The Seed Technologist Newsletter

A newsletter for members of AOSA-SCST

Volume 92 No. 1
April 2025

Trade, Tariffs, and the Global Seed Industry, Perspectives from ASTA

Research Abstracts presented in Rapid City, SD

2025 AOSA Rule Proposals

2025 Workshop Agendas

Seed ID: Meadow Fescue vs. Tall Fescue

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The Seed Technologist Newsletter

A newsletter for
The Association of Official Seed Analysts
and
The Society of Commercial Seed Technologists

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Newsletter Submission Guidelines

Articles should be typed, pertaining to some aspect of seed testing or other items of interest to the AOSA and SCST membership. These may include, but are not limited to:

Ongoing research

Committee and Working Group activity

Updates on the financial state of the organizations

Distinguished member profiles

Profiles of new members to the organizations.

Research paper abstracts

Results of research, referees, and validation studies

Upcoming changes to the AOSA Rules

Upcoming changes to the By-Laws of either organization

Survey study results

Information from other seed-trade organizations

Regional updates to state seed laws or RUSSL

Information on upcoming workshops or other opportunities for training

Book and resource reviews

Impressions from the Annual Meeting

Formatting:

Please include images as **separate** files, with credit to the photographer if different than the author. All images used will be credited.

For specific formatting within a document, please do not insert images, but leave a placeholder so that the editorial staff can include appropriate images, graphics, and tables within articles.

Please do not submit PDFs of articles.

Citations:

Cite image sources and references used.

Cite any additional sources used to compose the article, including co-authors so that they may be credited.

Author's name and contact information to be included in our contributor's page.

Publications must be in accordance with the Anti-trust policy of the AOSA- SCST.

Calendar of Events

April

AOSCA Western Regional Meeting Hood River, OR	April 21-23, 2025

May

ISTA Congress Christchurch, NZ	May 5-9, 2025
USDA Seed School Gastonia, NC	May 28-30, 2025

June

AOSA-SCST Annual Meeting Missoula, MT	June 8-12, 2025
ASTA leadership Summit Washington, DC	June 8-11, 2025
AOSCA Annual Meeting Kansas City, KS	June 16-19, 2025

July

Seeds Canada Annual Conference Quebec City, QC	July 7-9, 2025
AASCO Annual Meeting Corvallis, OR	July 15-17, 2025

August

USDA Seed School Gastonia, NC	August 11-13, 2025 Purity exam: August 14 Germination exam: August 15
ASTA Seed Management Academy West Lafayette, IN	August 26, 2025

September

Seed Congress of the Americas Foz do Iguacu, Brazil	September 29—October 3, 2025

October

Forage, Turf, & Conservation Seed Conference Kansas City, MO	October 29, 2025

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From AOSA/SCST Leadership

AOSA President James Smith, SCST President Melissa Phillips

One of the comments received from several members regarding the annual meeting was a request for a letter that members could bring to employers to emphasize the importance of attending the Annual Meeting and participation in committees, research, and Rule proposals. To meet this request, the leadership of AOSA and SCST drafted the letter included below. Thank you to everyone who provided feedback on how the Boards can support your active participation in AOSA and SCST.

To whom it may concern,

AOSA-SCST would like to communicate the importance of attendance at the annual meetings and active participation for our members. Attendance this year is exceptionally critical. As the organizations continue on the path to merge there will be key conversations, discussion, and opportunities for feedback. Input from the membership will be needed on these important issues. With that in mind, this coming meeting is on track to potentially be the last meeting as two separate organizations. This is a momentous time.

Beyond the importance of the 2025 meeting in Missoula, MT, Attendees at the meetings have the opportunity to improve their skills as analysts by connecting with their colleagues, benefiting from our collective decades of experience. As with many specialized fields, particularly in agricultural sciences, much of the knowledge that makes someone a good analyst is obtained through experience and discussion with colleagues and is not taught in a classroom or workshop.

For members at regulatory labs, the annual meeting is an important place to hear what concerns the industry has, and what new challenges may arise as new seed products are developed. For members at private labs the annual meeting is an opportunity to ask questions and provide input on regulatory practices and what they mean to commercial testing and production. Development of rule proposals, voting on the Rules, and participation in research is an important aspect of this entwined relationship. Forging strong bonds between private labs, companies, and regulatory bodies ensures that individual analysts have access to key personnel across the industry, promoting correct application of seed rules and regulations.

The Annual meeting is the primary forum for analysts to present research, discuss new methods, and begin the process for rule proposals. Now more than ever, this kind of input is invaluable as familiar crops change, and new crops are developed to meet market demands. To test seed effectively and account for changing markets and regulations input from the membership is crucial.

The Principals of AOSA-SCST appreciate your continued support of the organizations and those who support them.

James Smith- AOSA President

Melissa Phillips- SCST President

Diandra Viner- AOSA Vice-President

Quinn Gillespie- SCST Vice- President

Updates from AOSCA

Sarah Wilbanks, Ph.D. AOSCA Executive Director

As we step into the new season, AOSCA is excited to share updates on the latest initiatives, upcoming events, and opportunities for growth and collaboration within the seed industry.

Regional Meetings Underway & Preparations for the 2025 Annual Meeting
Throughout the spring, AOSCA will host regional meetings designed to address regional challenges, review standard change proposals and foster collaboration among seed certification agencies. These gatherings will provide a platform to discuss AOSCA business and regional challenges and opportunities all over the country. The Southern Region will met on March 25, 2025 in Savannah, GA. The Western Region will meet in Hood River, OR on April 22-23, 2025. And the Northern Region will meet virtually on April 15 , 2025.

On June 16-19, 2025 AOSCA will host the 2025 Annual Meeting in Kansas City, KS. Our annual meetings provide a platform for seed certification agencies to help drive certification into the future, and this meeting will be no different. Among business sessions, we have several educational sessions one in particular focusing on molecular testing within seed science. We would like to invite SCST/AOSA members to join us at this meeting!

All meeting information is available on the AOSCA website.

AOSCA Academy

AOSCA is committed to supporting the professional development of our members. We are pleased to announce that after a successful first year hosting the AOSCA Academy, we have another cohort eager to grow in 2025 within the second cohort. The Academy is designed for seed certifiers seeking to enhance their leadership skills and learn effective strategies for team management, communication, and decision-making in the seed industry.

Engage and Stay Informed

As we navigate through these exciting opportunities, AOSCA encourages all members to stay connected. Be sure to visit the AOSCA website and follow us on social media to stay up-to-date on the latest developments, news, and resources available to the seed certifying community.

Together, we continue to advance the standards of seed certification, ensuring that high-quality seed is delivered to the market for the benefit of growers and consumers alike.

Looking forward to a productive and prosperous spring season!

Trade, Tariffs, and the Global Seed Industry

Kaity Crawford, Director, ASTA Marketing and Communications

Since taking office on January 20, the new Administration has announced tariffs on several trading partners under different U.S. trade and economic authorities. Continuing announcements over the first 100 days—whether through Executive Order (EO) or other measures—represent the first shifts in U.S. trade policy that will continue to evolve over the next four years. In an era of rapid change, it is more critical than ever for the U.S. seed sector to stay informed on how tariff policy may impact the future of our industry.

Under the International Emergency Economic Powers Act (IEEPA), the President has broad authority to take action to restrict imports in response a national emergency. At this time, the Administration has announced between 20-25% IEEPA tariffs on several U.S. trading partners, which impact a wide range of products including imports of planting seeds. Several of these announcements have subsequently been paused through April 2, and it remains to be seen how and whether the U.S. government will begin enforcing those tariffs.

In parallel, the President has also announced tariffs on specific sectors under a separate authority within the Section 232 Trade Act. After investigating whether imports of specific commodities impact U.S. national security, the Administration can impose tariffs to address those concerns. While these actions have not directly targeted the seed sector to date, several U.S. trading partners are considering retaliatory tariffs on U.S. exports in response to both IEEPA and Section 232 tariffs. Some trading partners, including **Canada** and the **European Union**, are considering whether U.S. exports of planting seeds should be targets for retaliation.

We encourage you to consider **tracking** the ongoing U.S. tariff announcements and the impacts they may have on your businesses. Through a blend of trade and advanced breeding approaches, the U.S. seed industry provides farmers with the most cutting-edge seeds. Our industry is highly specialized and diversified, developing and selling hundreds of varieties of seeds across numerous species. In 2024 alone, the U.S. seed sector exported $1.7 billion in seeds under 80 tariff codes, which were destined for over 100 export markets. However, rising costs that hinder seed trade and testing across borders could delay the commercialization of vital crops and improved varieties.

For these reasons, the U.S. seed industry continues to encourage the Administration to quickly come to a resolution with our trading partners.

Updates from ISTA

Yoana Uzunova, Marketing and Communication Manager

ISTA will be bringing the 34th ISTA Congress to Christchurch from 5-9 May 2025

The Congress brings together seed scientist and technologists for a two-day seed symposium and forum to discuss the most recent research into seed quality assurance and through the forum a current challenge facing the industry. The seed symposium will present research on "Seed Quality for Global Food Security and Biodiversity" followed by a discussion forum on New Breeding Technologies.

During the five days of the Congress, delegates will have the opportunity to network with and strengthen or begin collaborations with colleagues from around the world. Sponsors will achieve exceptional exposure to key players in global seed quality assurance through the Congress programme and associated Congress publicity. Your Sponsorship support will help ensure a vibrant and successful in person Congress that will ultimately contribute to a more secure future through the enhanced food and nutritional security that is made possible by the availability of high-quality seed.

We look forward to your support to help make the 34th ISTA Congress a great event.

For comprehensive details about the event, including its programme and key highlights, visit the official website: [ISTA 2025 | Home]

To explore the sponsorship opportunities and benefits for each category, download the **Sponsorship Prospectus** here: https://www.istacongress2025.com/sponsorship.

Upcoming workshop on Quality Assurance and ISTA Accreditation

The ISTA Accreditation and Technical Department, in collaboration with the Kimihia Research Centre Laboratory in Lincoln, looks forward to welcoming you to the ISTA Workshop on Quality Assurance and ISTA Accreditation – Advanced Level, taking place in Lincoln, New Zealand, in May 2025.

Workshop Aim

This workshop is designed to present and discuss the principles of quality management, with a focus on the specific needs of seed testing laboratories seeking to comply with the ISTA Accreditation Standard and maintain ISTA Accreditation.

Workshop Content

The workshop will include presentations and hands-on practical activities to help participants apply quality management principles in a seed testing laboratory. Key topics covered will include:

- Staff monitoring and internal audits
- Sampling procedures
- Equipment and consumables checks

All content will align with the **ISTA Rules and ISTA Accreditation Standard** to ensure laboratories meet required quality standards.

For detailed information on the preliminary programme, workshop organisers, lecturers, and to register, please click here.

