov)

## **ESTERASE BANDING PATTERNS IN ANNUAL AND PERENNIAL RYEGRASS BULK SAMPLES**

Genetically, annual ryegrass (*Lolium multiflorum* Lam.) is closely related to perennial ryegrass (*Lolium perenne* L.). It is difficult to distinguish the seeds by physical characteristics during a seed purity exam. The Federal Seed Act Regulations and AOSA Rules use fluorescence testing to distinguish between annual and perennial ryegrass. To provide an alternative method that identifies annual and perennial seeds, molecular markers have been developed, but can be costly. In an effort to reduce costs, SRTD Plant Physiologist Yujia Wu developed a rapid method of esterase isozyme staining to distinguish annual and perennial ryegrass by using iso-electric focusing (IEF) gel protein separation technology.

### **MATERIALS AND METHODS**

**Protein Extraction:** For this experiment, 31 annual ryegrass and 27 perennial ryegrass samples were selected. Two grams of seed from each sample were used for protein extraction after a purity exam was performed. The proteins were extracted by grinding the seed material in an extraction buffer (75 mM Tris pH 7.5 and 0.1%  $\beta$ -ME) and then centrifuging at 10,000 RPM for 10 minutes at 4 °C.

**IEF Gel Electrophoresis:** Vertical gel equipment was used for IEF gel electrophoresis. IEF gel was cast on a 1 mm thick cell plate. The power supply was programmed to run at 100V for 60 minutes, 250 V for 60 minutes, and 500 V for 30 minutes.

**Esterase Staining:** Aryl esterase stain was used to show esterase isozyme activity in the IEF gel. The staining solution contained 100 ml of 0.1 M sodium phosphate (pH 6.0), 3 ml of 1%  $\alpha$ -Naphthyl acetate and 100 mg of Fast Blue RR salt. The IEF gels were immersed in the staining solution after they completed running. They were then quickly transferred to a dark water bath

at 30 °C and allowed to incubate for 30 minutes to 2 hours. This time is approximate depending time needed to clearly see stained bands.

## RESULTS

Several distinguishable brown bands were visible on the esterase-stained IEF gel. The esterase bands made it easy to separate annual and perennial ryegrass into two banding patterns. All 31 annual ryegrass varieties displayed a pattern with two distinctive positive esterase isozyme bands (Figure 1); no bands could be distinguished in the 27 perennial ryegrass varieties tested (Figure 2).

The esterase isozyme is very stable in the extraction buffer. There was no significant degradation when comparing the 10 min to the 40 day extract (Figure 3). Different percentages of annual ryegrass were mixed with perennial ryegrass to test for sensitivity. The esterase isozyme was detected at 5% or greater annual contamination (Figure 4).

NOTE: Figures are combined images for illustration purposes.

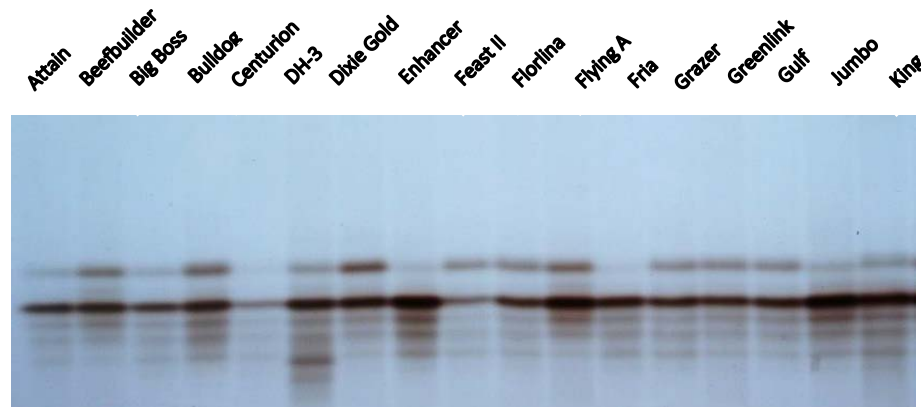


Figure 1: Esterase stained for annual ryegrass seed sample in IEF gel.

