



Seed Regulatory and Testing Branch

ITEMS OF INTEREST IN SEED

April 2010

www.usda.ams.gov/seed



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EDITOR'S NOTES

This issue of the Items of Interest in Seed (IOI) includes two articles based on the technical aspects of seed testing as promised in the October 2009 publication. The first article, "Identification and Characteristics of Select *Solanum* Species" by Botanist Patsy Jackson, discusses four species, three of which are recognized as either noxious or undesirable weeds in several states. The other article, "Seed Purity and Identification of Five *Poa* Species and *Puccinellia*" by Botanist Charlene Burton, presents helpful information for analysts trying to distinguish among a few common species of bluegrass.

The Seed Regulatory and Testing Branch (SRTB) has received several complaints from customers and State Seed Control Officials concerning the sale of small-packet vegetable seed over the Internet. Seed Marketing Specialist Roger Burton addresses this issue in his article "Internet Seed Sales and the Federal Seed Act." To test your knowledge of what the FSA says about internet seed sales, turn to page 11.

Seed Marketing Specialist Gene Wilson takes us on a historic journey with his article "Seed Quality: USDA and Seed Testing in the Early Years." The article, along with photographs from the SRTB archives, spotlights the important role USDA played in the development of seed testing procedures and requirements. It is interesting to note that some testing protocols from the turn of the century are still valid today.

Finally, your feedback concerning our IOI provides SRTB an excellent way to measure whether we are addressing the topics that interest you the most. Please send your comments and suggestions 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

FEDERAL SEED ACT CASES SETTLED

The following cases were settled administratively under the Federal Seed Act between September 12, 2009, and March 5, 2010. 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>.

Beachner Seed Company, St. Paul, KS, has paid \$4,050 for cases involving five seed shipments to Kentucky and Missouri. Seed regulatory officials in Kentucky and Missouri

cooperated in the initial sampling and inspection. The alleged violations, while not the same for all shipments, were:

- false labeling of variety name and percentages of pure seed, other crop seed, inert matter, weed seed, and germination;
- failure to label the interstate shipper's name and address or code designation; and
- failure to keep or supply required records.

Bennett Seed, Jennings, FL, has paid \$1,575 for cases involving three seed shipments to 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 pure seed and inert matter percentages;
- failure to label the presence of noxious-weed seeds and to label as a mixture; and
- failure to test for germination prior to interstate shipment.

DLF International Seeds, Halsey, OR, has paid \$2,700 for cases involving three seed shipments to Connecticut, Georgia, and Ohio. Seed regulatory officials in Connecticut, Georgia, and Ohio cooperated in the initial sampling and inspection. The alleged violations, while not the same for all shipments, were:

- false labeling of kind name, variety name, test date, and percentages of pure seed and germination; and
- failure to keep or supply required records.

Pennington Seed, Inc., Madison, GA, has paid \$16,250 for cases involving fifteen seed shipments to Georgia, Indiana, Maryland, Michigan, Nebraska, Ohio, Pennsylvania, Tennessee, and Texas. Portions of the shipments to Maryland, Ohio, Pennsylvania, and Tennessee were subsequently shipped to Indiana, Kentucky, and Pennsylvania. A portion of a shipment to Indiana was subsequently shipped to Kentucky. Seed regulatory officials in Georgia, Indiana, Kentucky, Michigan, Nebraska, Pennsylvania, and Texas cooperated in the initial sampling and inspection. The alleged violations, while not the same for all shipments, were:

- false labeling of variety name, test date, noxious-weed seeds rate of occurrence, and percentages of pure seed, other crop seed, and germination;
- failure to label the presence of noxious-weed seeds and to label as a mixture; and
- failure to keep or supply required records.

Plantation Products, Inc., Norton, MA, has paid \$3,900 for cases involving seven seed shipments to Indiana. Seed regulatory officials in Indiana cooperated in the initial sampling and inspection. The alleged violation was:

- false labeling of germination percentages.

Smith Seed Services, Halsey, OR, has paid \$2,600 for cases involving three seed shipments to Indiana, Michigan, and Tennessee. A portion of the shipment to Tennessee was subsequently shipped to Georgia. Seed regulatory officials in Georgia, Indiana, and Michigan cooperated in the initial sampling and inspection. The alleged violations, while not the same for all shipments, were:

- false labeling of pure seed percentages and of uniform “lot of seed”; and
- failure to label the presence of noxious-weed seeds.

The Scotts Company, Marysville, OH, has paid \$2,200 for cases involving three seed shipments to Georgia, Kentucky, and Missouri. Seed regulatory officials in Georgia, Kentucky, 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, inert matter, and germination percentages.

FALL 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.

The SRTB is currently conducting an annual and perennial ryegrass TTV test at the Sandhills Research Station, Jackson Springs, NC. This spring, SRTB plans to plant **okra** at Alcorn State University, Lorman, MS; **soybeans** at Clemson University, Clemson, SC; **garden beans** at the Piedmont Research Station, Salisbury, NC; **collards, broccoli, cabbage, cauliflower, and Brussels sprouts** at the Sandhills Research Station, Jackson Springs, NC; **melons and cantaloupes** at the Texas Department of Agriculture, Giddings, TX; and **beets** in the SRTB greenhouse.

We encourage all State seed control programs to submit seed samples of the previously mentioned kinds (in bold) for TTV testing.

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.

UPCOMING FEDERAL SEED SCHOOLS IN GASTONIA, NC

The Seed Regulatory and Testing Branch will host two Federal Seed Schools this year at our facility in Gastonia, NC, May 10-14 and August 16-20, 2010. The first three days of both 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 also be covered. The last two days of the week will focus on variety testing, including trait testing, and seed health testing, including detection of seed treatments by bioassay methods. The exact schedule will depend upon participant interest.

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 (\$32 per day). There is no charge for Federal and State government employees.

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

Seed grader and/or quality management training may also be available the last two days of each week if there is sufficient interest. For information on cost and registration for seed grader training or quality management training, please contact Perry Bohn at perry.bohn@ams.usda.gov.

PEOPLE'S GARDEN PLANTED BY SEED REGULATORY AND TESTING BRANCH

In a February 2009 ceremony in Washington, DC, Secretary of Agriculture Vilsack established the People's Garden (www.usda.gov/peoplesgarden) at the United States Department of Agriculture (USDA) headquarters and requested that field offices promote the program nationally. Seed Regulatory and Testing Branch (SRTB) staff, who work with and appreciate seeds and plants of all kinds, readily complied by planting a container garden.

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



The first crop planted was lettuce (*Lactuca sativa*) because it is cold-tolerant and can be planted in early spring. Three varieties of leaf lettuce were seeded into pots in the vestibule at the front entrance of the SRTB building. An educational display of lettuce seeds and information about lettuce production in the United States was included to promote the mission of the Agricultural Marketing Service. When the lettuce matured, leaves were harvested (left) and a salad luncheon was enjoyed by all employees.

For the 2009 summer rotation, SRTB personnel planted three varieties of pepper, grown in pots outdoors, near the entrance to the SRTB. Employees harvested and ate peppers during the summertime and as late as October.

A search for display material uncovered an abundance of fascinating information and the following paragraphs provide a little history, some science, and also nutritional information about peppers (pictured next page).

Peppers (*Capsicum*) may have originated in Bolivia. They were domesticated about 7,000 years ago and have been cultivated since that time. After Columbus and other New World explorers discovered them, they spread around the world and were first planted in the United States by Spanish colonists in present day New Mexico in the 1600's.

Peppers are classified by fruit characteristics such as pungency, color, shape, flavor, size and usage; i.e. bell, pimiento, cayenne, or jalapeno. Several hundred pod types are now grown worldwide with specific traits for processing, fresh use, flavor and pungency. Different pod types are cultivated for ethnic dishes (e.g., ancho for chile rellenos, pasilla for mole (mō lay) sauce (chocolate and hot peppers) and aji for ceviche). When the New Mexico pod-type pepper turns red, it is dried and ground into chili powder. These red pods contain three times the vitamin C of an orange and twice the pro-vitamin A content of a carrot, making them a very healthy food. Pod color is due to the production of carotenoid pigments. Green or bell pepper is bred to yield pods that ripen into red, yellow and orange colors. Colorful peppers are processed into food colorings that can replace unhealthy synthetic dyes. Also, oleoresin, a compound extracted from peppers, is used to dye and to increase the hotness of foods.

Peppers range in flavor from very mild to sharply pungent. Genetic and environmental factors influence pungency which is expressed in Scoville Heat Units, determined by a comparative taste test. Test participants first taste the undiluted pepper extract then continue tasting as the extract is further diluted in water until pungency can no longer be detected. The green or bell pepper and the pimiento are non-pungent types. The habanero or 'Scotch Bonnet' is the world's hottest pepper, ranking in excess of 200,000 Scoville units. Pungency is due to the production of a mixture of alkaloid compounds, the most well-known of which is capsaicin. Capsaicin is used medicinally as a pain reliever and in pepper sprays that sometimes replace tear gas and Mace®.