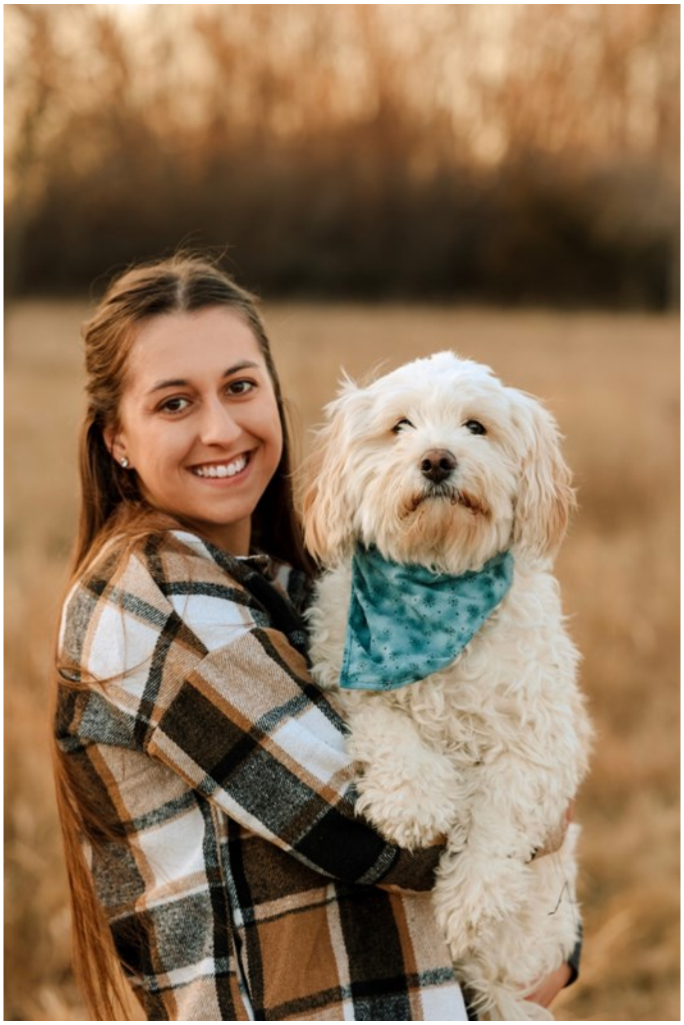
The latest version of the ISTA Reference Pest List (ISTA-RPL), v14.0 is now available online and my be downloaded from here.

The updated list includes **2 species** of the *Amaranthaceae* (Amaranth) and *Moringaceae* (Drumstick tree) families**.**

For more information on the ISTA-RPL project and its ongoing investigations, please visit its webpage.

New Analyst Profiles

As submitted by new Registered and Certified members



Rachel Geary, RST

Rachel joined the Wyoming State Seed Analysis Lab as the new manager in August of 2023.

She has a Bachelor's degree in Agronomy and a Master's degree in Plant Science, both from South Dakota State University. Rachel worked for the SDSU Seed Testing Lab for 5 years while attending classes at SDSU. She conducted her thesis research in the lab, which included determining the working weights and germination methods for stiff goldenrod and river bulrush. Rachel's passion for agriculture developed from growing up on a small family farm in Southeastern South Dakota.

In her free time, Rachel enjoys gardening, baking, and quilting. You can also find her curled up with her dog, Ziva, and a good book.

Meeting Basics

Location: Holiday Inn Missoula Downtown, Missoula Montana

Hotel deadline for group rate: May 7, 2025

Dates: June 8, 2025—June 12, 2025

Workshops offered: Tetrazolium, Seedling evaluation, Statistics, Vigor testing

Workshop Dates: Sunday, June 8, 2025

Tour Location: Alberton Orchards

Look for a special edition of the Newsletter all about the Annual Meeting coming in May!

Workshop Agenda: Tetrazolium

Instructors: TZ Committee

June 8, 2025 9:00am—3:30pm
Organized by the Tetrazolium Sub-committee

This full-day workshop will include two presentations on basic TZ methods and more advanced techniques on native and dormant seeds.

The majority of the workshop will focus on hands-on cutting and staining the following species: wheat, onion, alfalfa, sunflower, penstemon, little blue stem, and golden rod. Several members of the TZ subcommittee will be in attendance to show different techniques and answer questions. Attendees will have the opportunity to read samples stained overnight during the Tetrazolium Sub-Committee meeting on Monday.

TZ Workshop Schedule

9:00 – 10:00: Icebreaker and TZ introduction presentation – history of test, how it

works, stain evaluation basics, how to report results

10:00- 12:00: cut wheat, onion, alfalfa, sunflower

12:00-1:00: lunch

1:00- 1:30: presentation on native seed TZ's and how dormancy effects staining

1:30 – 3:30: evaluate stains from earlier – cut penstemon, little blue stem, golden rod,

look at photos of each of these to evaluate

Monday: look at overnight stains during committee meeting

Workshop Agenda: Seedling Evaluation

Instructor: Riad Baalbaki

June 8, 2025, 8:00 am – 12:00 pm
Organized by the Germination and Dormancy Sub-Committee

This half-day workshop will address two topics:

A. Towards a Uniform Evaluation of Hypocotyl Length. We will start by a brief discussion of factors determining hypocotyl length, emphasizing a more nuanced understanding of the hypocotyl's response to environmental factors. Given the wide variation in hypocotyl length within and among replicates, among tests from different lots and labs, and among species, the aim is to develop a more uniform approach to hypocotyl evaluations. Training will be virtual, using seedling images spanning a wide range of species. The focus will be on presenting a high number of examples, as well as group exercises on appropriate hypocotyl evaluations under different test conditions.

B. The Seedling Images Database as a Training and Learning Tool. The objective of this part is to train analysts on the multiple uses of the Seedling Evaluation Database, in order to improve evaluation uniformity. This part will demonstrate ways of using the database for group- and self-training, the database as an aid in evaluating 'difficult' seedlings and unfamiliar species, as well as its common use as a visual record of normal and abnormal seedlings across species.

Syllabus

8:00 am – 8:30 am: Understanding seedling growth with emphasis on hypocotyl development.

8:30 am – 9:45 am: Examples and applications of hypocotyl length evaluations.

9:45 am – 10:00 am: Break.

10:00 am – 10:30 am: The Seedling Images Database; overview of contents and usage instructions.

10:30 am – 11:15 am: Practical training on using the database as a learning tool.

11:15 am – 12:00 pm: Practical training on using the database for evaluating 'difficult' and 'unfamiliar' species.

Workshop Agenda: Statistics

Instructors: Statistics Committee

June 8, 1:00pm—5:00pm
Organized by the Statistics Committee

The half-day workshop will cover the following topics:

1. Why do seed test results differ among labs?

    Problems associated with differences in seed testing results.

    Types of errors that lead to mistakes in rejecting and accepting samples.

    Factors that contribute to differences in test results among labs.

    Ways to measure and reduce differences in test results.

2. Calculations of the fluorescence in blends and mixtures of ryegrasses.

    Varieties with low VFL,

    High VFL,

    No VFL description,

    Unknown amounts of annual and perennial ryegrass.

3. Proposed purity tolerance tables for native species.

    Native species tolerances for comparing purity test results of two subsamples from the same submitted sample of the same seed lot analyzed in the same or different laboratory (2-way test, P=0.1%).

    Native species tolerances for comparing purity test results of two different submitted samples from the same seed lot analyzed in the same or in different laboratories (1-way test, P=0.01%).

4. Participants can send questions before or during the workshop on tolerances or analyzing research data.

Workshop Agenda: Vigor Tests—Pitfalls and Causes of Unwanted Variation

Instructors: Laura Carlson, Riad Baalbaki

June 8, 2025; 1:00 pm to 5:00 pm
Organized by the Seed Vigor Sub-committee

This half-day workshop aims to train analysts on recognizing sources of unwanted variation in specific vigor tests, and ways of avoiding such variation to increase test uniformity within and among seed labs.

The workshop will focus on specific vigor tests, with preference to commonly and widely used methods of evaluating both agricultural and vegetable seed kinds. For each test, a brief review of accepted methodology will be followed by a closer look at sources of common errors in performing the test, sources of unwanted (and hidden) variation, and ways of reducing such variation.

Syllabus
1:00 pm to 2:45 pm

1:00-1:30 pm AA Testing Evolution Over 30 Years: successes in reducing sources of variation
(Tim Gutormson, SoDak Labs, Inc.)

1:35-2:05 pm The Cotton Cool Test: research to reduce variation among laboratories
(Michael Phillips, North Carolina State Univ.)

2:10-2:40 pm The Cotton Cool Test: laboratory variation and test termination innovation
(Lauren Shearer, SoDak Labs, Inc.)

2:40 pm to 2:55 pm Break

2:55 pm to 5:00 pm

2:55-4:50 pm Seedling Performance Tests: principles and sources of variation *(Riad Baalbaki, CDFA)*

a. What is a *Seedling Performance* test?
b. Uniformity tests
c. Seedling fresh weight tests
d. Seedling dry weight tests
e. Seedling length tests
f. Radicle emergence tests
g. Other seedling performance tests
h. Quantifying and interpreting *Seedling Performance* test results

4:50-5:00 pm General discussion and conclusions

Seed ID: Meadow Fescue vs Tall Fescue

Rachel Henricks, RST

Many species of cool season grasses can look very similar. Tall fescue and Meadow fescue can be particularly difficult to separate due to their similar size, shape, and coloring. Included here are some useful points of identification for these two species.

Tall fescue

Color is dark tan and can have areas tinged with purple.

Seed is widest below the middle

Rechilla has a knob/disc at the top. Rachilla does not lay flat against the seed and is round and slender.

Tall fescue and Meadow fescue, palea view. Photo Rachel Henricks, 2017

Meadow fescue

Color is light tan to dark tan

Seed is widest at the middle of the sidee and tends to lean toward one side.

Rachilla is stout and flattened. Rachilla stands away from the seed and is often twisted.

Tall fescue

Lemma veins are prominent

Lemma is coarsely granular and dull

Tall fescue and Meadow fescue, lemma view. Photo Rachel Henricks, 2017

Meadow fescue

Awn is usually lacking

Center nerve has short hairs near the top of the seed

Lemma is smooth as if glazed

Meadow fescue, *Festuca pratensis*

Steve Hurst. Provided by ARS Systematic Botany and Mycology Laboratory

Tall fescue, *Festuca arundinacea*
Steve Hurst. Provided by ARS Systematic Botany and Mycology Laboratory. Turkey, Kayseri

Sometimes Mother Nature will try to deceive you. These are Tall fescue seeds with twisted rachillas. The rachillas are still slender and peg-shaped with the widest point below the midpoint of the seed.

Photo Rachel Henricks, 2017

Herbicide classes: A guide to herbicide bioassays

Zach Duray, RGT, Illinois Crop Improvement Association, Inc.

Herbicide bioassays offer a simple and cost-effective approach for evaluating the presence of genetically modified traits in crops. From early plant genetic research, herbicide resistant markers have been coupled with genetic insertions to help guide event screening by herbicide bioassay. These methods, to this day, remain one of the most economical means of detecting genetic herbicide resistance in seed samples. In order to create a successful herbicide bioassay method, it is important to understand how herbicides work within the crop being tested, what the injury symptoms associated with the herbicide acting on that crop are, and when in the plant life stage to apply the herbicide to best show injury symptoms.