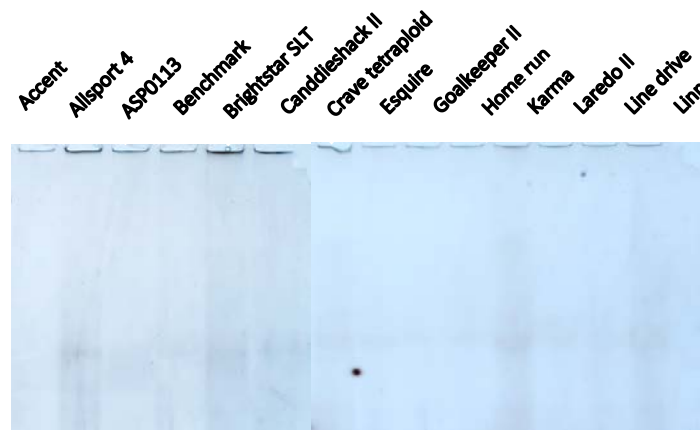


Figure 2: Esterase stained for perennial ryegrass seed sample in IEF gel. The black dot is left from staining particle Fast Blue RR salt.

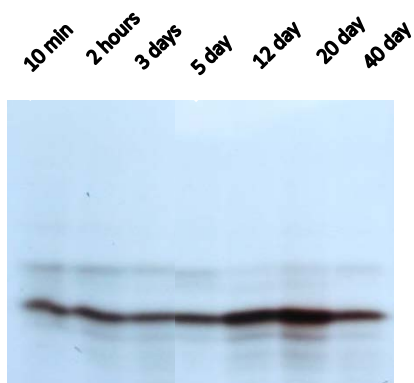


Figure 3: Esterase stained for annual ryegrass seed sample in IEF gel, the extracts were stored in -20 °C for up to 40 days.

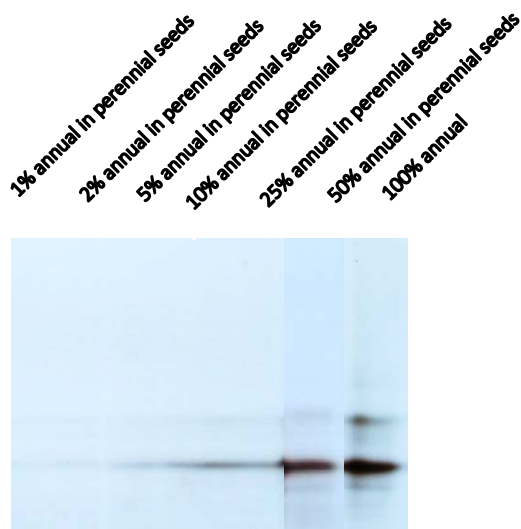


Figure 4: Esterase stained for annual ryegrass seed with varying levels of contamination

## CONCLUSIONS

The vertical IEF gel is a rapid and relatively cost effective method for ryegrass variety testing. The IEF gel pH range of 5-8 covers the majority of esterase isozyme proteins. Additionally, the supernatant from a one-step extraction can be used in the vertical IEF gel to generate highly resolved bands. The esterase isozymes were suitable to use for distinguishing annual and perennial ryegrass by IEF gel electrophoresis, in that it is easy to distinguish them by the negative and positive esterase in the gel. The extract is stable to store at -20 °C for a few weeks. Finally, sensitivity tests showed the presence of annual ryegrass seeds could be detected at amounts of 5% or higher in perennial ryegrass samples. This one-step extraction method proved to be both cost effective and efficient in ryegrass seed testing.

For information regarding this article, contact Dr. Yujia Wu (704) 810-7267; [yujia.wu@ams.usda.gov](mailto:yujia.wu@ams.usda.gov).

## FEDERAL SEED ACT CASES SETTLED

The Federal Seed Act (FSA) provides authority for the regulation of the interstate shipments of agricultural and vegetable seeds. The FSA requires that seed shipped in interstate commerce are labeled with certain information necessary for the seed buyer to make an informed choice. The labeling information and any advertisements pertaining to the seed must be truthful. Between September 1, 2016, and August 31, 2017, a total of 29 seed companies paid \$90,750 to settle alleged violations of the FSA.

For specific information regarding these violations, please visit <https://www.ams.usda.gov/rules-regulations/fsa> then [Filing a Complaint](#) and [View a list of settled FSA Cases](#). USDA's Agricultural Marketing Service (AMS) administers the FSA by leveraging its resources with State departments of agriculture. These investigations were a result of joint efforts with seed regulatory officials in Arkansas, Florida, Georgia, Indiana, Kentucky, Missouri, New Mexico, New York, Pennsylvania, Tennessee, Texas, Virginia, and West Virginia. By working collaboratively with State partners, SRTD helps promote uniformity among State seed laws and fair competition within the seed trade through the enforcement of the FSA.