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



The SRTB winter People's Garden was planted with two varieties of radish: a long white icicle type and the typical red-ball-type radish. Radishes were seeded in November, grew well in the cooler temperatures of fall and, as of mid-February, have survived the cold temperatures and snowfall. Radishes should be ready to harvest about 30 days after planting. In late February, the SRTB planted snow peas and onions, to be followed by tomatoes for the summer People's Garden.

Click on the following link for additional interesting information about the People's Garden project, gardening tips, etc.: http://www.usda.gov/wps/portal/?navid=PEOPLES_GARDEN.

References:

Bosland, P.W. 1996. Capsicums: Innovative Uses of an Ancient Crop. pp. 479-487. In J. Janick (ed.) Progress in New Crops. American Society of Horticultural Science (ASHS) Press, Arlington, VA.

Eshbaugh, W.H. 1993. History and Exploitation of a Serendipitous New Crop Discovery. pp. 132-139. In J. Janick and J.E. Simon (eds.) New Crops. Wiley Publishing, New York.

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

QUESTIONS AND ANSWERS

Q. When are the terms **dormant** and **non-viable** used in relation to tetrazolium test results?

A. When firm, ungerminated seeds are present on the last day of a germination test, i.e. at the final count, a tetrazolium test is one acceptable way to determine if they have the potential to germinate. Those that do are reported as **dormant** per Federal Seed Act (FSA) regulations and Association of Official Seed Analysts (AOSA) rules, and as **fresh** per International Seed Testing Association (ISTA) rules. Seeds that do not exhibit the potential to germinate are reported as **dead** per FSA, ISTA, and AOSA.

If the tetrazolium test is performed as a stand-alone test rather than at the end of a germination test, seeds that demonstrate the potential to germinate are called **viable** and those that do not are called **non-viable** per AOSA and ISTA rules. FSA regulations do not have provisions for stand-alone tetrazolium tests. The results of the tetrazolium test should not be used for labeling germination of seed lots shipped in interstate commerce and subject to regulation under the FSA.

See the related article “How to Handle Ungerminated Seeds and Insufficiently Developed Seedlings on the Final Day of the Germination Test,” in the April 2009 issue of the “Items of Interest in Seed” (IOI).

Links:

FSA: www.ams.usda.gov/seed

AOSA: www.aosaseed.com

ISTA: www.seedtest.org

For information regarding this question and answer, contact Botanist Sandy Dawson at (704) 810-7270 or sandy.dawson@ams.usda.gov.

Q. The importing country has a requirement for a “radiation free” certificate. How is a radiation free certificate obtained for seed?

A. According to the U.S. Customs website (www.export.gov) for assistance with country-specific documentation requirements (including radiation certificates), contact the Trade Information Center at 1-800-USA-Trade.

LADINO CLOVER VS. WHITE CLOVER

Ladino was originally considered a variety of white clover (*Trifolium repens*) that exhibited the largest growth habit of the three clover types: large, intermediate, and low-growing. Over time it became necessary to distinguish the larger-growing type from the smaller common-clover types. Therefore, ladino clover evolved into a kind designation and became recognized as a valid kind name under the Federal Seed Act (FSA) regulations.

There have been numerous variations in kind name designations for labeling white and ladino clovers. Dutch clover, white Dutch clover, and ladino white clover are some other commonly-used names.

White clover and ladino clover are the two kind names accepted by FSA regulations for labeling purposes in interstate commerce.

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

FIELD PEA OR ROUGHPEA?

Common names are often used when referring to seeds of a particular plant species. However, this can lead to confusion since different common names are used in different geographical areas, and a single common name may refer to more than one plant species. *Pisum sativum* and *Lathyrus hirsutus* are two species of legumes that have multiple common names; several of them very similar. This issue is further complicated by the fact that professional seed and regulatory organizations may recognize different common names for these two kinds.

Pisum sativum is often labeled as Austrian winter pea, whereas *Lathyrus hirsutus* is often labeled as Austrian winterpea or winterpea. The name 'Austrian Winter' was originally a variety of field pea that is now considered a type (Wiersema and Leon, 1999). Fortunately, seeds of the two species are very different in appearance, (see Figs. 1 and 2 below), permitting seed analysts to visually distinguish between them.

Photos by Sandy Dawson, USDA, AMS, 2010



FIG. 1.--*Pisum sativum* (field pea)



FIG. 2.--*Lathyrus hirsutus* (roughpea)

References:

Association of Official Seed Analysts (AOSA). www.aosaseed.com.
Federal Seed Act (FSA) Regulations. www.ams.usda.gov/seed.
International Seed Testing Association (ISTA). www.seedtest.org.
USDA-ARS Germplasm Resources Information Network (GRIN). www.ars-grin.gov.
Wiersema, John H. and Blanca Leon. 1999. World Economic Plants. CRC Press, New York.

For information regarding this article, please contact Branch Chief Dr. Richard Payne at (704) 810-8884 or richard.payne@ams.usda.gov; or Seed Marketing Specialist Roger Burton at (704) 810-7265 or roger.burton@ams.usda.gov.

INTERNET SEED SALES AND THE FEDERAL SEED ACT

The Seed Regulatory and Testing Branch (SRTB) receives complaints from consumers regarding the sale of small-packet vegetable seed over the Internet. State Seed Control Officials also express concerns over requirements of the Federal Seed Act (FSA, the Act) relating to Internet seed sales when shipped in interstate commerce. Ultimately, seed sold or offered for sale over the Internet **is not exempt** from the requirements of the FSA; it is subject to the same requirements of the FSA as any other seed shipped in interstate commerce. Additionally, seed advertised on the Internet is subject to the advertising requirements of the FSA.

Requirements for small-packet vegetable seed (one pound or less) are covered in sections 201(b) (1) and 201(b) (2) of the Act and sections 201.25 through 201.31 of the Federal Seed Act Regulations (the Regulations). These sections require the packets or containers to include, as part of the labeling, the correct kind and variety names as determined in accordance with section 201.34 of the regulations, the word "Hybrid" if the variety is hybrid seed, and the complete name and address of the interstate shipper.

Section 201(b) (2) of the Act and 201.29 of the Regulations require that vegetable seeds in containers of one pound or less must germinate at or above the minimum standard set forth in section 201.31. If the vegetable seed germination percentage is less than the standard set forth in section 201.31, then the label shall have the words "Below Standard" clearly stated in type no smaller than 8 point. Also, each variety that germinates less than the standard is also required to show the percentage of germination, the percentage of hard seed (if any), the calendar month and year the test was completed to determine such percentages, and the complete name and address of the interstate shipper.

Section 202 "Records" of the Act and sections 201.4, 5, 6, 7, and 7a "Records for Agricultural and Vegetable Seeds" of the Regulations address the records requirements pertaining to all persons transporting agricultural and vegetable seed in interstate commerce. Such records shall be accessible for inspection by authorized agents of the Secretary of Agriculture for the purposes of the effective administration of the Act at any time during customary business hours.

Section 205 of the Act and 201.36b of the Regulations address "Advertising" and "False Advertising" of agricultural and vegetable seeds.

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

AN IMPORTANT NOTE TO STATE SEED CONTROL OFFICIALS

Please contact the Seed Regulatory and Testing Branch (SRTB) when your office or laboratory has changes regarding the following information:

- Seed control officials or regulatory and laboratory contacts
- Commissioners, directors, or secretaries
- Titles
- Department names (division, section, bureau, etc.)
- Addresses (physical or mailing)
- Telephone numbers (voice and fax)
- E-mail addresses
- Web sites

SRTB wants to make sure laboratory reports, copies of regulatory correspondence, training notices, program announcements, and requests for information reach the correct person as soon as possible. Sometimes SRTB may need to refer a customer to a State office, and directing them to the appropriate contact person can be a helpful service.

For further information or to submit updates, please contact Seed Marketing Specialist Jerry Irwin at (704) 810-8878; jerry.irwin@ams.usda.gov.

AN IMPORTANT NOTE TO OUR SEED COMPANY CUSTOMERS

Please contact the Seed Regulatory and Testing Branch when your company has changes regarding the following information:

- Addresses (physical, mailing, or billing)
- Telephone numbers (voice and fax)
- Company contacts
- Updated DBA (doing business as) information
- Any other changes to your existing account, such as mailing or courier instructions for Seed Analysis Certificates, etc.

For further information or to submit updates, please contact Carolyn Camidge at (704) 810-8871 or carolyn.camidge@ams.usda.gov.

NOXIOUS-WEED SEED LIST FOR 2010

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

The SRTB will post the 2010 issue in April. To receive electronic notifications when SRTB posts new publications or changes to existing publications on the Web site, click on <http://www.ams.usda.gov/seed>, choose "Subscribe to Publications" under the Resources heading, and follow the instructions.

For information regarding this article, contact Seed Marketing Specialist Jerry Irwin at (704) 810-8878; jerry.irwin@ams.usda.gov.