A herbicide's mode of action explains "how" a herbicide works; it describes the process within the plant that is affected by the herbicide. These are organized into broad categories. Examples of modes of actions include the disruption of an essential enzyme in a metabolic pathway (amino acid synthesis inhibitor), or a plant hormone upregulated to cause structural damage (growth regulator).

The site of action is the physical location within the plant where the herbicide binds. Herbicide sites of action are categorized by Site of Action (SOA) groups, and are designated by numbers:

SOA Number	Site of Action
1	Acetyl CoA carboxylase (ACC-ase) Inhibitor
2	Acetolactate Synthase (ALS) Inhibitor
4	T1R1 Auxin Receptors
5	Photosystem II Inhibitor
9	5-Enolpyruvyl shikimate-3-Phosphate Synthase (EPSPS) Inhibitor
10	Glutamine Synthetase Inhibitor
14	Protoporphyrinogen Oxidase (PPO) Inhibitor
27	4-Hydroxyphenylpyruvate dioxygenase (HPPD) Inhibitor

Knowing herbicide modes of action and how they are classified is helpful in deciding how to approach developing a herbicide bioassay. Some considerations include: herbicide symptoms that appear during a specific growth stage of a plant, the types of symptoms, if the chemical is contact or systemic, or risk of drift.

SOA Number	Herbicides	Examples	Symptoms
1	Quizalofop (Assure II)	PowerCore Enlist Corn	Unbranched, stubby roots, stunting.
2	Chlorsulfuron (Glean)	STS soybeans, Clearfield tolerant crops	Unbranched, stubby roots, stunting, leaves turn yellow from outer edge, veins turn light yellow to dark purple.
4	Dicamba (Clarity), 2,4-D	RoundupReady Xtend, Enlist Soybeans	Stunting, malformed seedlings, new malformed growth, concerns with drift injury due to being highly volatile.
5	Metribuzin (Sencor)	Metribuzin tolerant crops	Chlorotic and necrotic tissue, stunting.
9	Glyphosate (Roundup)	Glyphosate tolerant crops, RoundupReady	Stunting, necrosis, chlorosis. Systemic action throughout the plant.
10	Glufosinate (Liberty)	LibertyLink crops	Chlorotic and necrotic tissue, stunting. Primarily a contact herbicide, limited translocation
14	Sulfentrazone (Spartan)	Sulfentrazone tolerant crops	Chlorotic and necrotic tissue on leaf margins.
27	Isoxaflutole (Balance Flexx)	LL/GT27 soybeans	Bleaching on new growth.

Some herbicides are more favorable in some bioassay types than others. Seedlings screened against an HPPD inhibitor will need more time to grow in a well-lit environment in order for bleaching symptoms to develop, which requires a seedling growout and sprayover. Dicamba is a volatile herbicide prone to drift, so opting for a seed imbibition method may be more sensible than a sprayover method. Some injury symptoms can be different when the herbicide is applied at different times. When LibertyLink soybean is sprayed at the seedling stage, leaves will show chlorotic and necrotic lesions starting at the herbicide point of contact and are scored 2-3 weeks after planting, where in a seed imbibition test for the same herbicide, the seed's hypocotyl is stunted and stiff, and is scored 5-7 days after planting.

Although herbicide injury symptoms in bioassays are generally uniform across testing labs, differences in method can cause subtle changes to how a non-tolerant seedling will appear. These changes can be caused by several variables: herbicide concentration, moisture, temperature, humidity, growth media, or lighting. Having reliable sources of tolerant and non-tolerant control seed is essential for verifying a method. It is important to validate methods and observe results with several tolerant and non-tolerant varieties in order to create a consistent, robust and repeatable test.

References:

Matt Raymond, RGT, (retired), Illinois Crop Improvement Association. 2016 Superworkshop presentation "How Herbicides Work"

Aaron Hager, University of Illinois Extension Specialist – Weed Science. Urbana, IL. hager@illinois.edu

Analysis of Soybean Development after Mechanical Damage at the Embryonic Axis

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Soybean mechanical damage is one of the essential factors affecting seed soybean quality. The damage fractures the cotyledon or the embryonic axis of the seed. Some soybean seeds with damage at the embryonic axis recover and develop normal seedlings. Studies have reported the damage and the effect of the damage. However, no study has been conducted on controlled mechanical damage at the embryonic axis, and no reports have been made on their recovery from injury. The objectives of this research were to: 1) elucidate soybean germination after controlled mechanical damage at the embryonic axis, 2) compare germination recovery on the damage at different parts of the axis, and 3) compare germination recovery on different genetic backgrounds. Three soybean (*Glycine max*) cultivars harvested in 2022 and 2023 were used in the study with the three damage types, at radicle tip, mid-radicle (hypocotyl), and whole radicle (up to epicotyl), in addition to undamaged control. Number of dead, abnormal, and normal seedlings were collected on four replications of 25 seeds per treatment. After the evaluation, the dry weight of root and hypocotyl, percent dry weight of root and hypocotyl, number of secondary roots, length of the longest root and hypocotyl, and percent length of the longest root and hypocotyl were collected on five normal seedlings per replication per treatment. Most soybeans recovered from the damage and were evaluated as normal seedlings at the end of the germination period. No significant difference was observed in total germination among undamaged, damage at the radicle tip, and mid-radicle. Damaged seedlings developed from 4 to 7 secondary roots on average across the treatments and cultivars. The weights and lengths of the roots and hypocotyl decreased as more damage occurred. However, there was no significant difference in the root dry weight of the seedlings, with damage at the radicle tip and no damage control. Moreover, all treatments for certain cultivars showed a comparable percentage of root and hypocotyl length and mass. Significant difference in root and hypocotyl development patterns in length, mass, and number of secondary roots were observed among cultivars. These research findings are the first to quantify and report the seedling recovery after mechanical damage and will help understand seed development after damage. Further research is being conducted at the University of Illinois to investigate the development of damaged seeds in the field.

Application of Multi-spectral Imaging and Machine Deep Learning for Weed or Crop Seeds Analysis

Ruojing Wang[1]* , Rafizul Haque[1], Amir Ardalan Kalantari Dehaghi[2], Liang Zhao[1], Tony Kaekang Lee[2], Noureddine Meraihi[2]

Abstract

The detection and identification of noxious seeds are a routine analysis for issuing phytosanitary or seed certificates for safe agricultural trades. However, current manual analyses are time-consuming and heavily rely on extensively trained analysts and taxonomic expertise. At the same time, the current methodology makes it hard to meet the demands on testing accuracy in many cases due to a greater diversity of plant species and globalized trade. In this study, we explored a computer vision technology to respond to these challenges. This system involves a sample pre-screening machine, a multi-spectral imaging instrument, and a machine deep learning algorithm. We tested for application efficiency and fit for purpose with real-world large seeded crop samples of wheat (Triticum aestivum L. subsp. astivum) and barley (Hordeum vulgare L. subsp. vulgare). The targeted weed seeds, Cirsium arvense (Canada thistle) and its similar species of Carduus nutans and Cirsium vulgare was spiked into the samples. The sample was pre-screened with an auto sieving system to separate the target seeds from the crop seeds. The screened out target seeds, together with other seeds and debris, were used to generate multi-spectral images. The image sets were used to train deep learning models which were then validated with a separately generated image set. The results indicated that the auto-sieving system can separate targeted weed seeds from crop seeds with 100% accuracy. The deep learning model identified the target seeds with an accuracy of 92.22%. We further conducted an experiment to test the computer vision system in distinguishing five Brassica species that with similar size and morphology. The results indicated that the classification accuracies exceeded 97% for all five types or species with this system. This research underscores the promising potential of computer vision system with combination of sample treatment integrating mechanical shaker, multi-spectral imaging, and deep learning technology in seed testing. The study offers solutions to deal with the sample types when apply computer vision in testing practice of seed and phytosanitary certifications.

Embryonic Pathogen in Sugarbeet Seed and Impact in Seedling Development and Stand Establishment

Mark Anfinrud, Retired, SESVanderhave

Identified Alternaria Impacting Normal Germination Processes: Germination testing of various hybrids at 20c identified negative geotropism, curled roots or curled hypocotyls. Tissue samples extracted from infected radicles and hypocotyls were brought to NDSU Plant Pathology Lab where the diagnostic conclusion was Alternaria small spore.

Temperature Impact on *Alternaria* Aggressiveness: Germinations were initiated with 20c for 4 days followed by 25c for 3 days which greatly increased the % of *Alternaria* impact on radicle, hypocotyl and cotyledonary development influencing evaluation of % normal

Theoretical Mode of Action: Research is being conducted at the USDA in Fargo to identify how the *Alternaria* gets into the embryonic tissue. *Alternaria* is commonly known to emit pytotoxins to break down soil organic matter. It is obvious that when an *Alternaria* spore emits a phytotoxin within the developing seedling during germination, it acts like an auxin and causes the point of the emission to react negatively. (curl, decay, negative geotropism etc)

Seedling Expressions of Infection:

The infected radicle:

Infected black root tip causes the root to be pruned and forced to sprangle
Infected mid radicle causes the root to become infected and limits normal elongation.

The infected hypocotyl:

Cause various levels of curling interrupting the normal vertical progression necessary for uniform emergence.
More severe reactions noted where the curl turns into a sharp bend which becomes infected.
Negative geotropism could be a reaction due to *Alternaria* phytotoxins where radicles grow vertically or hypocotyls growing downward for a period of time during the early stages of seedling development

Infected cotyledons

Rare occasions was cotyledon infection noted at 20c
Adding 25c for 3 days greatly increased percentage of impact on cotyledons
Beginning stages was water soaking of one or both cotyledons followed by increasing areas of infected tissue resulting in turning black.

2025 AOSA Rule Proposals

Submitted by AOSA Rules Committee

Proposal No.	Purpose	Submitted by
1	To add bulk weights for species with a purity weight listed in Table 2A.	Bryce Calligan, Professional Member, Bayer Crop Science
2	To add the additional name of canola (Argentine type) to Brassica napus var. napus to Table 2A, 6A, and Volume 3 of the AOSA Rules	Christopher Roberts, RST, Corteva Agriscience
3	To improve the reporting requirements for de-coated seed by providing more information on the chosen method.	Todd Erickson, USDA Seed Regulatory & Testing Division
4	To add Glyceria declinata to AOSA Rules Volume, Uniform Classification as a weedy species.	Quinn Gillespie, RST, Universal Seed LLC.
5	To update the identification and description of aerial seedling structures of cyclamen, changing the identification and description of 'cotyledons' to 'epicotyl.'	Riad Baalbaki, David Johnston, Germination and Dormancy Subcommitteee
6	To revise section 3.5.6 Negative Geotropism of Volume 4, to clarify the differences in geotropic responses between seedling shoots and roots, and the correct evaluation of each.	Heidi Jo Larson, Laura Donaldson, David Johnston, Kathy Mathiason, Marija Topic, Riad Baalbaki, Seedling Images Working Group
7	To add a note, under Poaceae Grass Family III-Corn in AOSA Rules for Testing Seeds Volume 4, clarifying the evaluation of anthocyanin color that can be present in Zea mays seedlings.	Heidi Jo Larson, Laura Donaldson, David Johnston, Kathy Mathiason, Marija Topic, Riad Baalbaki, Seedling Images Working Group
8	To add a note, under Poaceae Grass Family I-Cereals in AOSA Rules for Testing Seeds Volume 4, clarifying the anthocyanin color that can be present in Secale cereale and x Triticosecale seedlings.	Heidi Jo Larson, Laura Donaldson, David Johnston, Kathy Mathiason, Marija Topic, Riad Baalbaki, Seedling Images Working Group
9	To add a sketch and clarify how a detached coleoptile tip should be evaluated for members of the Poaceae Grass Family I-Cereals, AOSA Rules for Testing Seeds, Vol. 4.	Heidi Jo Larson, Laura Donaldson, David Johnston, Kathy Mathiason, Marija Topic, Riad Baalbaki, Seedling Images Working Group

Proposal 1

Submitted by Bryce Callighan

Purpose of proposal

Improve the usability of Table 2A. There are multiple null values for noxious weed seed for species with a defined purity weight. This rule proposal fills out the values so that an analyst does not need to calculate the value.