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

## FEDERAL SEED ACT & SEED INSPECTOR / SAMPLER TRAINING

SRTD regulatory staff conducted several Federal Seed Act (FSA) inspector/sampler training sessions in 2017. There were two FSA trainings conducted: one during the 2017 Association of American Seed Control Officials (AASCO) annual meeting held in Charlotte, North Carolina, and a second with Minnesota State Seed Control Officials (SCO's). There were also two inspector/sampler training sessions held: with Georgia State SCO's and Washington State SCO's.

The three training sessions with MN, GA, and WA were conducted via teleconference using Power-Point presentations. This method of long distance training resulted in significant savings in travel costs and allowed the seed inspectors to continue their normal activities at the end of the training sessions.

In total, the training sessions included 24 States and 57 State Departments of Agriculture personnel.

The following topics were covered:

- Federal Seed Act: How It Works
- FSA enforcement
- USDA Seed Analysis Certificate (SAC) Sampling Guidelines
- Seed sampler safety
- Sampling principles, documentation, and problems
- Proper selection and use of seed sampling triers
- AOSA, AASCO, ISTA, and FSA sampling intensity requirements
- Proper calibration and use of automatic sampling equipment
- Proper selection and use of dividers and dividing techniques

- Planning and execution of sampling
- Sampling containers, mini bulk containers, and bulk seed
- Proper handling, storage, and shipping of samples for testing
- Seed inspector identification of obvious labeling violations

For information regarding this article or to apply for participation in an upcoming FSA or seed inspector/sampling training session, please contact Seed Regulatory Supervisor Roger Burton (704) 810-7265; [roger.burton@ams.usda.gov](mailto:roger.burton@ams.usda.gov).

## **INTERNATIONAL SEED TESTING ASSOCIATION ANNUAL MEETING**

SRTD Deputy Director Ernest Allen participated in the annual meeting of the International Seed Testing Association (ISTA), June 19-22, 2017, in Denver, Colorado.

The 2017 meeting was held in collaboration with the Association of Official Seed Analysts (AOSA) and the Society of Commercial Seed Technologists (SCST). This meeting was the first time that the three seed testing organizations held a joint annual meeting. The meeting generated a collaborative environment where seed scientists from around the world could network and discuss current issues facing the global seed industry. Dr. Craig Morris, former Deputy Administrator of the USDA Livestock, Poultry, and Seed Program, gave the keynote address at the meeting. His message focused on cooperation between the organizations in attendance and stressed the importance of the role the seed industry plays in agriculture.

The meeting consisted of several reports from committees within ISTA which included updates on current and future projects, finalized projects, and rule proposals submitted by various committees. Ernest Allen and Dr. Steve Jones (Canadian Food Inspection Agency) led a discussion on the 2018 ISTA rule proposals and led the voting the following day. Dr. John Wiersema (USDA Agricultural Research Service) presented on the activities of the Nomenclature Committee. Committee reports can be viewed on [ISTA Web site](#).

At the Ordinary Meeting on June 22, Ernest Allen served as the voting delegate on behalf of the Agricultural Marketing Service, which is the U.S. Designated Authority to ISTA. Of the 77 ISTA member countries, 28 were represented at the meeting. Twenty-four Designated Members entitled to vote at the Ordinary Meeting were present, exceeding the required quorum. ISTA President, Craig McGill (New Zealand), gave the welcome address and chaired the Ordinary Meeting.

Decisions of the Ordinary Meeting:

- ISTA annual membership fees for 2016 will remain unchanged. No increase was proposed by the Executive Committee or the Secretariat of the organization.
- There were a total of 21 proposals submitted to the membership for voting. Approved rule changes which will take effect January 1, 2018, include the following:
  - Clarification of requirements for the number of secondary roots necessary when the primary root is defective for Glycine Max. The new rule (5.2.7.2) maintains that "...at least 3 secondary roots equal to or greater than half of the length of the

hypocotyl must be present for normal seedlings.” *This rule change does not harmonize with AOSA or FSA, where more discretion is given to the analyst. for example, when there are two strong secondary roots. SRTD voted not to accept this rule.*