REQUESTING AOSA MASTER CALIBRATION SAMPLES – NEW CONTACT

Requests to borrow Association of Official Seed Analysts (AOSA) orchardgrass and/or Kentucky bluegrass Master Calibration Samples (MCSs) are now being handled by Botanist Todd Erickson. Please direct your requests or questions to Todd Erickson by phone, fax or e-mail:

Todd Erickson
USDA AMS LS SRTB
801 Summit Crossing Place, Suite C
Gastonia, NC 28054
Fax No.: (704) 852-4189
Phone: (704) 810-7266 or (704) 810-8874

For additional information about the MCS loan procedure, see the October 2007 IOI article, "New Loan Procedure for the Association of Official Seed Analysts Master Calibration Samples" or go to www.aosaseed.com, click on "Resources", scroll to the bottom of the page and click on "Master Calibration Samples".

For information regarding this article contact Botanist Todd Erickson at (704) 810-8866 or todd.erickson@ams.usda.gov; or Botanist Charlene Burton at (704) 810-8880 or charlene.burton@ams.usda.gov.

SEED QUALITY: USDA AND SEED TESTING IN THE EARLY YEARS

The present day farmer and gardener can rest assured that the quality of purchased seed is more likely to meet their needs and expectations than at any time in the past. Why is this true? One reason is the development of seed testing and its use as an indicator of seed quality. The U.S. Department of Agriculture (USDA) played an important role in the development and use of seed testing as a measure of quality.

The importance of agriculture in the United States in the 19th century led to the creation of USDA in 1862. One of the most important and immediate issues facing USDA was the lack of good quality seeds available to farmers and gardeners. Growers had to contend with poorly germinating seed, misrepresentation of the kind or variety, adulterated seed (deliberate or unintentional), and the presence of varying quantities of weed seeds (some highly detrimental to the environment).

The only manner in which seed quality could be determined before actual planting rested on progress in seed testing. The impetus for seed testing arose from the conflict between the public's need to know the quality of seed and their lack of time and resources necessary for obtaining that knowledge. During those years when seed testing was in its infancy very little commercial seed testing occurred. The USDA and some state governments, wanting to ensure that the product possessed the quality and identity advertised, stepped into the breach and encouraged the use of testing while simultaneously helping to develop the techniques and standards for testing.

USDA Archival Photo



Circa 1900, USDA seed analysts use natural daylight for performing purity tests.

Systematic development of seed testing in the United States began with agricultural experiment stations. A seed testing laboratory was established at the Connecticut Agricultural Experiment Station shortly after its creation in 1875, the first such station in the United States. Following this, additional laboratories were located at experiment stations in Michigan and North Carolina. Within a few years, others in the United States were publishing the results of seed tests.

One essential but missing ingredient was standards for uniform testing procedures. "In 1893 the Botanist of the Department of Agriculture recommended that seed testing be undertaken systematically and scientifically" (Pieters, 1899). In 1897 USDA formed a committee to draw up rules and regulations for seed testing. The first report on this subject was issued by USDA in February 1897 entitled, "Rules and Apparatus for Seed Testing" (Justice, 1962). By 1899 agricultural experiment stations began working under uniform rules. Also, USDA personnel began conducting seed schools in 1908 to teach standardized testing techniques to state and private seed technologists.

In the mid 1890s, USDA established its first seed laboratory under the direction of Botanist Gilbert H. Hicks. In 1902 Edgar Brown became head of the seed laboratory and remained so until 1938. Due to both his abilities and his long tenure, a wide array of research and testing was undertaken under his guidance. Also during this time, the USDA seed laboratory became a charter member of and an active participant in the Association of Official Seed Analysts (AOSA) and International Seed Testing Association (ISTA).

The methodology of seed testing in this early period would still be recognizable today. Pieters (1899, p. 574) describes USDA botanists' purity testing methods:

When a purity test is to be made, the sample is first poured into a bowl and thoroughly mixed. A small sample, varying in weight from 1 to 25 grams, according to the size of the seed, is then weighed and spread upon a sheet of white paper. Here it is examined with a hand glass, if necessary, and all foreign matter removed. The inert matter, as sticks, stones, dirt, broken

seeds, and chaff, is placed on one side and weighed; also, all seeds not of the kind under examination are removed and weighed. The percentage of each kind of impurity is then determined and recorded. The weed seeds are identified, and their names are recorded with the number found in the weighed sample.

And as regards USDA's germination tests, Pieters (1899, p. 574) continues:

The germination tests are made either in the chamber or greenhouse, or both as is best suited to the particular variety. ... Blue blotters and cotton-flannel folds are used to hold the seeds, and the moisture and temperature are regulated according to the needs of the variety. Many grass seeds are tested in sand in the greenhouse, experience showing that such a test is most reliable.

Another important aspect of seed testing in addition to uniform standards and techniques is seed identification. Much work in this area was performed by F. Henry Hillman who, employed by the USDA Seed Laboratory at the beginning of the 20th century, used his artistic talents to produce excellent drawings of crop and weed seeds. In fact, requests are still received at the Seed Regulatory and Testing Branch for copies of his work.

The presence of weed seeds had been an on-going problem in the seed industry and USDA's concern over this became increasingly evident. By 1895 USDA recognized 200 weeds that were serious obstacles to agriculture and noted that 108 were non-native (Ennis, 1962). USDA planted unknown weed seeds found in imported grasses and forage plants and grew them to maturity in order to identify them. The purpose was to allow the USDA to "keep informed of the character of the weeds now being introduced into this country" (Pieters, 1899). Interestingly, the test plots for these early grow-outs were located in the vicinity of what is now the Pentagon and USDA headquarters. In 1906 the Federal Seed Laboratory tested 873 samples of red clover and alfalfa seeds and found that 30.6 percent of the samples contained seeds of the weed dodder (Justice, 1961).



Germination testing laboratory at USDA in the early 20th century.

With the development of seed testing techniques and the adoption of uniform standards of testing, a regulatory approach to the control of seed quality soon became practical. One of the first such attempts began in 1905 when USDA purchased seeds of certain kinds, tested them and identified individuals and organizations with mislabeled seed. A few years later, under the provisions of the Seed Importation Act of 1912, USDA tested imported seed of certain kinds to verify they met minimum purity requirements and did not exceed weed limitations. Between 1904 and 1919 USDA examined approximately fifteen thousand seed samples (Rollin and Johnston, 1961). In the following years, regulatory efforts eventually culminated at the federal level with the passage of the Federal Seed Act in 1939, which enforces “truth in labeling” regarding seed in interstate commerce. All of these regulatory efforts were predicated on the ability to test seeds accurately and with confidence.

Summary

These beginnings culminated in the concerted effort by all concerned to ensure the quality of seed through uniform, thorough testing. And while commercial seed testing is basic to the seed industry’s assurance of seed quality, the role of USDA and state agencies in the development and utilization of seed testing continues to provide additional assurance that labeling represents a realistic assessment of the product inside. Seed testing remains the foundation of quality assurance for the seed consumer.

References:

Ennis, Jr., W.B. 1962. Weeds. p. 124-129. *In* United States Department of Agriculture Yearbook of the Department of Agriculture. Government Printing Office, Washington, DC.

Justice, Oren L. 1961. The science of seed testing. p. 407-413. *In* United States Department of Agriculture Yearbook of the Department of Agriculture. Government Printing Office, Washington DC.

Pieters, A.J. 1899. Seed selling, seed growing, and seed testing. p. 549-574. *In* United States Department of Agriculture Yearbook of the Department of Agriculture. Government Printing Office, Washington DC.

Rollin, S.F. and Frederick A. Johnston. 1961. Our laws that pertain to seeds. p. 482-492. *In* United States Department of Agriculture Yearbook of the Department of Agriculture. Government Printing Office, Washington, DC.

DETERMINING PURE SEED IN INSECT-DAMAGED FABACEAE SEEDS

Federal Seed Act (FSA) regulations and Association of Official Seed Analysts (AOSA) rules state that insect-damaged seeds with internal damage only or with holes that are not large enough to permit an estimation of the extent of damage are considered pure (FSA regulations 201.48(c) and AOSA rules 3.2(b)). When the extent of damage is visible, seeds are evaluated by the “half-seed rule,” whereby more than 50 percent of the seed must remain to be considered pure. However, the weevil and the chalcid fly are common insect pests of Fabaceae seeds with exceptions to the general purity rule regarding insect damage evaluations.

Vetch (*Vicia* spp.) seeds, when damaged by the weevil, are associated with an exception to the “insect damage” rule in both FSA regulations and AOSA rules. The weevil lays its eggs either singly or in clusters on the seed pod. If more than one egg is deposited, a single seed may contain multiple insects. When the larvae hatch, they excavate into the seed where they develop, in most cases, until early adulthood. Eventually they depart, leaving the seed with multiple characteristic holes (fig. 3). FSA regulations and AOSA rules classify vetch seeds as

Photo by Deborah Meyer, CDFA/PPDC, 2007



FIGURE 3.—Field Bean: Exit holes of multiple weevils

Photo by Deborah Meyer, CDFA/PPDC, 2007



FIGURE 4—Vetch: Weevil-infested vetch seeds are considered pure regardless of the amount of damage

pure irrespective of the amount of damage caused by the weevil, provided the seed is not broken to one-half the original size or less (fig. 4).

FSA regulations and AOSA rules differ when considering pea (*Pisum sativum*) seeds damaged by the weevil. Damage caused by the weevil is not considered according to AOSA rules, as long as the seed is otherwise pure as defined by the “half seed rule.” In contrast, per FSA regulations, the amount of weevil damage is considered when applying the “half seed rule” for purity determination of all large-seeded legumes including pea seeds. Refer to section 201.48(c) in FSA regulations and Pure Seed Unit #2 in AOSA rules.