Present rule

See Table 2A of AOSA Vol 1

Proposed rule

See Attached modified Table 2A*

Method for calculating the noxious seed exam weight was to first use the seeds per gram value in Table 2a. Using the calculation 50,000 seeds per gram, I then compared to the recommended purity weight to see if it was close to 10x. There were two species where the calculated noxious weight was significantly lower than 10x the purity weight:

- Atriplex canescens – recommend 180g, but will defer if 190 is chosen by rule committee
- Betula populifolia – recommend 3g, but will defer if 5g is chosen by rule committee

Exceptions were also made if the required purity weight was above 500g.

Harmonization and Impact statement:

This was not a harmonization effort but instead transparency to the values as defined by the AOSA rules

Supporting evidence:

b If it is necessary to conduct a noxious weed seed examination, see section 2.3 to determine size of the working sample. For those kinds listed that show over 500 grams as the minimum weight for purity analysis, the actual amount given shall also be considered the minimum quantity to be examined for noxious weed seeds. In no other cases does the amount examined for noxious weed seeds need to exceed 500 grams for raw seed or 1,000 grams for coated, encrusted or pelleted seeds.

Submitted by:

Bryce Callighan

Bryce.callighan@bayer.com

815-979-8078 (Text if you have a question, otherwise I will assume a spam call).

2/1/2024

*The complete proposed text of the updated Table 2A can be found on the Rules Committee page here:
https://analyzeseeds.com/wp-content/uploads/2025/02/Proposal-1.1-Table-2A.pdf
Only lines with proposed changes are included on the following pages.

Proposal 1.1, Table 2A

Lines with proposed changes.

The noxious weed seed and bulk examinations working weights shall be 10 times the purity working weight (the weight of seed mat or seed tape containing approximately 25,000 seed units) or a maximum of 1,000 grams for kinds in Table 2A for which the working sample weight of raw seed is 500 grams.

2.4 The minimum working sample weights for purity analysis, noxious weed seed examination and bulk examination are given in Table 2A.

Table 2A. Weights for working samples

Pure Seed Unit #	Chaffy (C) or Super Chaffy (SC)a	Kind of seed	Minimum weight for purity analysisb	Minimum weight for noxious weed seed or bulk examination	Approximate number of seeds per gramc	Approximate number of seeds per ounced
			Grams	Grams	Number	Number
5		*Abies amabilis* J. Forbes Pacific silver fir	100	500	25	705
5		*Abies balsamea* (L.) Mill. balsam fir	20	200	130	3,740
5		*Abies concolor* (Gordon & Glend.) Lindl. ex Hildebr. white fir	83	500	30	855
5		*Abies fraseri* (Pursh) Poir. Fraser fir	20	200	125	3,500
5		*Abies grandis* (Douglas ex D. Don) Lindl. grand fir	66	500	38	1,070
5		*Abies homolepis* Siebold & Zucc. Nik- ko fir	40	400	65	1,780
5		*Abies lasiocarpa* (Hook.) Nutt. subalpine fir	30	300	85	2,340
5		*Abies magnifica* A. Murray California red fir	200	500	13	355
		Abies magnifica A. Murray var. *shastensis* Lemmon Shasta red fir	see *Abies ×shastensis*			
5		*Abies procera* Rehder noble fir	95	500	26	750
5		*Abies ×shastensis* (Lemmon) Lemmon Shasta red fir	200	500	13	355
5		*Abies veitchii* Lindl. Veitch fir	20	200	130	3,680
5		*Abies* spp. fir	-	-	-	-
42	C	*Abronia* spp. sandverbena	-	-	-	-
		Acer ginnala Maxim. amur maple	see *Acer tataricum* subsp. *ginnala*			
26		*Acer macrophyllum* Pursh bigleaf maple	350	500	7	195
26		*Acer negundo* L. box elder or negundo maple	100	500	25	710

Pure Seed Unit #	Chaffy (C) or Super Chaffy (SC)a	Kind of seed	Minimum weight for purity analysisb	Minimum weight for noxious weed seed or bulk examination	Approximate number of seeds per gramc	Approximate number of seeds per ounced
			Grams	Grams	Number	Number
26		*Acer pensylvanicum* L. striped maple	100	500	25	710
26		*Acer platanoides* L. Norway maple	400	500	6	165
26		*Acer pseudoplatanus* L. sycamore maple	200	500	13	370
26		*Acer rubrum* L. red maple	50	500	50	1,420
26		*Acer saccharinum* L. silver maple	500	500	3	90
26	C	*Acer saccharum* Marshall sugar maple	175	500	14	380
26	C	*Acer spicatum* Lam. mountain maple	50	500	50	1,420
26	C	*Acer tataricum* L. subsp. *ginnala* (Maxim.) Wesm. Amur maple	75	500	35	950
1		*Aesculus pavia* L. red buckeye	4,500	4,500		3
26	C	*Ailanthus altissimus* (Mill.) Swingle tree-of-heaven, ailanthus	80	500	30	915
1		*Amelanchier alnifolia* (Nutt.) Nutt. ex M. Roem. Saskatoon serviceberry	30	300	84	2,385
50	SC	*Artemisia tridentata* Nutt. big sagebrush	0.75	7.5	4,500	127,000
38	SC	*Atriplex canescens* (Pursh) Nutt. fourwing saltbush	19	180	146	4,150
1		*Berberis vulgaris* L. European barberry	30	300	85	2,340
26	C	*Betula alleghaniensis* Britton yellow birch	3	30	985	27,900
26	C	*Betula lenta* L. sweet birch	2	20	1,420	40,400
26	C	*Betula nigra* L. river birch	3	30	825	23,400
26	C	*Betula papyrifera* Marshall paper birch	1	10	3,040	86,300
26	C	*Betula pendula* Roth European white birch	0.5	5	5,290	150,000
26	C	*Betula populifolia* Marshall gray birch	0.5	5	9,380	266,000
4	C	*Calocedrus decurrens* (Torr.) Florin incense cedar	87	500	29	815
36		*Carya illinoinensis* (Wangenh.) K. Koch pecan	2,300	2,300	-	6
36		*Carya ovata* (Miller) K. Koch shagbark hickory	2,300	2,300	-	6
26		*Casuarina* spp. beefwood	3	30	1,030	29,300

Pure Seed Unit #	Chaffy (C) or Super Chaffy (SC)a	Kind of seed	Minimum weight for purity analysisb	Minimum weight for noxious weed seed or bulk examination	Approximate number of seeds per gramc	Approximate number of seeds per ounced
			Grams	Grams	Number	Number
3	C	*Catalpa bignonioides* Walter southern catalpa	50	500	45	1,280
3	C	*Catalpa speciosa* E. Y. Teas northern catalpa	50	500	45	1,280
2	C	*Cedrus atlantica* (Endl.) G. Manetti ex Carrière Atlas cedar	200	500	12	350
2	C	*Cedrus deodara* (Roxb. ex D. Don) G. Don deodar cedar	300	500	8	225
2	C	*Cedrus libani* A. Rich. cedar-of-Lebanon	200	500	11	305
6		*Celastrus orbiculatus* Thunb. Oriental bittersweet	20	200	120	3,360
6		*Celastrus scandens* L. American bittersweet	40	400	55	1,630
39	C	*Cercocarpus ledifolius* Nutt. ex Torr. & A. Gray curlleaf mountain-mahogany	25	250	100	3,000
39	C	*Cercocarpus montanus* Raf. var. *montanus* true mountain-mahogany	28	280	90	2,500
4	C	*Chamaecyparis lawsoniana* (A. Murray) Parl. Port Orford cedar	5	50	465	13,100
35		*Cornus florida* L. flowering dogwood	190	500	13	375
35		*Cornus sericea* L. subsp. *sericea* red-osier dogwood	75	500	40	1,150
34		*Crataegus mollis* (Torr. & A. Gray) Scheele downy hawthorn	110	500	24	653
4	C	*Cupressus arizonica* Greene Arizona cypress	30	300	90	2,500
4		*Cupressus nootkatensis* D. Don Alaska cedar	10	100	240	6,750
1		*Ephedra nevadensis* S. Watson Nevada ephedra, Nevada Mormon-tea	60	500	45	1,280
1		*Ephedra viridis* Coville green Mormon-tea	60	500	45	1,280
28	SC	*Ericameria nauseosa* (Pall. ex Pursh) G.L. Nesom & G.I. Baird rubber rabbitbrush	2	20	1,350	38,200
1	C	*Eucalyptus deglupta* Blume Mindanao gum	0.5	5	10,000	280,000
1	C	*Eucalyptus grandis* W. Hill ex Maiden rose gum	5	50	715	20,000
26	C	*Fraxinus americana* L. white ash	100	500	22	625
26	C	*Fraxinus excelsior* L. European ash	200	500	13	370

Pure Seed Unit #	Chaffy (C) or Super Chaffy (SC)a	Kind of seed	Minimum weight for purity analysisb	Minimum weight for noxious weed seed or bulk examination	Approximate number of seeds per gramc	Approximate number of seeds per ounced
			Grams	Grams	Number	Number
26	C	*Fraxinus latifolia* Benth. Oregon ash	150	500	18	505
26	C	*Fraxinus nigra* Marshall black ash	100	500	25	710
26	C	*Fraxinus pennsylvanica* Marshall var. *lanceolata* (Borkh.) Sarg. green ash	50	500	50	1,420
26	C	*Fraxinus pennsylvanica* Marshall var. *pennsylvanica* green ash	100	500	25	710
2		*Gleditsia triacanthos* L. honey locust	400	500	6	175
3		*Grevillea robusta* A. Cunn. ex R. Br. silky-oak	40	400	66	1,875
38	SC	*Krascheninnikovia lanata* (Pursh) A. D. J. Meeuse & A. Smit winterfat	12	120	213	6,040
5		*Larix decidua* Mill. European larch	15	150	170	4,810
5		*Larix kaempferi* (Lamb.) CarriΠre Japanese larch	10	100	260	7,380
5		*Larix occidentalis* Nutt. western larch	8	80	315	8,940
5		*Larix sibirica* Ledeb. Siberian larch	25	250	95	2,690
5		*Larix ×marschlinsi* Coaz Dunkeld larch	10	100	240	6,750
3		*Liquidambar styraciflua* L. sweetgum	10	100	247	7,010
26	C	*Liriodendron tulipifera* L. tulip-poplar, yellow-poplar	58	500	43	1,215
1		*Magnolia grandiflora* L. southern magnolia	200	500	14	400
1		*Malus s*pp. apple	50	500	45	1,250
1		*Malus* spp. crabapple	20	200	145	4,130
35		*Nyssa aquatica* L. water tupelo	500	500	1	30
35		*Nyssa sylvatica* Marshall black tupelo	300	500	7	210
2		*Picea abies* (L.) H. Karst. Norway spruce	20	200	140	4,000
2		*Picea engelmannii* Parry ex Engelm. Engelmann spruce	8	80	300	8,440
2		*Picea glauca* (Moench) Voss white spruce	6	60	405	11,500