- Deletion of the words ‘encrusted seed’ from seed lot size in chapter 11. *Deleting ‘encrusted seed’ from chapter 11 changes how maximum seed lot sizes are calculated or encrusted seed species. This change could force U.S. companies split seed lots if maximum lot weights are exceeded. SRTD voted not to accept this rule.*
- Clarification that seed partially transformed into ergot bodies should be counted as ergot. 3.2.1 Pure seed: “The following structures...unless transformed into partially or fully ergotised visible fungal sclerotia, smut balls, or nematode galls...” *AOSA passed a similar proposal at the 2017 meeting. SRTD voted to accept this rule.*
- The Bulking and Sampling Committee voted to revise chapter 18 in its entirety. The revised version is intended to be more user friendly by revising the order of subjects and making the text throughout more concise. *SRTD voted to accept the changes to this chapter.*
- For a complete list of changes approved during the Ordinary meeting please visit the ISTA website at [www.seedtest.org](http://www.seedtest.org).

Next year’s ISTA Congress is scheduled for June 11-14, 2018, in Japparo, Japan.



**Team LPS attends the first joint meeting of AOSA, SCST, and ISTA. L to R – Anitra Walker, Todd Erickson, Patsy Jackson, Craig Morris, Lan Chi Trinh, and Ernest Allen.**

For more information, contact SRTD Director Ernest Allen at (704) 810-8884; [ernerst.allen@ams.usda.gov](mailto:ernerst.allen@ams.usda.gov).

## NORTHEAST SEED ANALYST WORKSHOP

SRTD Seed Marketing Specialist Lan-Chi Trinh traveled to Harrisburg, PA, to attend the Northeast Seed Analyst Workshop (NESAW) hosted January 18-19, 2017, by the Pennsylvania Department of Agriculture.


Lan-Chi Trinh presented information on how to identify seed to family and participated in seed testing discussions. Representatives of State seed laboratories of the Delaware, Georgia, Maryland, New York, Pennsylvania, and Virginia Departments of Agriculture attended. Industry representatives from Keystone Seed Laboratory and Seedway, Inc. also attended.

The focus for this year's workshop was basic seed testing. Johnny Zook, from PA Department of Agriculture, demonstrated the new ryegrass fluorescence formula and new mixture calculations. Kyle Arvin from NY Department of Agriculture and Markets gave a session on seed structures, botany terms, scientific names, and using seed keys to identify seeds.


By the group's preference, NESAW is unstructured in that it has no officers, dues, constitution, or by-laws. State and Federal laboratories volunteer to host the workshop and NESAW participants select the topics covered. We thank the Pennsylvania Department of Agriculture for hosting this year's NESAW meeting.


For information regarding this meeting, contact Seed Marketing Lan-Chi Trinh at (704) 810-7272; [lan-chi.trinh@ams.usda.gov](mailto:lan-chi.trinh@ams.usda.gov)

## NOXIOUS- WEED SEEDS SHOWCASE

<i>Avena sterilis</i>	Common names: Animated Oat, Sterile Oat	Family name: Poaceae
<p><i>Avena sterilis</i> is an abundant weed in cereal fields and is a noxious contaminant. It competes with common crops such as wheat and oat which reduces the grower's yield. Each plant produces a large amount of seeds. The seeds can grow in moderately fertile soil in full sun. The flowers are sometimes used for bouquets or companion pot plants.</p>		 <p>Cappers, Neef, Bekker 2009</p>



<i>Hydrilla verticillata</i>	Common Names: Hydrilla, Water Thyme	Family: Hydrocharitaceae
<p><i>Hydrilla verticillata</i> is an herbaceous annual or perennial aquatic weed. It has long branching stems that reach the surface of the water and form dense mats. It can grow in almost any freshwater body. Hydrilla is recognized as one of the most invasive weeds in the world; an infestation can choke waterways and public water supplies, block piers, plug irrigation pumps, and harbor types of algae that attract mosquitoes. Hydrilla received its name from Greek mythology, the 9-headed serpent Hydra because of its regenerative abilities.</p>		 <p>Steve Hurst, USDA NRCS PLANTS Database, Bugwood.org</p>

<i>Setaria pallide-fusca</i>	Common names: Cattail grass, Yellow bristlegrass	Family: Poaceae
<p><i>Setaria pallide-fusca</i> is an annual weed native to Africa. The name refers to the color; “pallid” meaning yellow, and “fuscus” meaning reddish-brown or purple. It is considered a noxious-weed seed because it germinates late in the season once most weed control measures have already been applied. It is adapted to a wide range of soils and climates. The plants effectively self-pollinate to where even isolated plants have few empty spikelets. One plant could produce as many as 5000 seeds in a tropical environment.</p>		 <p>USDA, APHIS 2005</p>

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Smithsonian Marine Station at Fort Pierce . [https://www.sms.si.edu/irlspec/Hydrilla\\_verticillata.htm](https://www.sms.si.edu/irlspec/Hydrilla_verticillata.htm).