The chalcid fly is often found in alfalfa, red clover, crimson clover, birdsfoot trefoil, and similar kinds of small-seeded legumes. Unlike the weevil, the chalcid fly does not lay its egg on the surface of the seed. It burrows into the ovary of a flower and deposits a single egg into an immature seed. In approximately one week, the egg hatches and the resulting larva begins to develop in the seed. A few weeks later the adult fly chews an exit hole and emerges from the seed, leaving a characteristic hole. Those seeds in which the fly has not yet exited typically do not have a visible hole, so the analyst must look for other signs of infestation. Chalcid-damaged seeds may appear dull, oily, dry, puffy, crumbly, or with attached dust particles (fig. 5). Fabaceae seeds damaged by chalcid flies are inert regardless of the amount of damage. Refer to section 201.51(a)(3) in FSA regulations and Pure Seed Unit #2 in AOSA rules.

Photo by Ernest L. Allen, USDA, AMS, 2009



FIGURE 5—Alfalfa: (l to r) Pure seed, seed containing insect larva, chalcid fly exiting seed, hollow seed

Photo by Ernest L. Allen, USDA, AMS, 2009



FIGURE 6—Alfalfa: Analyst using forceps to widen hole to confirm chalcid damage

To identify chalcid damage in badly infested or questionable samples, press seeds lightly between fingers or forceps. Affected seeds will crumble or collapse relatively easily under light pressure. If chalcid damage is suspected when only a small hole is discovered, use the tip of pointed forceps to press the area around the hole until the type of damage can be determined (fig. 6). Analysts may also use a blower to aid in the purity separation of chalcid-infested seeds. The chalcid larva eventually will replace most of the endosperm of the seed, making it lighter than uninfested seeds of similar size. If the insect has already left the seed, only the shell of the seed coat will remain. The blower should be set close to an empirically-determined point where only inert matter, infested seeds, and small or immature seeds blow over

into the light-portion cup. After blowing, the analyst should examine both light and heavy portions according to applicable rules.

The developmental lifecycles of the weevil and chalcid fly inside of host seeds make detection and evaluation difficult. Knowing the indications of possible contamination by these two pests is necessary for accurate purity evaluations.

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SRTB would like to acknowledge and thank Deborah Meyer (Senior Seed Botanist-Supervisor, California Department of Food and Agriculture) for contributing photos for this article.

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

SEED PURITY AND IDENTIFICATION OF FIVE *POA* SPECIES AND *PUCCINELLIA*

Many species of the genus *Poa* produce small seeds with very similar morphological characteristics. These similarities can make identification in purity tests very difficult, especially for the beginning analyst. Seeds of *Poa* species may be classified as either crop or weed seeds depending on how they are listed in Handbook 25, "Uniform Classification of Weed and Crop Seeds," published by the Association of Official Seed Analysts. State seed laws are also a determining factor regarding the classification of certain *Poa* species as either crop or weed seeds. The bluegrass species discussed in this article may be encountered when performing purity separations. *Puccinellia* seeds may also be encountered and are similar in appearance to Kentucky bluegrass.

Poa pratensis (Kentucky bluegrass) is a crop kind. Seeds of some varieties of Kentucky bluegrass resemble rough bluegrass (see *Poa trivialis*), which can make identification of both seeds difficult. When it appears that a large quantity of rough bluegrass seed is present in a Kentucky bluegrass sample, a 400-seed separation may be performed. Kentucky bluegrass and rough bluegrass both have blowing points for the General-type seed blower; however, Kentucky bluegrass requires a higher setting than rough bluegrass.

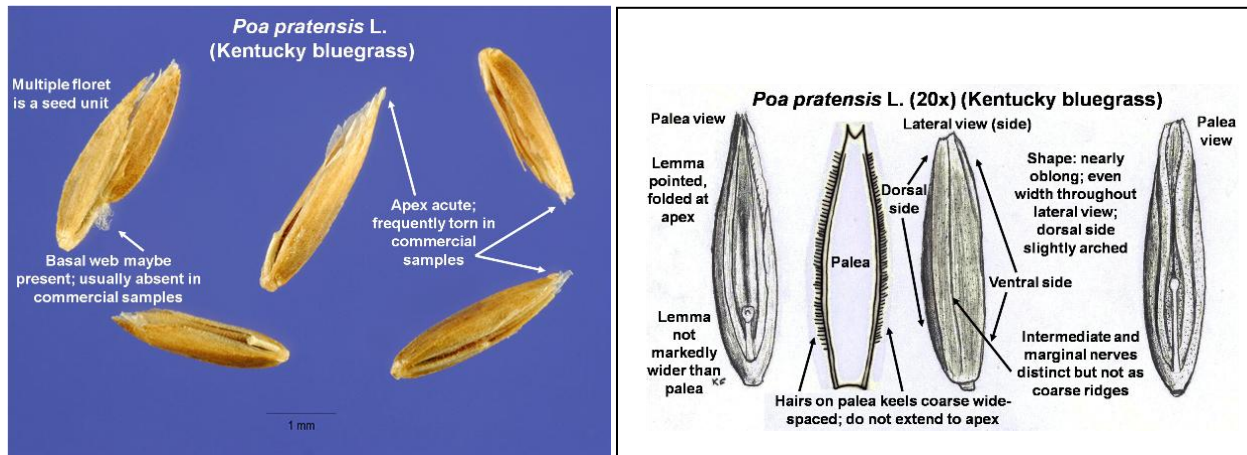
Two helpful characteristics for distinguishing seeds of these two *Poa* species are the hairs on the keels of the palea and the intermediate and marginal nerves. On Kentucky bluegrass seeds, the hairs on the keel of the palea are visible under the microscope at 10x magnification.

The hairs are coarse and wide spaced, resembling large teeth. In contrast, hairs on the keels of the palea of rough bluegrass are minute and dense and not readily visible at 10x magnification.

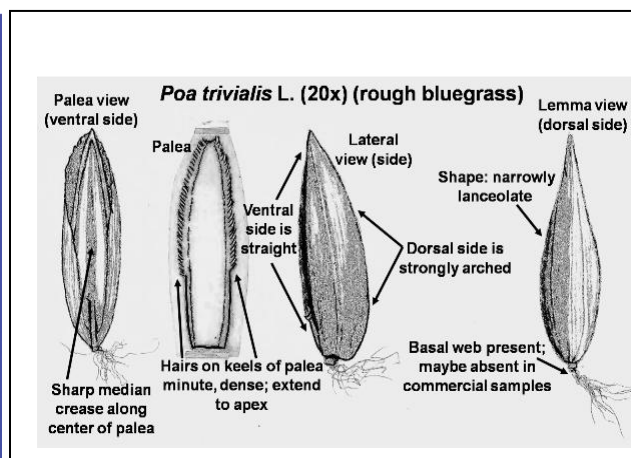
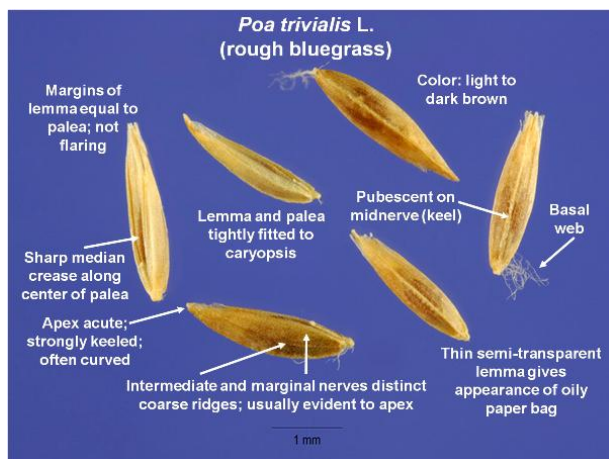
The intermediate and marginal nerves are distinct, but not as coarse ridges, and do not extend to the apex (tip) of the palea in Kentucky bluegrass. On rough bluegrass seeds, these nerves are distinct coarse ridges that extend to the apex of the palea.