Pure Seed Unit #	Chaffy (C) or Super Chaffy (SC)a	Kind of seed	Minimum weight for purity analysisb	Minimum weight for noxious weed seed or bulk examination	Approximate number of seeds per gramc	Approximate number of seeds per ounced
			Grams	Grams	Number	Number
2		*Picea glauca* (Moench) Voss 'Densata' Black Hills spruce	5	50	510	14,400
2		*Picea glauca* (Moench) Voss western white spruce, Alberta white spruce	6	60	415	11,800
2		*Picea glehnii* (F. Schmidt) Mast. Sakhalin spruce	8	80	300	8,520
2		*Picea jezoensis* (Siebold & Zucc.) Carriére yeddo spruce	6	60	405	11,500
2		*Picea koyamae* Shiras. Koyama spruce	8	80	310	8,770
2		*Picea mariana* (Mill.) Britton et al. black spruce	3	30	890	25,300
2		*Picea omorika* (Pancic) Purk. Serbian spruce	8	80	320	9,080
2		*Picea orientalis* (L.) Link Oriental spruce	15	150	175	4,780
2		*Picea polita* (Siebold & Zucc.) Carriére tigertail spruce	40	400	65	1,810
2		*Picea pungens* Engelm., including Glauca group blue spruce and Colorado blue spruce	10	100	235	6,630
2		*Picea rubens* Sarg. red spruce	8	80	310	8,750
2		*Picea sitchensis* (Bong.) Carriére Sitka spruce	5	50	465	13,100
2		*Pinus albicaulis* Engelm. whitebark pine	300	500	8	225
2		*Pinus aristata* Engelm. bristlecone pine	50	500	50	1,440
2		*Pinus banksiana* Lamb. jack pine	9	90	281	7,965
2		*Pinus canariensis* C. Sm. Canary Island pine	275	500	9	260
2		*Pinus caribaea* Morelet Caribbean pine	45	450	55	1,560
2		*Pinus cembra* L. Swiss stone pine	500	500	4	115
2		*Pinus cembroides* Zucc. Mexican pinyon pine	500	500	4	115
2		*Pinus clausa* (Chapm. ex Engelm.) Vasey ex Sarg. sand pine	25	250	101	2,875
2		*Pinus contorta* Douglas ex Loudon incl. var. *latifolia* Engelm. ex S. Watson shore pine, lodgepole pine	11	110	228	6,455
2		*Pinus coulteri* D. Don Coulter pine, bigcone pine	500	500	3	85
2		*Pinus densiflora* Siebold & Zucc. Japanese red pine	25	250	100	2,810
2		*Pinus echinata* Mill. shortleaf pine	28	280	88	2,505

Pure Seed Unit #	Chaffy (C) or Super Chaffy (SC)a	Kind of seed	Minimum weight for purity analysisb	Minimum weight for noxious weed seed or bulk examination	Approximate number of seeds per gramc	Approximate number of seeds per ounced
			Grams	Grams	Number	Number
2		*Pinus elliottii* Engelm. slash pine	96	500	26	735
2		*Pinus flexilis* E. James limber pine	250	500	10	275
2		*Pinus glabra* Walter spruce pine	25	250	102	2,900
2		*Pinus halepensis* Mill. Aleppo pine	50	500	55	1,560
2		*Pinus heldreichii* Christ Bosnian pine	50	500	45	1,220
2		*Pinus jeffreyi* Balf. Jeffrey pine	300	500	7	200
2		*Pinus kesiya* Royle ex Gordon Khasia pine	50	500	51	1,440
2		*Pinus lambertiana* Douglas sugar pine	500	500	5	130
2		*Pinus luchuensis* Mayr Formosa pine	30	300	80	2,260
2		*Pinus merkusii* Jungh. & de Vriese Merkus pine	65	500	39	1,100
2		*Pinus monticola* Douglas ex D. Don western white pine	47	470	53	1,500
2		*Pinus mugo* Turra var. *mughus* (Scop.) Zenari Mugo Swiss mountain pine	15	150	180	5,150
2		*Pinus mugo* Turra var. *mugo* Swiss mountain pine	20	200	135	3,880
2		*Pinus muricata* D. Don bishop pine	25	250	102	2,900
2		*Pinus nigra* J. F. Arnold subsp. *laricio* Maire Corsican pine	30	300	70	2,010
2		*Pinus nigra* J. F. Arnold subsp. *nigra* Austrian pine	50	500	55	1,630
5		*Pinus palustris* Mill. longleaf pine	224	500	11	315
2		*Pinus parviflora* Siebold & Zucc. Japanese white pine	250	500	9	265
2		*Pinus patula* Schltdl. & Cham. Jelecote pine	20	200	116	3,300
2		*Pinus pinaster* Aiton cluster pine	110	500	22	625
2		*Pinus pinea* L. Italian stone pine	500	500	1	40
2		*Pinus ponderosa* P. Lawson & C. Lawson ponderosa pine, western yellow pine	98	500	25	720
2		*Pinus radiata* D. Don Mon-terey pine	80	500	30	830
2		*Pinus resinosa* Aiton red pine, Norway pine	23	230	110	3,130

Pure Seed Unit #	Chaffy (C) or Super Chaffy (SC)a	Kind of seed	Minimum weight for purity analysisb	Minimum weight for noxious weed seed or bulk examination	Approximate number of seeds per gramc	Approximate number of seeds per ounced
			Grams	Grams	Number	Number
2		*Pinus rigida* Mill. pitch pine	20	200	135	3,880
2		*Pinus serotina* Michx. pond pine	20	200	120	3,400
2		*Pinus strobus* L. eastern white pine	46	460	54	1,525
2		*Pinus sylvestris* L. Scotch pine, Scots pine	18	180	141	3,990
2		*Pinus taeda* L. loblolly pine	67	500	38	1,065
2		*Pinus thunbergii* Parl. Japanese black pine	30	300	75	2,130
2		*Pinus virginiana* Mill. Virginia pine, scrub pine	24	240	106	3,000
2		*Pinus wallichiana* A. B. Jacks. Himalayan pine	125	500	20	570
37	C	*Platanus occidentalis* L. American sycamore, American planetree	8	80	307	8,715
2		*Platycladus orientalis* (L.) Franco Oriental arborvitae, Chinese arborvitae	50	500	50	1,450
34		*Prunus armeniaca* L. apricot	500	500	1	19
34		*Prunus avium* (L.) L. cherry	400	500	6	165
34		*Prunus domestica* L. plum, prune	500	500	2	50
34		*Prunus persica* (L.) Batsch peach	1,500	1,500	-	7
5		*Pseudotsuga menziesii* (Mirb.) Franco grey Douglas fir, var. *caesia* (Beissn.) Franco and blue Douglas fir, var. *glauca* (Beissner) Franco	30	300	85	2,380
5		*Pseudotsuga menziesii* (Mirb.) Franco var. *menziesii* green Douglas fir	25	250	95	2,630
39	C	*Purshia mexicana* (D. Don) S. L. Welsh cliff-rose	19	190	130	3,650
2	C	*Purshia tridentata* (Pursh) DC. antelope bitterbrush	70	500	37	1,050
1		*Pyrus communis* L. pear	70	500	35	940
33		*Quercus alba* L. white oak	1,750	1,750	-	8
33		*Quercus muehlenbergii* Engelm. chinkapin oak	560	560	-	25
33		*Quercus* spp. (red or black oak group)	700	700	-	20
33		*Quercus virginiana* Mill. live oak	630	630	-	22
3		*Rhododendron* spp. rhododendron	0.5	5	11,000	312,500

Pure Seed Unit #	Chaffy (C) or Super Chaffy (SC)a	Kind of seed	Minimum weight for purity analysisb	Minimum weight for noxious weed seed or bulk examination	Approximate number of seeds per gramc	Approximate number of seeds per ounced
			Grams	Grams	Number	Number
7		*Robinia pseudoacacia* L. black locust	50	500	55	1,500
32		*Rosa multiflora* Thunb. multiflora rose	25	250	100	2,810
4	C	*Sequoia sempervirens* (D. Don) Endl. redwood	12	120	210	5,950
4	C	*Sequoiadendron giganteum* (Lindl.) J. Buchholz giant sequoia	12	120	200	5,670
3	C	*Syringa vulgaris* L. common lilac	12	120	200	5,670
4	C	*Thuja occidentalis* L. northern white cedar, eastern arborvitae	3	30	765	21,600
4	C	*Thuja plicata* Donn ex D. Don western red cedar, giant arborvitae	3	30	915	25,900
2		*Tsuga canadensis* (L.) Carriére eastern hemlock, Canada hemlock	6	60	410	11,700
2		*Tsuga heterophylla* (Raf.) Sarg. western hemlock, Pacific hemlock	5.5	55	460	13,025
26	C	*Ulmus americana* L. American elm	15	150	150	4,250
26	C	*Ulmus parvifolia* Jacq. Chinese elm	7	70	355	10,000
26	C	*Ulmus pumila* L. Siberian elm	15	150	145	4,060
1		*Vitis vulpina* L. riverbank grape	80	500	32	900

Proposal 2 (Amended)

Christopher Roberts

Title: Additional of the common name 'canola' to Brassica napus var. napus

Purpose of Proposal: To add the additional name of canola (Argentine type) to Brassica napus var. napus. Also commonly known as annual/winter rape. Canola is a widely used name in the seed and food industry for Brassica napus var. napus. and is becoming more and more prevalent in the United States and Canada.

Present Rule: Current common names listed is only winter rape or annual rape.

Proposed Rule: Additional of the common name canola (Argentine type) to Brassica napus var. napus in Table 2A, 6A and Volume 3 Uniform Classification.