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## **NOXIOUS WEED LIST VS. NOXIOUS-WEED SEED LIST**

The Noxious Weed List and the Noxious-Weed Seed List are two closely related lists in the plant industry. What are their differences?

Noxious-weed seeds are defined as the seeds or bulblets of any species of noxious weed that may adversely affect agriculture or the environment. Noxious-weed seed are of two classes, prohibited and restricted.

The State Noxious-Weed Seed List recognized in the Administration of the Federal Seed Act publication contains information about the various State labeling requirements and prohibitions of noxious-weed seeds. Noxious-weed seeds are listed by the botanical and common name according to the Seed Law and regulations of the particular State. Under the authority of the Federal Seed Act, the USDA regulates the interstate movement of certain agricultural and vegetable seeds and screenings.

Noxious weed is defined as any plant or plant product that can directly or indirectly cause injury to crops, livestock, poultry, or other interests of agriculture, irrigation, navigation, and natural resources. The Noxious weed list is maintained by the Plant Protection Act. Under the Plant Protection Act, Animal Plant Health Inspection Service administers the noxious weeds regulations, which prohibit or restrict the importation and interstate movement of those plants that are designated as noxious weeds. State plant regulatory officials regulate the shipment of nursery and greenhouse stock.

The Noxious-weed seed list, under the FSA is only concerned with agriculture and vegetable seed used for planting. Therefore, unlike the noxious weed list, it may not be inclusive of plants considered noxious in non-agricultural environments.

Each year, a notice from SRTD is sent to the State Seed Control Officials and/or Regulatory contacts requesting updates and modifications to their State noxious-weed seed list. SRTD appreciates their efforts in sending these updates since this publication is essential in helping the seed industry maintain compliance with the FSA and protecting consumers nationwide.

For information on this article, contact Seed Marketing Specialist Lan-Chi Trinh (704) 810-7272; [lan-chin.trinh@ams.usda.gov](mailto:lan-chin.trinh@ams.usda.gov)

## **OECD SEED SCHEMES MEETING**

Dr. Steve Malone, U.S. OECD Seed Schemes Program Manager, represented the U.S. at the Organization for Economic Cooperation and Development (OECD) Seed Schemes Ad Hoc Working Group (AHWG) & Technical Working Group (TWG) meetings held January 31-February 3 at the OECD Headquarters in Paris, France; and at the Working Group meetings and Annual Meeting on June 26-30 in Prague, Czech Republic.

Ad Hoc Working Groups (AHWG) are established to study specific seed schemes topics as needed, while Technical Working Groups (TWG) are standing committees that continually evaluate seed schemes rules and guidelines to make sure they are relevant and provide a framework for the worldwide movement of certified seed. The TWG makes recommendations at the annual meeting. Decisions to change rules and guidelines of the schemes are determined

by consensus of the official country delegates during the annual meeting. Those decisions become final upon concurrence by the OECD Committee on Agriculture and the OECD Council.

The Annual Meeting agreed on the following:

- Adopted the Strategic Plan created by a working group that included the U.S. It is a more streamlined and focused plan than the one it replaces. The same working group will now begin work on an action plan.
- Accepted Zambia as a participant in the Cereals, Maize, and Sorghum schemes, and approved the extension of Ukraine's participation to include the Beet scheme, and approved Senegal's continuation in the Cereal, Maize, and Sorghum schemes based on the report of the monitoring visit conducted earlier this year.
- Updated the isolation distances for sorghum Basic (Foundation) seed, and established purity standards and isolation distances for buckwheat.
- Approved a training module slide deck on control plot testing to be used for training staff in participating countries.
- Agreed to continue the notification process for critical issues for the next three years on a trial basis to determine if this will provide sufficient information to understand the extent and nature of problems in implementation of the schemes, or areas where seed schemes rules and guidelines need additional clarity.
- Added *Melilotus siculus* (Messina, Messina melilot, Sicilian melilot) to the Subterranean clover and Similar Species Seed Scheme and of *Trifolium isthmocarpum* (Moroccan clover) to the Grass and Legume Seed Schemes.
- Kristina Digryte (Estonia) was approved as the incoming Vice-Chair of the Bureau, and will chair the TWG for the next two years. Pedro Lavignolle (Argentina) will be the Bureau Chair, and Eddie Goldschagg (South Africa) moves to Past-Chair.