Photo by Steve Hurst @ USDA-NRCS, PLANTS Database

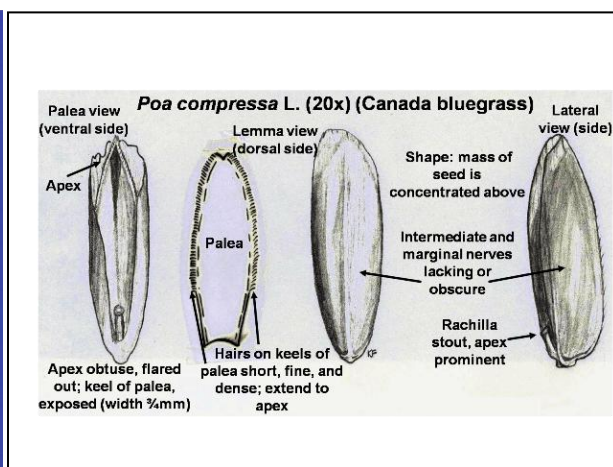
Drawing by Karen Faul, USDA, AMS



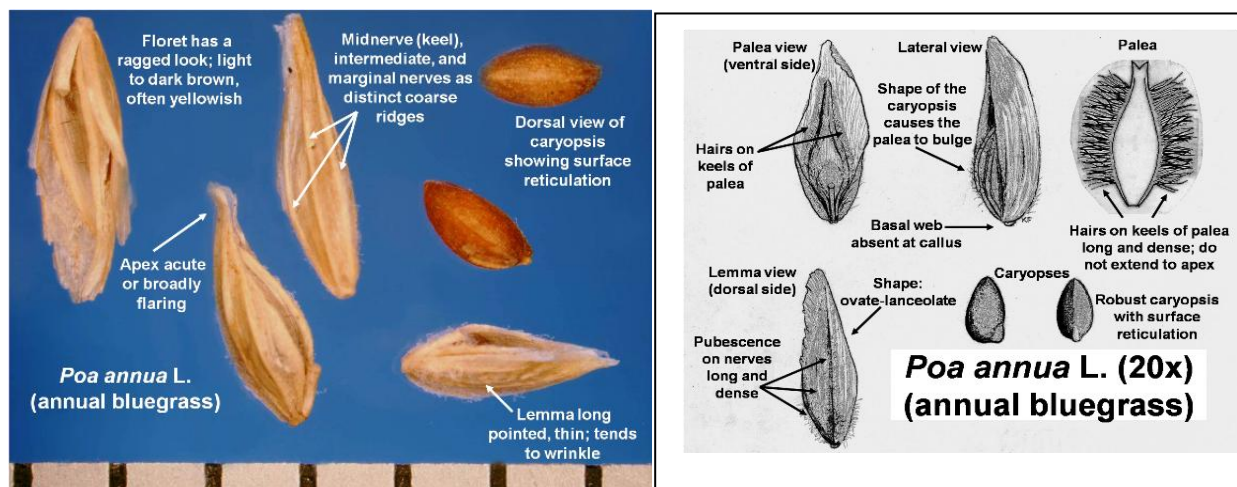
Poa trivialis (rough bluegrass) can be a crop kind or weed seed. In some States, it is considered an undesirable species or a restricted noxious-weed seed when present in lawn and turf seed and in mixtures. In other States, rough bluegrass is sold as a component in seed mixtures. Rough bluegrass has a blowing point for the General-type seed blower that is a factor of 0.82 (82 percent) of the blowing point determined for Kentucky bluegrass. The blowing point for rough bluegrass is calculated by multiplying the determined blowing point for Kentucky bluegrass by 0.82. When performing a purity test on rough bluegrass, the pure seed and inert matter are determined by blowing the sample at the calculated setting. The rough bluegrass seed in the heavy portion is considered pure seed and any rough bluegrass seed found in the light portion is inert matter. Characteristics to look for when identifying this seed include: a thin semi-transparent lemma resembling an oily paper bag, a sharp median crease along the center of the palea, and in the lateral (side) view, a strongly arched dorsal side of the lemma.



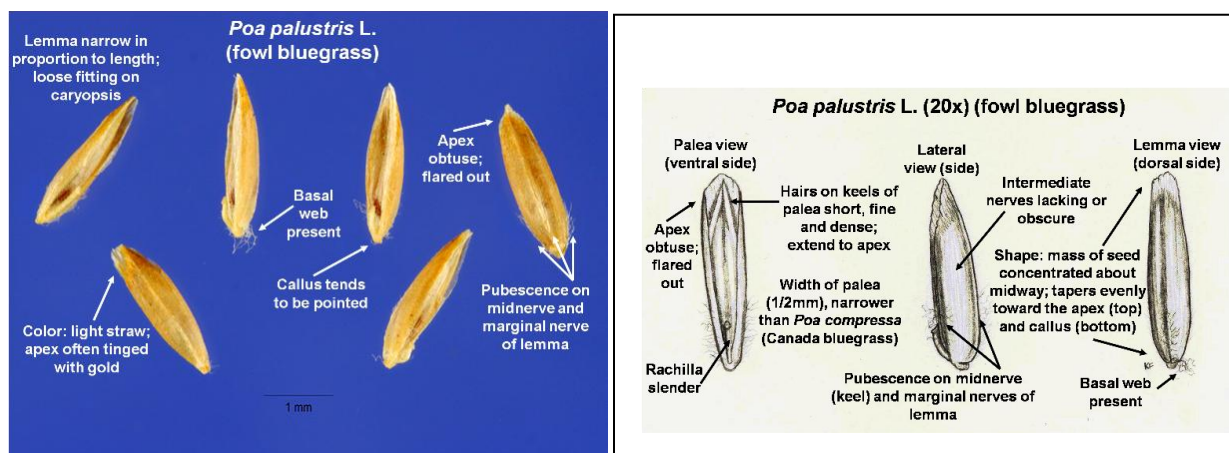
Poa compressa (Canada bluegrass) is a crop kind. It is often found in samples of Kentucky bluegrass. Both Kentucky bluegrass and Canada bluegrass have the same blowing point. Therefore when blowing a Kentucky bluegrass sample, Canada bluegrass seeds found in the light portion are classified as inert matter and those found in the heavy portion are classified as other crop. The color of Canada bluegrass seeds is straw; occasionally the apex (tip) may be tinged with purple. When found as a contaminant in samples of Kentucky bluegrass seed, the typical color for Canada bluegrass florets is greenish-grey to straw, because Canada bluegrass matures later than Kentucky bluegrass.



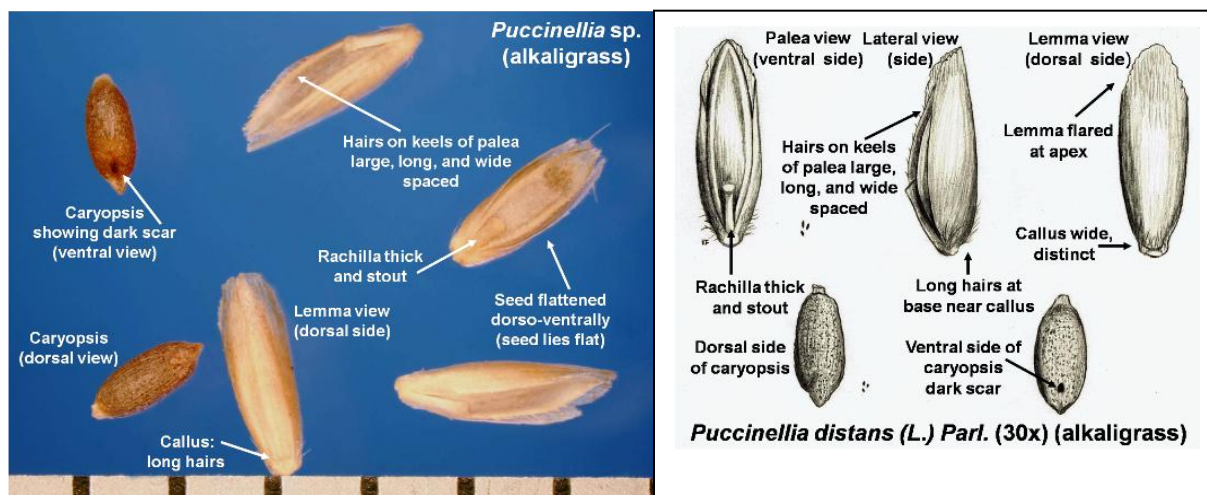
Poa annua (annual bluegrass) can be a crop kind or weed seed. In some states it is considered a noxious-weed seed. When found as a weed contaminant, multiple florets must be separated and counted individually. A fertile floret containing a caryopsis is counted as one seed. The characteristic appearance of the seed is hairy, ragged, and wrinkled with a robust caryopsis causing the palea to bulge.



Poa palustris (fowl bluegrass) is classified as a weed seed in AOSA Handbook No. 25. It is sometimes found as a contaminant in reed canarygrass. One characteristic used for identification of fowl bluegrass is its straw color and distinctive apex tinged with gold. The golden apex makes the seed look darker at the tip. Another characteristic is the slender, delicate rachilla.



Puccinellia species (alkaligrass) may be found as a contaminant in Kentucky bluegrass seed and may be mistaken for it. Some characteristic differences between the two are overall shape, hairs on the keels of the palea, and callus shape. Kentucky bluegrass is flattened laterally which means it always lies on its side. *Puccinellia* is flattened dorsoventrally with a rounded lemma and may lie on either the lemma or the palea side. The hairs on the keels of the palea of *Puccinellia* are large and widely spaced compared to the hairs on the keels of Kentucky bluegrasses. The callus of *Puccinellia* is large, wide, and has long hairs. In comparison, the callus of Kentucky bluegrass is tiny, tends to be pointed, and may have a basal web (network of hairs at the base of the seed).