Table 2A. Weights for working samples

Pure Seed Unit #	Chaffy (C) or Super Chaffy (SC)[a]	Kind of seed	Minimum weight for purity analysis[b]	Minimum weight for noxious weed seed or bulk examination	Approximate number of seeds per gram[c]	Approximate number of seeds per ounce[d]
			Grams	Grams	Number	Number
		Brassica chinensis L. pak-choi	see *Brassica rapa* subsp. *Chinensis*			
2		*Brassica juncea* (L.) Czern. India mustard	5	50	625	17,690
		Brassica napus L. subsp. *rapifera* Metzg. rutabaga	5	50	430	12,135
		Brassica napus L. var. *annua* W. D. J. Koch annual rape	see *Brassica napus* var. *napus*			
		Brassica napus L. var. *biennis* (Schübl. & G. Martens) Rchb. — winter rape	see *Brassica napus* var. *napus*			
		Brassica napus L. var. *napobrassica* (L.) Rchb. rutabaga	see *Brassica napus* subsp. *rapifera*			
2		*Brassica napus* L. var. *napus* annual rape and canola (Argentine type)	7	70	345	9,810
2		*Brassica napus* L. var. *napus* winter rape and canola (Argentine type)	10	100	230	6,520

Table 6A. Methods of testing for laboratory germination

Kind of Seed	Substrata[a]	Tempera-ture (°C)	First count (days)	Final count (days)	Specific requirements and notes	Dormant seed[f]
Brassica carinata A. Braun Ethiopian mustard	B, T	20; 20-30	5	7		
Brassica chinensis pak-choi	see *Brassica rapa* subsp. *chinensis*					
Brassica juncea India mustard	P	20-30	3	7	Light	KNO_3. Prechill at 10°C for 7 days and test for 5 additional days
Brassica napus subsp. *rapifera* rutabaga	B, T	20-30	3	14		
Brassica napus var. *napus* annual rape and winter rape, canola (Argentine type)	B, T	20; 15-25	3	7		
Brassica napus var. *napobrassica*	see *Brassica napus* subsp. *rapifera*					

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7654	*Brassica juncea* (L.) Czern.	mustard, brown; mustard, India; mustard, Indian	Brassicaceae	V	W	W	W	W	W	W	C
7657	*Brassica kaber* (DC.) L. C. Wheeler = *Sinapis arvensis* L.										
319661	*Brassica napus* L. subsp. *napus* f. *annua* (Schübl. & G. Martens) Thell.	rape, annual canola (Argentine type)	Brassicaceae	A	C	W	W	W	W	W	C
464497	*Brassica napus* L. subsp. *napus* f. *napus*	rape, winter canola (Argentine type)	Brassicaceae	A	C	W	W	W	W	W	C
7664	*Brassica napus* L. subsp. napus var. *pabularia* (DC.) Alef.	kale, Siberian	Brassicaceae	A	W	W	W	W	W	W	W

20

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7654	*Brassica juncea* (L.) Czern.	mustard, brown; mustard, India; mustard, Indian	Brassicaceae	V	W	W	W	W	W	W	C
319661	*Brassica napus* L. subsp. *napus* f. *annua* (Schübl. & G. Martens) Thell.	rape, annual canola (Argentine type)	Brassicaceae	A	C	W	W	W	W	W	C
464497	*Brassica napus* L. subsp. *napus* f. *napus*	rape, winter canola (Argentine type)	Brassicaceae	A	C	W	W	W	W	W	C
7664	*Brassica napus* L. subsp. napus var. *pabularia* (DC.) Alef.	kale, Siberian	Brassicaceae	A	W	W	W	W	W	W	W

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rape, annual	*Brassica napus subsp. napus f. annua*
rape, annual turnip	*Brassica rapa subsp. rapa*
rape, biennial turnip	*Brassica rapa subsp. rapa*
rape, bird	*Brassica rapa subsp. rapa*
rape, turnip	*Brassica rapa subsp. oleifera*
rape, winter	*Brassica napus subsp. napus f. napus*
raspberry	*Rubus spp.*
raspberry, hill	*Rubus niveus*
canola (Argentine type)	Brassica napus subsp. napus f. annua
canola (Argentine type)	Brassica napus subsp. napus f. napus

HARMONIZATION/IMPACT STATEMENT:

Canola is used as a common name in the Canadian M&P as well as ISTA for Brassica napus var. Napus. AOSA-SCST should harmonize this common name with both organizations to allow full use of the name canola and eliminate discrepancy between organizations for a common name for Brassica napus var. Napus. Canola is currently not a common name recognized in the FSA.

<u>*Canadian Methods and Procedures for Testing Seed (M&P*)</u>

Brassica napus var. *napus*
Rapeseed, oilseed rape,
canola - Agentine type

International Rules for Seed Testing

Table 15B. Specific conditions for the radicle emergence test procedures; all assessments of radicle emergence should be made by eye and without magnification

Species	Germination medium	Replication	Germination temperature	Criterion of radicle emergence	Timing of radicle emergence count
Brassica napus (oilseed rape, Argentine canola)	Pleated paper	2 replicates of 100 seeds	20 ±1 °C	Appearance of radicle after breaking through seed coat. Seeds in which seed coat has split, but no radicle has emerged, must not be included.	30 h ±15 min
Raphanus sativus	Top of paper	4 replicates of 50 seeds	20 ±1 °C	Production of 2 mm radicle.	48 h ±15 min
Triticum aestivum subsp. *aestivum* (excluding dormant seed lots)	Between paper	4 replicates of 50 seeds	15 ±1°C	Production of 2 mm radicle. Radicle includes parts that are within coleorhiza, as well as those that have emerged through it.	48 h ±15 min
Zea mays	Between paper	8 replicates of 25 seeds	20 ±1 °C or 13 ±1 °C	Production of 2 mm radicle. Radicle includes parts that are within coleorhiza, as well as those that have emerged through it.	66 h ±15 min at 20 ±1 °C 144 h ±1 h at 13 ±1 °C

Chapter 15: Seed vigour testing

Vigour test methods are species specific and require suitable equipment, the use of control samples and experience of the analyst. The expectation that a seed analyst can infrequently analyse an isolated sample to establish a level of vigour is unrealistic. Uniformity can be best achieved by working for a period of time alongside another analyst experienced in the use of the method. Training of analysts may be more important than the exact agreement in details of procedure.

The following ISTA vigour tests have completed validation:

Conductivity test: *Cicer arietinum*, *Glycine max*, *Phaseolus vulgaris*, *Pisum sativum* (garden peas only, excluding petits pois varieties), *Raphanus sativus*

Accelerated ageing test: *Glycine max*

Controlled deterioration test: *Brassica* spp.

Radicle emergence test: *Zea mays*, *Brassica napus* (oilseed rape, Argentine canola), *Raphanus sativus*, *Triticum aestivum* L. subsp. *aestivum*

Tetrazolium vigour test: *Glycine max*

SUPPORTING EVIDENCE:

[The Biology of Brassica napus L. (Canola/Rapeseed) - inspection.canada.ca]

[Brassica napus subsp. napus]

SUBMITTED BY: Christopher Roberts, RST, Seed Quality Testing Supervisor, Corteva Agriscience, 1000 W Jefferson Street, Tipton, IN 46072

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DATE SUBMITTED: 11/1/24

Proposal 3

Todd Erickson

Purpose of proposal

Improve reporting requirements for de-coated seed by providing more information on the chosen method.

Present rule

15. r. When coated kinds from the Poaceae or mixtures of other kinds are de-coated for germination testing, the following statement must be made on the report of analysis: Germination results based on pure seed units de-coated prior to germination testing.

Proposed rule

r. When coated kinds from the Poaceae or mixtures of other kinds are de-coated for germination testing, the following statement must be made on the report of analysis: Germination results based on pure seed units de-coated prior to germination testing. If the seeds were de-coated at the customer's request, the following statement must be used: Germination results based on pure seed units de-coated prior to germination testing, at the customer's request. If the seeds were de-coated for regulatory purposes, the following statement must be used: Germination results based on pure seed units de-coated prior to germination testing, according to regulatory requirements.

Harmonization and Impact statement

ISTA and FSA do not have specific required statements for germination results of de-coated seed

Supporting evidence

This proposal was based on a suggestion from the purity committee. The intent is to clarify on the ROA why the seed was de-coated prior to planting. The existing rule indicates that the de-coated statement is to be used when the conditions in 6.8(l)(b & c) are met (Poaceae or mixes). The reason for de-coating may not be immediately apparent if the seed was de-coated for regulatory purposes or customer requests, so this should be clearly stated in the report.

Submitted by:

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10/1/24

Proposal 4

Quinn Gillespie

2025 AOSA Rule Proposal #4

PURPOSE OF PROPOSAL:
To add *Glyceria declinata* to AOSA Rules Volume 3, Uniform Classification as a weedy species.

PRESENT RULE:
None

PROPOSED RULE:

NOMEN #	SCIENTIFIC NAME	COMMON NAME	FAMILY	SPP. CLASS	CONTAMINATING CLASSIFICATION						
					A	**F**	**H**	**R**	**S**	**T**	**V**
465018	*Glyceria declinata* Bréb.	manna grass, waxy	Poaceae	W	W	W	W	W	W	W	W

HARMONIZATION/IMPACT STATEMENT:

Taxonomy: In the literature cited *Glyceria declinata* is referred to as "waxy manna grass", "low mannagrass", and "waxy mannagrass." The common name "waxy manna grass" is the current common name described in the Germplasm Resource Information Network (GRIN). While the USDA PLANTS Database lists *Glyceria declinata* as "waxy mannagrass" the former has been selected as a common name to remain consistent with GRIN and with the common names of other *Glyceria spp*. listed in Volume 3 of the AOSA Rules.

Environmental Impact: *Glyceria declinata* is native to Europe and Northern Africa and has been naturalized to Australia, New Zealand, and the United States in Oregon and California. It is a common weed in Oregon grass seed crops. In California *G. declinata* is described as moderately invasive by the California Invasive Plant Council (n.d.) and can pose a threat to endangered or threatened native species. Dense growths of *G. declinata* may reduce native populations of endangered or threatened species of flora in vernal pools where the young plants may be mistaken for *Lolium multiflorum*. (DiTomaso, et al., 2013). The California Department of Fish and Wildlife Native Plant Program has identified *G. declinata* as a direct threat to Sacramento Orcutt grass and has made efforts to reduce the spread of this invasive species. Current recommendations are to keep the presence of *G. declinata* below ten percent where Sacramento Orcutt grass is found. (Bjerke, 2018).

In one vernal pool sampled in 2001, the cover of *Glyceria* sp. (initially identified as *G. occidentalis*) was determined to be 2%. When sampled in 2006 the *Glyceria* sp. found was determined to be morphologically consistent with *G. declinata* with over 90% coverage of the same area. Dense coverage of *G. declinata* can also make it difficult to cultivate fields. (Gerlach, 2006). In pools where *G. declinata* was incorrectly identified as a variation of *G. occidentalis* there has been significant spread of *G. declinata* to the point that the invasive *G. declinata* is now the likely the only *Glyceria* species present in these pools. In a survey of central valley pools in California (Gerlach et al. 2009) determined that all samples of *Glyceria* spp. collected from these pools were morphologically consistent with *Glyceria declinata*.