Ongoing discussions to be continued by Ad Hoc and Technical Working Groups

- Proposals to expand allowance for varietal mixtures of the same species continues to be at an impasse. The main sticking point is agreement on restricting maize mixtures to integrated refuge blends as proposed by the European Union (EU). An alternative proposal to allow silage corn blends under the herbage mixture rules currently in place for grasses, legumes, and cereals was introduced jointly by Canada and New Zealand, but was opposed by some EU countries. The TWG has asked interested countries and affiliated organizations for additional data on the pros and cons of these proposals. Both proposals will continue to be discussed at future meetings, but there was a sunset provision agreed on that if no consensus can be reached within the next two years, all proposals on this topic will be withdrawn.
- The AHWG on labelling continues to gather information on methods for prevention of counterfeiting but no firm proposals for new rules have been developed. The labelling working group will collect information from participating countries on additional official and non-official information allowed on labels with the goal of clarifying the rules regarding these allowances. Through surveys of member countries the secretariat is building a catalog of label security measures employed by participating countries in hopes that the more effective strategies will be adopted by other countries. The randomly generated alpha-numeric digital signature used by Oregon Seed Certification Services was demonstrated at the TWG.
- Work continues on the recognition of various biochemical and molecular techniques (BMTs) for assessing varietal identity and purity in partnership with seed analyst

organizations such as AOSA and the International Seed Testing Association (ISTA). One part of that this past year is an effort to identify methods that are validated by publication in established laboratory rules such as AOSA and ISTA or other chemical and genetic laboratory association or publication in refereed journals. Under this approach, such publication would be enough for a method to be considered valid for OECD purposes. The U.S. favors this approach of relying on the expertise of the seed analysts and their organizations to provide validation of methods. This is particularly important for species where the breeding process relies heavily on BMTs and is the only way to distinguish between certain varieties. However, at the annual meeting some countries wanted to go back to an approach that would require approval of each specific method by the annual meeting before it would be recognized as acceptable for use in OECD certification to supplement results of field inspections and traditional post-harvest seed testing.

In 2018, the TWG will meet January 30 – February 1 at the OECD Headquarters in Paris. The annual meeting is scheduled for June 25-29, 2018, in Paris, but there are discussions underway to possibly move it to Poland, so the date could also change. Meetings for 2019 are tentatively set to be hosted by Argentina and Austria, with locations and dates to be determined.

For more information on the OECD Seed Schemes, go to <http://www.ams.usda.gov/rules-regulations/fsa/oecd-schemes> or <http://www.oecd.org>.

For information regarding this article, contact Steve Malone (704) 810-8888; [stephen.malone@ams.usda.gov](mailto:stephen.malone@ams.usda.gov).

## **SEED DIVISION PASSES ISTA AUDIT**

On January 18, 2017, the International Seed Testing Association (ISTA) audited the Livestock, Poultry, and Seed Program's (LPS) Seed Division in Gastonia, NC. ISTA is an organization of governments comprised of over 70 countries and distinct economies worldwide whose mission is to develop and maintain internationally established rules for seed shipped in international commerce. Most countries in Europe require ISTA tests prior to importing seed.

LPS's Seed Division was the first laboratory to become ISTA accredited in the United States and is now considered by ISTA to have a mature quality management system. Audits of mature systems are very thorough, in that documents, records, and processes are meticulously reviewed by technical experts and system auditors for adherence to ISTA standards.

After a ten hour comprehensive review of the Seed Division's laboratory and administrative processes, ISTA auditors closed the audit by complementing the Division on the teamwork and competence of its staff, the Division's well maintained facilities, and their observable commitment to the continual improvement of their quality management system. Given the high level of scrutiny of Seed Division's processes, the team represented LPS extremely well during the audit, which resulted in perhaps one of the most successful ISTA audits the Division has ever had!