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USDA PLANTS Database. www.plants.usda.gov

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IDENTIFICATION AND CHARACTERISTICS OF SELECT *SOLANUM* SPECIES

The *Solanum* genus, also known as nightshades, consists of approximately 1,500 species. These species are of economic importance primarily because of their food, drug, and aesthetic uses. Unfortunately, the genus also contains many noxious and poisonous species that are

important for the seed analyst to know. Four species are discussed and characterized in this article: *Solanum carolinense*, *Solanum elaeagnifolium*, *Solanum viarum*, and *Solanum melongena*. In a purity separation, seeds of *S. carolinense*, *S. eleagnifolium* and *S. viarum* are always classified as weeds and are designated as noxious weeds in some states. When found as a contaminant, seeds of *S. melongena*, or eggplant, sometimes may be considered as crop seeds and sometimes as weed seeds, depending on the species of the pure seed component (Association of Official Seed Analysts, Uniform Classification of Weed and Crop Seeds).

Solanum carolinense (horsenettle) is a fast growing, poisonous perennial that has been reported in every state except Montana, Nevada, North Dakota, and Wyoming. The fruit is approximately 15 mm in diameter and contains many straw colored seeds (fig. 7). The seeds are ovate or C-shaped and have a smooth reticulum. Seed size is approximately 2.5 mm in length and 1.8 mm in width. The hilum is conspicuously keyhole-shaped and recessed.

Solanum elaeagnifolium (silverleaf horsenettle, white horsenettle) is recognized as a noxious weed in 21 states. It is a spiny and poisonous perennial that has been spreading to the north and east from the southwestern United States. The fruit, which contains approximately 30 seeds, is brownish to yellow in color and approximately 13 mm in diameter. The seeds are ovate or C-shaped, strongly flattened, and faintly reticulate. Seed size is approximately 3 mm in length and 2.6 mm wide (fig.8). Hardened pieces of dried mesocarp attached to seed coats are characteristic for this species (fig. 9).

Solanum viarum (tropical soda-apple) is perennial with long prickly spikes that can grow up to 6 ft. tall. It has been reported in the southeastern states and also in Pennsylvania. The fruit is light green with dark veining, resembles a tiny watermelon, and contains over 200 seeds. The seeds are dark brown, approximately 2.5 mm in length, and are oval or C-shaped (fig. 10). Most seeds will have a characteristic dark "spot" on the seed surface. *Solanum viarum* is a federal noxious weed.

Solanum melongena (eggplant) is a perennial that is grown as an annual vegetable crop. This species has occasionally escaped cultivation and has been reported in Florida, Louisiana, Massachusetts, Mississippi, and Pennsylvania. The fruit may be yellow, purple or white in color and usually contains several thousand seeds. The seeds are C-shaped, have keyhole shaped hilums, and are approximately 3.5 mm in length and 3 mm in width (fig. 11). The reticulum of the seed coat is characteristically smooth and wavy with a dull appearance.

The identifying characteristics above should aid analysts in distinguishing the seeds of these four very-similar species.

Photo by Patsy Jackson, USDA, AMS, 2008



FIGURE 7.—*S. carolinense* (1 mm increments)

Photo by Patsy Jackson, USDA, AMS, 2008



FIGURE 8.—*S. elaeagnifolium* (1 mm increments)

Photo by Patsy Jackson, USDA, AMS, 2008



FIGURE 9.—*S. elaeagnifolium*; seeds inside pod

Photo by Patsy Jackson, USDA, AMS, 2008



FIGURE 10.—*S. viarum*

Photo by Patsy Jackson, USDA, AMS, 2009

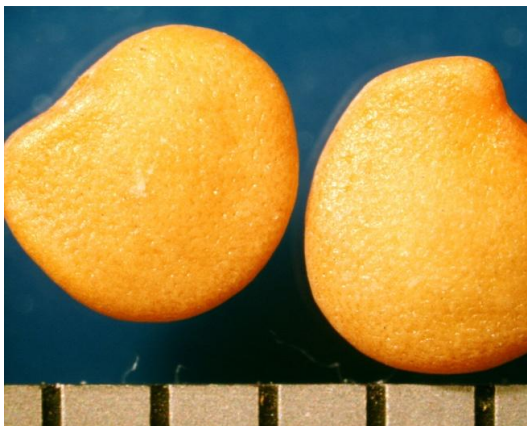


FIGURE 11.—*S. melongena* (1 mm increments)

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THE USE OF PRECHILL TESTS IN BREAKING DORMANCY OF BERMUDAGRASS SEEDS

Seed dormancy can delay germination in a number of seed kinds, including many grass species. Dormancy is a natural mechanism of many plants to maximize offspring survival by delaying germination until certain environmental factors are present. Physical and chemical treatments can break dormancy, depending on the species in question. The International Seed Testing Association (ISTA) rules, Federal Seed Act (FSA) regulations, and Association of Official Seed Analysts (AOSA) rules all prescribe methods for breaking dormancy in certain species. Bermudagrass (*Cynodon dactylon*) is one species that exhibits dormancy, and thus applicable methods are outlined in rules or regulations for breaking dormancy. Understanding how these methods break dormancy and the possible negative effects they could have on a seed is helpful when deciding the best method to use for germinating bermudagrass.

Seed analysts may encounter two botanical varieties of bermudagrass: giant bermudagrass (*Cynodon dactylon* var. *aridus*) and bermudagrass or common bermudagrass (*Cynodon dactylon* var. *dactylon*). The ISTA rules recommend a prechill treatment for *Cynodon dactylon*, but do not distinguish between common and giant. ISTA rules suggest a prechill between 5 to 10°C for up to 7 days for bermudagrass. The FSA regulations and AOSA rules distinguish between giant and common bermudagrass. In both sets of rules, giant bermudagrass receives a prechill at 10°C for 7 days. However, common bermudagrass has no prescribed dormancy breaking method under FSA regulations or AOSA rules.

Seed dormancy can be caused by conditions within the seed coat which prevent germination (exogenous dormancy) or by the physiology of the seed itself (endogenous dormancy) (Copeland, 2001). Bermudagrass, along with many grasses, belongs in the endogenous group. Endogenous dormancy is likely caused by the balance and interaction of various growth inhibitors and promoters within the embryo and can be broken by methods that affect this balance (Adkins, 2002). Such methods include leaching of inhibitory compounds, exposure to

cold, exposure to light of certain wavelengths or duration, and treatment with growth-promoting hormones. Dormant bermudagrass seeds respond well to cold exposure. Shaver et al. (2006) found that bermudagrass seed plots planted in the colder months of February and March established more rapidly than seed planted in April and May. Cold stratification is thought to lead to an increase in oxygen uptake and an increase in enzymes like endopeptidase, which break down seed storage proteins and thus provide more energy to the embryo (Copeland, 2001; Gai, 2008).

While cold exposure may help break dormancy, it can also stress seeds. Cold temperatures have been found to lower the production of seed storage proteins and photosynthetic proteins (Gai, 2008). Cold stress may also weaken cell walls and cause ion leakage across cell membranes, inhibiting cell growth and metabolism. Obviously a balance must be found between achieving maximum germination and preventing seed damage. When testing bermudagrass by rules that recommend a prechill for breaking dormancy, the Seed Regulatory and Testing Branch (SRTB) generally conducts a paired test. Prechill and non-prechill tests are planted at the same time. The non-prechill test is conducted normally, while the prechill test is placed in a 10°C chamber for 7 days and then transferred to the 20-35°C chamber. As bermudagrass germination typically requires 3 to 4 weeks to complete, the paired test saves time by preventing the need to replant a prechill test after the non-prechill has been conducted. Often, the non-prechilled sample germinates better than the prechilled sample. The prechilled seeds frequently succumb to fungal infestation, likely aided by the effects of cold stress mentioned above (Fig. 12).

When conducting a bermudagrass germination test, the analyst should consider the rules being followed, the length of the test, and the effects that cold exposure can have on the seed, both positive and negative.

Photo by Todd Erickson, USDA, AMS, 2010

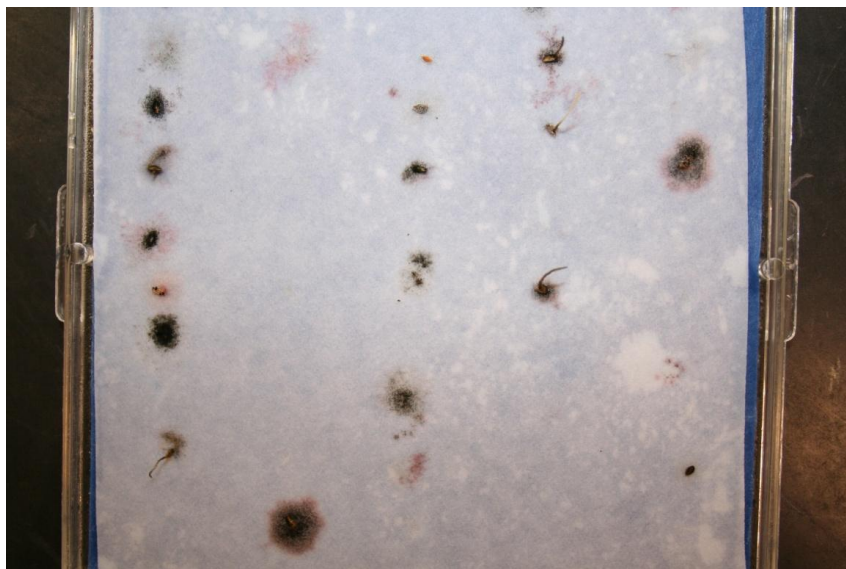


Figure 12.—Prechilled common bermudagrass seeds with fungal growth

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

SEED PROTEIN ELECTROPHORESIS TRAINING

Eliane Guillemette, a botanist with the Canadian Food Inspection Agency (CFIA), Ottawa Plant Laboratories, Seed Science, visited the plant physiology laboratory of the Seed Regulatory and Test Branch (SRTB) in Gastonia, NC, November 30 to December 4, 2009, to learn protein electrophoresis methods for seed identification. Ms. Guillemette is in charge of seed varietal testing at CFIA Seed Sciences. SRTB Plant Physiologist Dr. Yujia Wu has extensive knowledge and practical laboratory experience in electrophoresis testing, method development and improvement, and teaching.