Impact on international trade: There are four very similar species of concern in Australia, *G. declinata* and *G. fluitans* are found on the Australia list of permitted species for import, while *G. leptostachya* and *G. occidentalis* (listed as *G. ×occidentalis)* are listed as species that are weeds and prohibited from entry to Australia (BICON, 2024a, 2024b). Accordingly, it is necessary to confirm identification of *Glyceria* at species level for contaminants found in seed for export to Australia. As the only diploid species of this grouping, *G. declinata* is the most easily identifiable without conducting a lengthy grow out test (Church, 1949). *Glyceria fluitans* is listed as tetraploid in the Kew Royal Botanical Gardens C-Values Database (Leitch et al. 2019). Ploidy testing identifying a *Glyceria* sp. contaminant as having a ploidy level consistent with that of *G. declinata* has been satisfactory to issue a preliminary report for samples with this contaminant for export to Australia (Garay 2007) .

Canada M&P: Not listed in Canada Methods and Procedures or Weed Seed Order

ISTA: ISTA Stabilized List of Plant Names only describes *Glyceria fluitans* and *Glyceria maxima.*

Australian Biosecurity Import Conditions: *Glyceria declinata* is listed in Case: Permitted Seed for Sowing.

SUPPORTING EVIDENCE:

Although described as a separate and distinct species in multiple references based on short stature, bilobed palea tips, lobed lemma tips, and narrow leaf blades (Hitchcock, 1951), *G. declinata* has also been described as a variation of *G. occidentalis* (Holmgren and Holmgren, 1977). To answer the question of whether *G. declinata* found in California was truly the same as the native European species and not a variation of *G. occidentalis* the team at Flora of North America conducted a study to determine molecular and morphological markers to identify *G. declinata*. In their study, samples of *Glyceria* found in California vernal pools proved to be *Glyceria declinata* with chloroplast genotypes identical to the native European *Glyceria declinata* samples. From Whipple et al. (2007) "*Glyceria declinata* is usually shorter and more decumbent than *G. occidentalis*, its panicle branches tend to be shorter, straighter, and have fewer spikelets than those *of G. occidentalis*, and its lemmas have two more or less equal lobes on either side of the tip rather than inconspicuous, unequal lobes (see images at http://herbarium.usu.edu/webmanual/). The morphological and cpDNA data support both recognition of *G. declinata* as a distinct species and its presence in western North America." These lobes on the lemmas of *G. declinata* can be an important point of identification and are well described by Flora of North America in their identification key at http://floranorthamerica.org/Glyceria#Key.

Glyceria declinata is one of four species of the *Glyceria* spp. complex which may be indistinguishable from one another when the identifying features are damaged or missing as the caryopses of these species are very similar. The distinctive lobes present on the lemma may be easily broken off during processing. Official descriptions of *Glyceria* spp. are also typically based on the lowest lemma present in a spikelet, but there can be a great deal of variation within the panicle (Barkworth et al. 2019) which may also make purely morphological identification difficult. Other species in this grouping include *Glyceria fluitans,* previously mentioned *Glyceria occidentalis,* and *Glyceria leptostachya.* Of these four species, only *Glyceria declinata* may be distinguished via ploidy testing, either using a root tip squash method or by ploidy via flow cytometry as *Glyceria declinata* is the only diploid species of these four morphologically similar species (Church 1949). *G. fluitans, G. occi-*

dentalis, and G. leptostachya are all tetraploid species (Leitch et al., 2019). *G. declinata* may also be identified by grow out tests (Garay 2007).

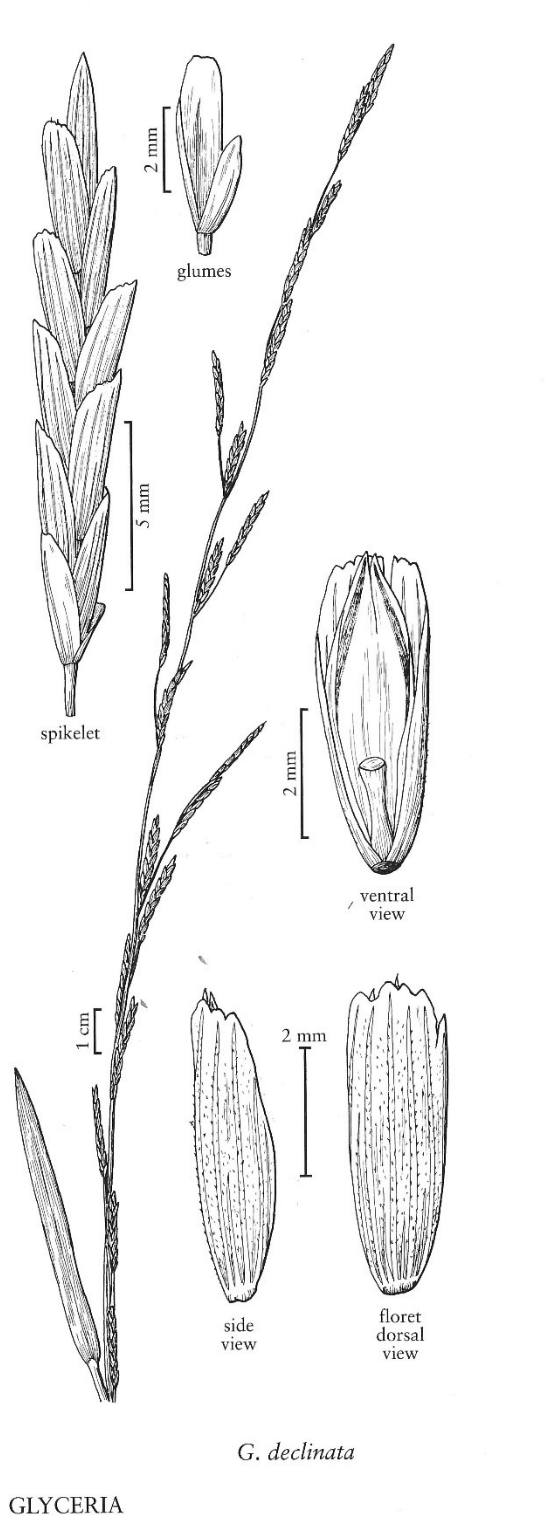

Fig. 1: *Glyceria declinata* illustration. (Roche 2019)

Fig. 2: Bilobed palea and lemma lobes of *Glyceria declinata* (image by Fred Hrusa2006)

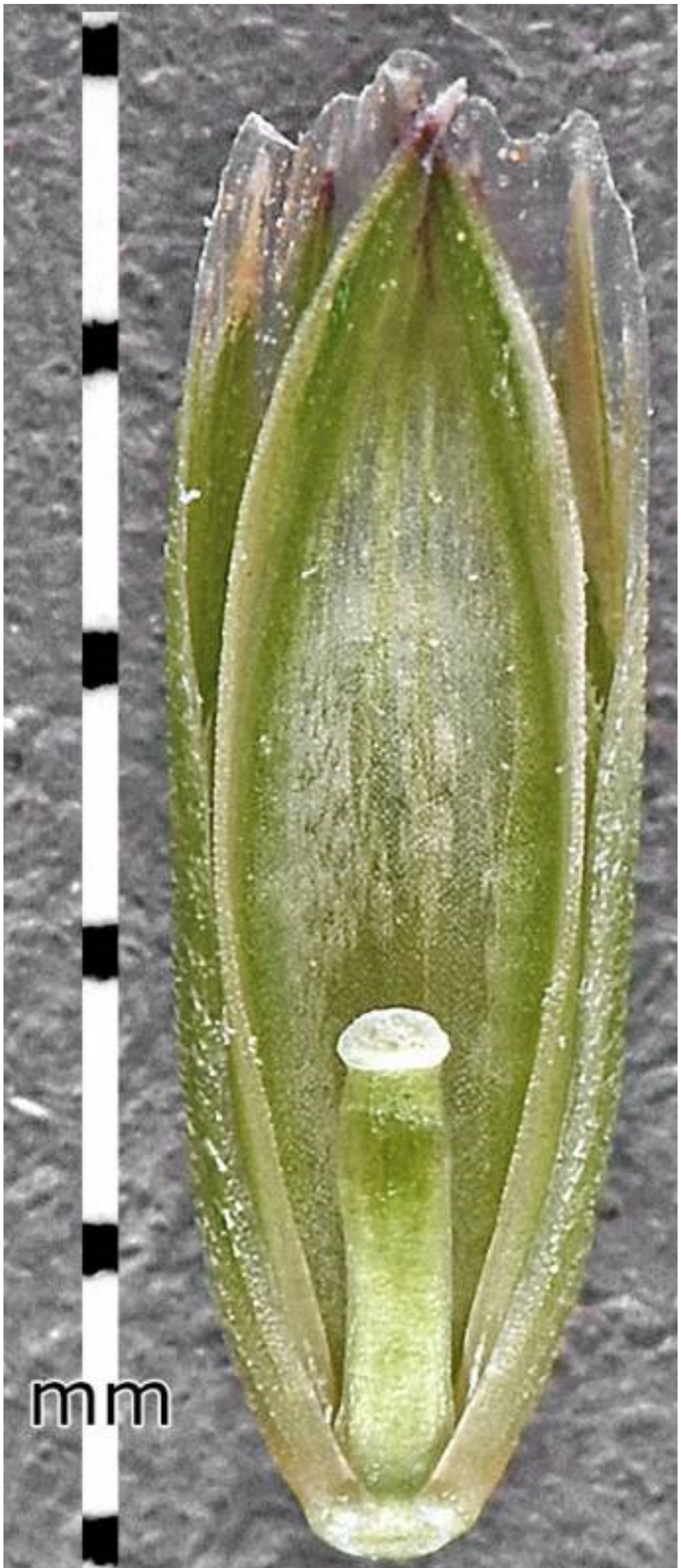

Fig. 3 *Glyceria declinata* (G. D. Carr 2022)

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DATE SUBMITTED: 7/1/2024

TECHNICAL COMMITTEE REVIEW:

This proposal was reviewed by the chairs of the AOSA-SCST Purity Subcommittee.

Proposal 5

Riad Baalbaki, David Johnston, Germination and Dormancy Subcommittee

1. PURPOSE OF PROPOSAL: The purpose of this proposal is to update the identification and description of aerial seedling structures of cyclamen (Cyclamen africanum; PRIMULACEAE, PRIMROSE FAMILY I, Vol. 4 of AOSA Rules), namely changing the identification and description of 'cotyledons' to 'epicotyl.' Evaluation criteria of aerial seedling parts will not be impacted; these will apply to the newly named and described epicotyl if the proposal is accepted.

2. PRESENT RULE:

GENERAL DESCRIPTION

Seedling type: Epigeal dicot.

Food reserves: Fleshy endosperm; minor reserves in the cotyledon.

Shoot system: Swollen tuberous hypocotyl and a single cotyledon (normally there is no second cotyledon) borne on a petiole, the terminal bud lying at its base.

Root system: Several seminal roots, developing more or less simultaneously at the distal end of the hypocotyl. More than one sufficient seminal root is required.

ABNORMAL SEEDLING DESCRIPTION

Cotyledons:

• cotyledon petiole broken or split (see note 2).

Epicotyl:

• missing (may be assumed to be present if cotyledon petiole is intact).

Hypocotyl:

• not forming a tuber.

• split, constricted, spindly, glassy.

Root:

• none, or only one seminal root.

• stunted or stubby.

Seedling:

• one or more essential structures impaired as a result of decay from primary infection.