ISTA and Seed Division audit teams from L to R: Dr. Florina Palada (Acting ISTA Secretary General and System Auditor), Ernest Allen (SRTD Director), Anny Roelofsen (ISTA Technical Auditor), Robert Southward (ISTA System Auditor), Charlene Burton (SRTD Botanist), Dr. Yujia Wu (SRTD Quality Manager and Plant Physiologist), Patsy Jackson (SRTD Botanist), Todd Erickson (SRTD Laboratory Supervisor), and Rodney McNeace (SRTD Seed Marketing Specialist).

For more information, contact SRTD Director Ernest Allen at (704) 810-8884; [ernest.allen@ams.usda.gov](mailto:ernest.allen@ams.usda.gov).

## STOPPING THE SPREAD OF PALMER AMARANTH

Palmer amaranth is quickly becoming a serious problem for farmers in the Southeast and Midwest. There are plenty of online articles describing its biology and best control practices. The focus of this article is to determine how the seed testing community can play its part in preventing the spread of *Amaranthus palmeri*. The two main areas to concentrate on are seed sampling, and how to identify and report potential Palmer findings in purity and noxious tests.

A seed test (purity, noxious, germination, etc.) can only be as good as the sample that was taken. If the sampler did not follow the proper procedure, taking the required number of samples and from multiple locations throughout the lot, then the laboratory tests will never accurately reflect the true properties of the lot. State seed samplers are the first line of defense in this war, and thus their training is key. Samplers must be aware of potential Palmer contaminations in the areas they are sampling, and take all necessary precautions to ensure that a representative sample is taken. Many Palmer amaranth outbreaks seem to be connected to lots of native seed mixes. These native seed mixes are heterogeneous, so obtaining a representative sample is both difficult and crucial. The sampler will need to inspect the seed as it is sampled to determine if a larger sample size than required should be taken to ensure accurate representation of the lot. Increasing sample size will increase the statistical confidence in the results.

Seed mixes will naturally begin to segregate by size as the containers are moved from one location to another. Thus samples must be taken so that all sections of the containers have an equal chance to be sampled. Selecting a probe that can reach at least halfway, or ideally all the

way through a container is key. The container should be sampled at multiple locations: top, middle and bottom. Another good practice, when possible, is to flip each bag a few times to create a more uniform distribution of seed before sampling.

When the sample reaches the seed testing laboratory, a new issue arises. The *Amaranthus* genus is readily identifiable by its small, round, brownish-black and shiny seeds. However, there are no definitive physical characteristics by which the seed analyst can reliably distinguish *Amaranthus palmeri* from other *Amaranthus* species. Size overlaps on many of the *Amaranthus* species, and color and texture can vary as much within species as between species. The differences are generally so minute as to be undetectable.

How then can Palmer amaranth be detected? A growing number of laboratories, including the California Department of Food and Agriculture, Eurofins Biodiagnostics, and University and Illinois have developed DNA tests to distinguish Palmer from other amaranth species. While these tests currently are somewhat expensive and time consuming, they are at present the buyer's only guarantee, except for a grow-out, that seed they are buying is free of Palmer amaranth. The Association of Official Seed Analysts (AOSA) has issued a statement on Palmer amaranth, indicating that any *Amaranthus* seeds found should be reported on the laboratory's Report of Analysis. This is crucial because *Amaranthus* seeds are generally not considered noxious, so any *Amaranthus* seeds found in a noxious test were previously not required to be reported. However, by reporting any *Amaranthus* seeds found, the buyer and seller can be armed with the knowledge that there is a potential for Palmer amaranth contamination, and can decide if further DNA testing is warranted.

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## **TRUENESS-TO-VARIETY OVERVIEW**

Each year, the Seed Regulatory and Testing Division (SRTD) 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 SRTD. SRTD relies on State seed control programs to submit the samples for inclusion in the TTV tests.

This year, SRTD conducted tests on varieties of garden beans, pumpkins, and sweet corn at Mountain Horticultural Crops Research and Extension Center in Mills River, NC.

One trial consisted of a total of 150 ryegrass samples: 117 samples of annual ryegrass, 32 samples of perennial ryegrass, and 1 sample of intermediate ryegrass. The ryegrass was planted at the fields of Sand Hills Research Station, Jackson Springs, NC, for varietal evaluation. Plants were evaluated based on visual confirmation of established ryegrass morphological characteristics which included plant height, heading, leaf color, and leaf texture.