The meeting was a wonderful opportunity for Dr. Wu to teach electrophoresis procedures, and a chance for both Dr. Wu and Ms. Guillemette to exchange ideas and learn about advanced techniques in their area of study.

Protein electrophoresis is a powerful method for seed varietal testing. When it is difficult or impossible to visually distinguish between the seeds of different varieties, electrophoresis can assist by separating proteins into specific banding patterns in the gel. These banding patterns are used to identify the variety. Dr. Wu and Ms. Guillemette worked with three major types of gel electrophoresis during the week: sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS PAGE), isoelectric focusing (IEF) gels, and acetic-polyacrylamide gel electrophoresis (A-PAGE). SDS PAGE is a technique widely used in crop-seed variety testing. It involves a total-protein extraction directly from seeds, with the resulting banding pattern showing most of the genetic information related to variety differences. SDS PAGE is a very suitable test for species such as wheat, barley, and oat. In IEF gel electrophoresis, the various proteins are separated by the differences in their electrical charges. This technique allows the activity of native enzymes in the gel to be preserved. It is then easy to stain the gel with a specific enzyme to show unique bands that may be used to distinguish among varieties. This method works well for tall fescue, wheatgrass, bermudagrass, and as a hybrid purity test for corn.

A-PAGE, another unique method, utilizes ascorbic acid to create acidic conditions and uses urea to enhance conductivity within the gel to facilitate protein separation by electrical charge. This method works very well for acidic seed proteins and is a standard method referenced in the International Seed Testing Association's (ISTA) publication, *Handbook of Variety Testing*.

Wheat seeds were used for training in all three electrophoresis methods. Dr. Wu and Ms. Guillemette completed protein analyses using each method, analyzed the results, and found that they had obtained the expected results. The combination of Ms. Guillemette's field work experience and Dr. Wu's laboratory expertise led to an improvement in skill level and scientific understanding for both scientists, with the added advantage of an established educational relationship between the two laboratories. Ms. Guillemette returned to her laboratory in Canada eager to implement the electrophoresis variety-determination tests that she learned during her week-long training session with Dr. Wu.

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

SEED SAMPLER TRAINING

Seed Regulatory and Testing Branch (SRTB) Chief Richard Payne and Seed Marketing Specialist Roger Burton conducted one-day Seed Sampler Training sessions in Des Moines, IA, on January 19 and Plainfield, IN, on January 27, 2010. The Monsanto Company requested the training sessions for their company personnel.

The following topics were covered in part:

- Samplers' role in quality control programs;
- Sampler safety;
- Sampling principles, documentation and problems;
- Proper selection and use of seed sampling triers;
- Proper calibration and use of automatic sampling equipment;
- Proper selection and use of dividers and dividing techniques;
- Planning and execution of sampling;
- AASCO, AOSA, and FSA sampling intensity requirements;
- OECD Seed Schemes maximum seed lot sizes;
- Sampling containers, mini bulk containers, and bulk seed; and
- Proper handling, storage, and shipping of samples for testing.

A visual hands-on seed sampling evaluation was conducted each day.

A sincere "Thank You" to management of the seed warehouses in Des Moines, IA, and in Plainfield, IN, for the use of their company facilities for these seed sampler-training sessions.

AASCO: Association of American Seed Control Officials

AOSA: Association of Official Seed Analysts

FSA: Federal Seed Act

OECD: Organisation for Economic Co-operation and Development

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SEED GRADER TRAINING IN AMES, IA

The Seed Regulatory and Testing Branch (SRTB) held a Seed Grader Training and Testing session February 23-24, 2010, in Ames, IA. The Iowa State Seed Science Center hosted six participants in this session. Training covered the requirements to grade seed exported from the United States into Canada. The Agricultural Marketing Service (AMS) recommends qualified participants to the Canadian Food Inspection Agency (CFIA) for recognition as GD class seed graders. Qualification is dependent upon: employment in an accredited laboratory, status as a Registered Seed Technologist (RST) or Certified Seed Analyst (CSA) for purity and germination, and acquisition of passing grades on the written theory examination and chosen components of the practical examination.

The GD grader classification represents accreditation to review reports of analysis issued by accredited seed testing laboratories recognized by Canada and to assign Canada pedigreed grade names to all crop kinds listed in one or more of the Grader Tables. Varieties of seed that are not registered in Canada cannot be assigned a Canada pedigreed grade name by a grader in the United States.

See program requirements at: [U.S. Seed Grader Information](#).

For more information about seed grading, please contact Perry Bohn at 704-810-7262 or e-mail at perry.bohn@ams.usda.gov.

SEED TESTING FACILITIES APPROVED AS ACCREDITED SEED LABORATORIES

The Audit Review and Compliance Branch (ARC) approved four additional company laboratories as Accredited Seed Laboratories (ASL): AgReliant Genetics, LLC, Elmwood, IL; Indiana Crop Improvement Association, Lafayette, IN; Monsanto Company, Waterman, IL; and Turf Tech Inc., Tangent, OR. The Monsanto Company facility was also accredited for sampling under the Accredited Seed Sampling Program (ASSP).

Reasons a seed company may want to consider becoming an ASL:

- To acquire authorization to use an official USDA Process Verified Report of Analysis on internationally-shipped seed
- To become eligible to test seed for the OECD Seed Schemes
- To qualify as a recognized laboratory with Seed Graders authorized to assign grades for seed being exported to Canada
- To have an internationally-recognized USDA Accredited Laboratory as part of their organization
- To have in place a process verified system accredited by the USDA

For more details regarding the ASL program check the website: [Seed Accreditation Programs](#), or for more information regarding this article, contact U.S. OECD Seed Schemes Program Manager Perry Bohn at (704) 810-7262; perry.bohn@ams.usda.gov.

SEED SEGMENTS

By Jerry Irwin

A JOURNEY TO CALIFORNIA

The Seed Segments reporter traveled to California, a state with several crop-growing regions. California has varying climates and elevations, which enable an array of crops to grow throughout the State.

California has a climate that is suitable for growing just about any crop. The State has a large central valley that is broken into two regions: the lower part of the central valley is the San Joaquin Valley and the upper part is the Sacramento Valley. California also has a very productive Central Coastal Valley. Much of the nation's produce grows in the Salinas Valley because of its ability to grow leafy vegetables practically year-round. Finally, California has another large agriculturally-producing valley known as the Imperial Valley. It is located at the very southern end of the State, east of San Diego and west of Yuma, AZ. For California agricultural statistics, visit their Web site (www.cdffa.ca.gov).

John Heaton, Senior Agricultural Biologist in the Nursery, Seed, and Cotton Programs in the Pest Exclusion Branch at the California Department of Food and Agriculture (CDFA) headquartered in Sacramento, CA, provided information about the California State Seed Program.

What activities are included in the Pest Exclusion Branch?

The mission of Pest Exclusion is to keep exotic agricultural and environmental pests out of the State of California and to prevent or limit the spread of newly discovered pests within the State. To accomplish this mission, the Branch has two roles: (1) regulatory compliance and enforcement and (2) service to the agriculture industry and the public.

The Branch is divided into three program components:

1. Exterior Pest Exclusion oversees border station inspections of all commercial and private vehicles entering the State;
2. Interior Pest Exclusion oversees enforcement of quarantines, inspection of packages at parcel carrier terminals, and phytosanitary certification of exports;
3. Nursery, Seed, and Quality Cotton Programs oversee licensing, pest cleanliness, registration and certification, truth in labeling, and quality cotton. The Nursery, Seed, and Quality Cotton Programs are a conglomeration of several statewide programs. One of them is the Seed Services Program. The Seed Services Program seeks to exclude the introduction and spread of primarily weed pests in planting seed.

What are the main functions of the Seed Services Program?

The main functions of the Seed Services Program are activities that ensure an orderly market for quality seed in California. This involves authorizing firms that sell seed in

California, enforcing the California Seed Law, conducting a compliance monitoring program, and assisting in the resolution of complaints involving seed.

The State contracts with County Agricultural Commissioners to provide local enforcement of the California Seed Law, but the Seed Services Program provides statewide enforcement. County inspectors evaluate the labeling of seed lots that arrive from out-of-state suppliers, as well as the labels of firms that package seed in their counties. Inspectors work closely with State enforcement officials when violations of the California Seed Law are encountered.