SRTD would like to thank all States that participated in this year's TTV trials. Once results and information have been compiled, participating States will be notified of any mislabeling.



Figure 1: Ryegrass trials in greenhouse



Figure 2: Samples transplanted in field

For questions concerning either the TTV program or instructions for submitting samples, please contact Seed Marketing Specialist Akhtar A. Kazmi (704)810-8878; [Akhtar.kazmi@ams.usda.gov](mailto:Akhtar.kazmi@ams.usda.gov)

## X-RAY MACHINE ASSISTS WITH GRASS SEED PURITY ANALYSIS

Technology evolves constantly for better efficiency and continual improvements. The seed testing industry is constantly seeking new ways to take advantage of these new advancements to increase uniformity and accuracy in all testing methods.

Most seed analysts use a diaphanoscope (transmitted light) to view the internal structures of grass seed. The purpose of this tool is to assist with the purity analysis for endosperm detection of grass seed. The AOSA and FSA purity test is divided into 4 components: pure seed, other crop, inert matter, and weed seeds. Grass seed must have some degree of endosperm development to be considered pure seed, with the amount of endosperm required varying by species. The endosperm is enclosed in bracts referred to as glumes, paleas and lemmas, making extra measures necessary to detect endosperm. The florets could be sterile or contain only flower parts, insects, and/or ergot, all considered inert matter. Slight pressure with forceps can also be used to detect endosperm development [FSA 201.48(g)]. Although these methods are reliable to determine the internal anatomy of grass seeds, there are still some seed species with hard, thick seed coats where the internal anatomy is difficult to detect.

The International Seed Testing Association Rules, Chapter 14, describes X-ray testing to assist with evaluating the internal anatomy revealed by radiograph. This X-ray technology helps to see the internal anatomy of species such as *Achnatherum hymenoides* (Indian ricegrass) and *Schizachyrium scoparium* (little bluestem), examples of the seed kinds whose internal structures are difficult to detect by diaphanoscope or even slight pressure.

SRTD's X-ray machine is a multi-focus unit which is also excellent for magnifying smaller seeds. The X-ray can also show other structures clearly like anthers, stamens, or insects so there is no doubt whether the structure is a caryopsis or not. Figure 1 shows clear views of the internal anatomy by X-ray. However, the same seed kind is shown in Figure 2 by use of the diaphanoscope has the internal views obscured. Although fewer seeds could be viewed at one time compared to a regular purity, this method could help assure an increase in uniformity and accuracy amongst the seed industry on seeds with thick seed coats.

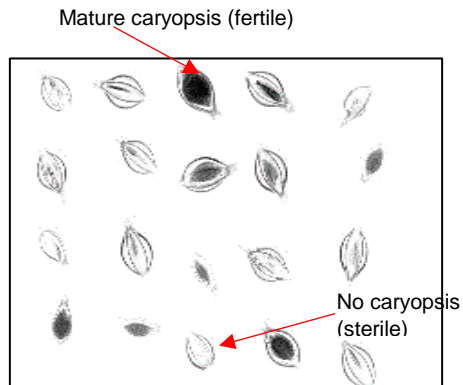


Figure 1: *Achnatherum hymenoides* (Indian ricegrass) from X-ray



Figure 2: *Achnatherum hymenoides* (Indian ricegrass) from diaphanoscope

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## CALENDAR OF EVENTS

Organization for Economic Cooperation and Development (OECD) Seed Schemes Technical Working Group Meeting Paris, France	January 30- February 1, 2018
American Society of Plant Biologist (ASPB) Western Section Meeting Fullerton, CA	February 3 -4, 2018
ASTA 58th Annual Vegetable & Flower Seed Conference Orlando, FL	February 2-5, 2018
Association of Official Seed Analysts/ Society of Seed Technologist (AOSA/ SCST) Raleigh, NC	June 2018
International Seed Testing Association (ISTA) Japparo, Japan	June 11-14, 2018
Association of Official Seed Certifying Agencies (AOSCA) Annual Meeting Atlanta, GA	June 24-27, 2018
Organization for Economic Cooperation and Development (OECD) Seed Schemes Annual Meeting Paris, France	June 25-29, 2018
SRTD Seed School Gastonia, NC	August 2018
Association of American Seed Control Officials (AASCO)	TBD

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