The Seed Services Program also conducts compliance monitoring through samples collected by regional biologists working for CDFA. Each regional biologist is assigned several counties from which he or she must collect an assigned number of official seed samples on a random basis. The samples are sent to the State seed laboratory, where they are analyzed for compliance to the State seed law. Violators are notified of deficiencies and if the lot is still in inventory, a stop-sale order may be issued until the problem(s) is corrected.

What are some of the more extraordinary duties that the Seed Services Program has dealt with?

Another responsibility of the Seed Services Program is to conduct an alternative dispute resolution process. The steps for this process are thoroughly prescribed in regulations. They involve conciliation between disputing parties, an investigation by the Seed Services Program, a meeting of the Investigative Committee (during which time the disputing parties can present the details of their dispute), a report by the Investigative Committee, and mediation if the disputing parties are not satisfied with the committee's report.

During the last four years, the Seed Services Program has averaged about two formal seed complaints per year. The complaints have included varietal purity, undeclared weed seeds, and low germination. All of the cases required extensive investigation. Perhaps the most intriguing case involved a cotton crop grown from seed that was coincidentally sampled four months earlier as part of the compliance monitoring program. Even with a preponderance of evidence that the seed quality was okay and evidence that several cultural practices may have contributed to an already bad crop-year, the complainant insisted that the case and the whole resolution process be reviewed by the Attorney General's Office. It was reassuring to learn that our investigation and the seed complaint process were adequate and able to withstand the scrutiny of Department lawyers, as well as the Attorney General's Office.

With more than 350 crops planted and harvested in California, is there a top-three list of popular crops in California?

California agriculture saw a fifteen percent gain in the sales-value of its products in 2007. The State's 75,000 farms and ranches received a record \$36.6 billion for their output in 2007, up from \$31.8 billion in receipts a year earlier.

The top three agricultural and vegetable crops in 2007 were reported to be:

Lettuce (\$2,178,041,000)
Alfalfa Hay (\$1,434,850,000)
Tomatoes (\$1,241,735,000).

What unique challenges does the Seed Services Program face?

Like many government programs, the Seed Services Program is always trying to give the stakeholders the best value for their dollar. Since the program receives no General Funds, there is constant pressure to collect adequate funds to cover the approved budget. A recent analysis of reported sales revealed that seed sales increased an average of five percent per year over the last fifteen years but ten percent per year during the last four years. There are a couple of reasons for the increase in reported sales during the last four years:

- The steady increase in the value of seed and
- Enforcement on firms that were previously not paying fees and assessments, but which are now reporting sales.

The biggest challenge the program will face in the future is the delivery of the same level of services with a retiring workforce and harder economic times. With each enforcement, the pool of nonpaying firms shrinks, making it harder to find new funds to cover an increasing budget.

Do the inspectors sample other commodities as well as seed?

Yes. There is only one CDFA Inspector that works fulltime for the Seed Services Program. The other CDFA Inspectors as well as the County Inspectors have many other responsibilities, ranging from nursery inspections, pesticide inspections and even Weights and Measures. The one northern CDFA biologist works 75 percent of the time for Nursery Services and 25 percent of the time for Seed Services. The three southern CDFA biologists work 75 percent of the time for Nursery Services and only 25 percent of the time for Seed Services. The need to juggle so many responsibilities makes it difficult for the biologists to collect seed samples and still be available to investigate seed complaints or train county staff in seed law.

How do you communicate with the inspectors who work remotely?

Ideally, the inspectors should know when they see a violation, but realistically, they wear so many hats that sometimes they cannot remember the details of the seed law and they need to communicate with headquarters. Since none of the inspectors are housed at the headquarters, it is essential that we have excellent means of communication. Each inspector has been assigned a cell phone and a digital camera. The digital cameras have proven to be well worth their investment. They can document label violations quickly and accurately. The images are easily transmitted back to headquarters where the violations can be thoroughly addressed. Most of the correspondence with inspectors

therefore occurs through e-mail and attached files. Some inspectors have more recently been assigned laptop computers and Wi-Fi cards, which allow them to communicate instantly with headquarters via e-mail, as well as to check databases such as the list of varieties protected by the Plant Variety Protection Office.

When county inspectors find problems with out-of-state seed shipments, they simply note the problem on the border inspection report and fax it to headquarters. With adequate documentation and communication, the staff at headquarters can immediately follow-up on the enforcement. Letters to violators are always carbon copied to the enforcing inspectors to assure them that their efforts have not been for nothing. This protocol has been proven more successful than counting on the county inspectors or regional biologists to initiate enforcement letters.

How do the Seed Services Program and California Seed Laboratory benefit from the cooperative agreement between CDFA and the Agricultural Marketing Service (AMS)?

The cooperation between CDFA and the USDA Seed Regulatory and Testing Branch (SRTB) has been excellent. The staff at AMS is always very helpful and supportive. They are an invaluable resource for interpretation of the Federal Seed Act. Their level of service is exceptional among Federal agencies.

A good example is a recent seed complaint involving a small farmer that had a problem with some pepper seed. After a considerable investigation by CDFA, it seemed that we were at a standstill because we could not find the expertise we needed to do molecular evaluation of some pepper varieties from the various lots we sampled. The SRTB volunteered to help us and provided the necessary molecular characterization to proceed with our investigation. A short time after providing the essential molecular characterization, SRTB called and informed us that they could also provide further documentation of the same material by conducting a small grow-out. Needless to say, the farmer was more than happy to have this evaluation by SRTB. The work conducted by SRTB proved pivotal in resolving this dispute to the satisfaction of both parties involved.

What advice would you give to someone who is interested in the field of seed law compliance?

I think it is very important to stay current on what is happening in the industry. I recommend that seed control officials, labelers, and dealers set a Google Alert for keywords in the news, such as; "seed," "certified seed," "plant variety protection," and "Federal Seed Act." This way, when these words appear in articles that are posted on the internet, you will automatically get a once-a-day summary e-mail. It can take a while to go through the e-mails, but there are some excellent articles that can help document real problems in the seed world. Those articles come in handy when you have to explain why parts of the seed law or activities of your program are so important.

The importance of seed is obvious to us, so we just assume that other people understand it too. My experience, however, has been that even well connected people

in the industry often do not know what is going on in other States or in the global marketplace. They are simply too busy trying to keep their businesses alive. Once they start reading about the various issues, they come to appreciate how important the seed law is. Seeds truly are the foundation of all agriculture and the foundation of our civilization. Countries that do not have a good infrastructure and an orderly market for seeds are constantly struggling with poverty.

My advice to someone interested in the field of seed law is to stay alert. The seed industry is very fast paced and tremendously competitive. Most of the players are very reputable, but occasionally someone gets in a jam and they try to slip inferior product through the marketplace. If they are successful once, you can bet they will probably try it again. Bad seed is a threat to the success of farmers and consumers. The seed law is there to make sure that does not happen.

The SRTB thanks John Heaton for submitting information for the IOI's Seed Segments column. The Seed Segments reporter may contact you to share information about your seed program.

For information regarding this article, contact Seed Marketing Specialist Jerry Irwin at (704) 810-8878; jerry.irwin@ams.usda.gov.

RYEGRASS FLUORESCENCE LIST

View the current ryegrass fluorescence list of the National Grass Variety Review Board by opening the following pdf file:

http://www.aosca.org/VarietyReviewBoards/Grass/NGVRB_VFL_Aug2009.pdf.

Access the Web site for additional reports and information:

<http://www.aosca.org/VarietyReviewBoards/Grass/Grass.html>.

PLANT VARIETY PROTECTION CERTIFICATE STATUS

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

SUBSCRIPTION INFORMATION

The Seed Regulatory and Testing Branch (SRTB) Web site (<http://www.ams.usda.gov/seed>) contains links to SRTB publications, which include current and past issues of the "Items of Interest in Seed" (IOI). An electronic subscription option is available on the SRTB home page. The subscription service provides an e-mail notification when SRTB publications are issued or changed. The e-mail notice includes the option of unsubscribing or viewing the publications.

For information regarding this article, contact Seed Marketing Specialist Jerry Irwin at (704) 810-8878; jerry.irwin@ams.usda.gov.

CALENDAR OF EVENTS

**Federal Seed School
Gastonia, NC**

May 10-14, 2010

Association of Official Seed Analysts (AOSA)
Annual Meeting
St. Louis, MO

June 4-11, 2010

International Seed Testing Association (ISTA) Congress
Cologne, Germany

June 15-22, 2010

American Seed Trade Association (ASTA) Annual Meeting
San Antonio, TX

June 26-30, 2010

Association of Official Seed Certifying Agencies (AOSCA)
Annual Meeting
Buffalo, NY

August 8-11, 2010

**Federal Seed School
Gastonia, NC**

August 16-20, 2010

American Association of Seed Control Officials (AASCO)
Annual Meeting
Portland, OR

August 6-8, 2010

Seed Regulatory and Testing Branch (SRTB) sponsored training shown in **bold**.

For further information regarding the Calendar of Events, contact Management Analyst Karen Sussman at (704) 810-7272; karen.sussman@ams.usda.gov.

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“The word miracle aptly describes a seed.”

Jack Kramer
Horticultural Author

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

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