• albino.

NOTES

1. The cotyledon petiole should be examined at the point of entry into the seed coat for signs of decay.

2. Normally there is no second cotyledon. The dark green, heart-shaped blade of the single cotyledon is not usually evident during the prescribed test period.

REFERENCES

Bekendam, J. and R. Grob. 1979. Handbook for Seedling Evaluation, Second Edition. International Seed Testing Association, Zurich, Switzerland.

3. PROPOSED RULE:

GENERAL DESCRIPTION

Seedling type: Epigeal dicot.

Food reserves: Fleshy endosperm; minor reserves in the cotyledon if present.

Shoot system: Swollen tuberous hypocotyl and an epicotyl consisting of a first leaf borne on a petiole, with a terminal bud lying at its base. Cotyledons do not usually develop; if present, they usually remain small with no contributing function to seedling development.

Root system: Several seminal roots, developing more or less simultaneously at the distal end of the hypocotyl. More than one sufficient seminal root is required.

ABNORMAL SEEDLING DESCRIPTION

Cotyledons:

not usually present.

Epicotyl:

missing first leaf.

less than half of the original leaf tissue remaining attached (see note 1).

less than half of the original leaf tissue free of necrosis or decay (see note 1).

petiole broken or split (see note 2).

decay at the leaf-petiole juncture.

Hypocotyl:

not forming a tuber.

split, constricted, spindly, glassy.

Root:

none, or only one seminal root.

stunted or stubby.

Seedling:

one or more essential structures impaired as a result of decay from primary infection.

albino.

NOTES

1. In previous editions of Vol. 4, the first leaf was interpreted as a single cotyledon, although its structure is identical to that of subsequent leaves. Cotyledons usually remain rudimentary. In some cases, small cotyledons are distinguishable at the early stage of germination, usually disappearing upon further seedling development.

2. The petiole should be examined at the point of entry into the seed coat for signs of decay.

REFERENCES

Bekendam, J. and R. Grob. 1979. Handbook for Seedling Evaluation, Second Edition. International Seed Testing Association, Zurich, Switzerland.

de Vogel, E.F. 1980. Seedlings of Dicotyledons. Structure, Development, Types. Pudoc, Wageningen, the Netherlands. p. 63.

4. HARMONIZATION AND IMPACT STATEMENT:

If adopted, this proposal will diverge from ISTA's description of Cyclamen africanum seedlings. ISTA's description implies that the first emerging aerial structure should be regarded as a single cotyledon.

5. SUPPORTING EVIDENCE:

Characterization of the first Cyclamen seedling aerial structure as a single cotyledon was first proposed by Lubbock (1892) when describing Cyclamen persicum. However, the author referred to this cotyledon as "enlarging and performing the functions of a leaf which it resembles in all respects." Later, de Vogel (1980) stated that this structure should be identified as a leaf and its petiole (the complete structure would therefore be an epicotyl) and noted that cotyledons do not usually develop in cyclamen-type seedlings. According to de Vogel (1980) "The cotyledons may be present or not, if present they are at most small and remain subterranean and sometimes they are only retardedly freed from the envelopments. The food in the hypocotyl or root part supports the development of a single leaf. In seedlings where two cotyledons are present, the foliar nature of this leaf is obvious. In the ones without cotyledons the single leaf has often been interpreted as a single cotyledon. This is, however, not much different from the subsequent leaves, and fits their sequence, similarly like in those seedlings in which the cotyledons are small but present. One can conclude that in the former the true cotyledons have entirely disappeared, while in the latter such a reduction process is not yet completed. The single leaf serves for a long time as the only assimilating paracotyledon, in some cases even during the entire first season."

References:

de Vogel, E.F. 1980. Seedlings of Dicotyledons. Structure, Development, Types. Pudoc, Wageningen, the Netherlands. p. 63.

Lubbock, J. 1892. A Contribution to Our Knowledge of Seedlings. D. Appleton and Co. p. 184.

6. SUBMITTED BY:

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7. DATE SUBMITTED:

October 3, 2024

Proposal 6

Heidi Jo Larson, Laura Donaldson, David Johnston, Kathy Mathiason, Marija Topic, Riad Baalbaki

Evaluating Geotropic Responses Rule Proposal

PURPOSE OF RULE PROPOSAL: The purpose of this proposal is to revise section **3.5.6 Negative Geotropism** of Volume 4, to clarify the differences in geotropic responses between seedling shoots and roots, and the correct evaluation of each.

PRESENT RULE:

3.5.6 Negative geotropism. Negative geotropism is caused by a physiological disorder usually characterized by root structures that grow upward. Seedlings with negative geotropism must be classified as abnormal. However, the germination analyst must make certain that the condition is not caused by poor laboratory conditions. "Apparent" negative geotropism may occur with artificial substrata if adverse moisture conditions are present or if the substrata contain phytotoxic substances. Also, if seeds are planted in tightly packed soil or if the soil surface becomes dry, seedlings may appear to have negative geotropism. If test conditions are suspected to be the cause of negative geotropism, the sample should be retested under favorable conditions, including retests made in sand, or soil, or organic growing media.

PROPOSED RULE:

3.5.6 Geotropism**.** Geotropism (more commonly referred to as gravitropism) is the directional growth of plant structures, including those of seedlings, to gravity. Positive geotropism is growth towards the gravitational field, while negative geotropism is growth away from the gravitational field. For seedling roots, positive geotropism (growth downwards towards gravity) is normal, while negative geotropism is to be evaluated as abnormal. In contrast, negative geotropism of seedling shoots (growth upwards away from the gravitational field) is normal, while positive geotropism is abnormal. For a seedling to be evaluated as normal, the root should have a positive geotropic response, and the shoot should have a negative geotropic response. In most abnormal cases, either a seedling's shoot or root will exhibit an abnormal geotropic response, but rarely both. Therefore, in describing abnormal responses, it is recommended to note whether the geotropic abnormality is that of roots or shoots (or specific shoot structures).

However, the germination analyst must make certain that the condition is not caused by test conditions. "Apparent" negative geotropism of the roots may occur with artificial substrata if adverse moisture conditions are present or if the substrata contain phytotoxic substances. Also, if seeds are planted in tightly packed soil or if the soil surface becomes dry, seedling roots may appear to have negative geotropism. "Apparent" positive geotropism of the shoots is commonly the result of overcrowding, light availability, or tightly rolled towels. "Correction" of growth orientation is usually a good indicator of absence of a truly abnormal geotropic response. If test conditions are suspected to be the cause of abnormal geotropism of many seedlings within single replicates, the sample should be retested under favorable conditions, including retests made in sand, or soil, or organic growing media.

HARMONIZATION AND IMPACT STATEMENT:

The Federal Seed Act, Canada M&P, and ISTA Rules do not have a detailed explanation contrasting positive and negative geotropism.

SUPPORTING EVIDENCE:

While reviewing the Seedling Evaluation Surveys results, many seedlings were incorrectly evaluated as abnormal due to geotropic response. Results indicated that negative geotropism is understood to mean an incorrect direction of growth (downwards for shoots and upwards for roots), rather than a description of growth away from gravity. Consequently, some analysts would label positively geotropic root responses and negatively geotropic shoot responses as abnormal due to “negative geotropism.” Section 3.5.6 of Vol. 4 of AOSA rules (Negative Geotropism) is probably the source of this confusion, as only negative geotropism is described and evaluated as an abnormality. Current ISTA rules and Canadian M&P, like the AOSA rules, only address negative geotropism of the roots as an abnormality. In practice, most apparent and real geotropic responses are those of the shoot. The revised text of section 3.5.6 emphasizes that both negative and positive geotropism can be normal or abnormal, depending on the seedling structure being evaluated and the possible effect of test conditions.

REFERENCES:

Molas, M.L., and J.Z. Kiss. 2009. Phototropism and gravitropism in plants. Adv. Bot. Res. 49: 1-34. https://doi.org/10.1016/S0065-2296(08)00601-0.

Morita, M.T. 2010. Directional gravity sensing in gravitropism. Ann. Rev. Plant Biol. 61: 705-720. https://doi.org/10.1146/annurev.arplant.043008.092042

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October 15, 2024

Proposal 7

Heidi Jo Larson, Laura Donaldson, David Johnston, Kathy Mathiason, Marija Topic, Riad Baalbaki

Anthocyanin Rule Proposal-Corn

PURPOSE OF RULE PROPOSAL: The purpose of this proposal is to add a note, under Poaceae Grass Family III-Corn in AOSA Rules for Testing Seeds Volume 4, clarifying the evaluation of anthocyanin color that can be present in *Zea mays* seedlings.

PRESENT RULE:

ABNORMAL SEEDLING DESCRIPTION

Seedling:

.

.

. albino.

NOTES

1. Seedlings grown in the dark or in low intensity light will exhibit increased elongation of the coleoptile and mesocotyl. In towels, there may be considerable twisting of the shoot system. Overcrowding may cause splitting of the coleoptile and leaves.

.

.

8. Slower developing seedlings with a short shoot and a longer root should be examined carefully to determine if the shoot is short because of damage or because it is a characteristic of the seed lot (i.e. inbred, tough pericarp) or due to test conditions.

PROPOSED RULE:

Seedling:

.

.

. Albino.

.(see also note 9).

NOTES

.

.

.

8. Slower developing seedlings with a short shoot and a longer root should be examined carefully to determine if the shoot is short because of damage or because it is a characteristic of the seed lot (i.e. inbred, tough pericarp) or due to test conditions.

9. A reddish to purplish coloration of the coleoptile and leaves (frequently observed at their tips), the mesocotyl, or roots, is due to the presence of anthocyanin pigments and should be evaluated as normal.

HARMONIZATION AND IMPACT STATEMENT:

The Federal Seed Act, Canada M&P, and ISTA Rules do not include notes on evaluating anthocyanins in seedling tissues of corn.

SUPPORTING EVIDENCE:

While reviewing the results of two seedling evaluation surveys (Poaceae, Grass Family-Cereals; Poaceae Grass Family-Corn), it was evident there was confusion among analysts how to handle seedlings that had anthocyanins present. A significant number of analysts wrongly classified seedlings with anthocyanins as abnormal. Anthocyanins are water soluble pigments found in different types of plant tissues and can range in color from blue, purple, to red. Under field conditions, anthocyanin development is usually the result of a combination of low temperature stress and high light intensity, producing the 'purpling' effect observed in corn seedlings and the 'striped' coloration of roots. In germination tests, the first leaf, coleoptile, mesocotyl, and roots of grasses can sometimes exhibit purplish-red coloration indicative of anthocyanin presence. As seedling development progresses, this purplish-red color disappears upon exposure to light and increased chlorophyl production.

Petrella, D.P., J.D. Metzger, J.J. Blakeslee, E.J. Nangle, and D.S. Gardner. 2016. Anthocyanin production using rough bluegrass treated with high intensity light. HortScience. 51(9) 1111-1120. doi:10.21273/HORTSCI10878-16.

Zykin, P.A., E.A. Andreeva, A.N. Lykholay, N.V. Tsvetkova, and A.V. Voylokov. 2018. Anthocyanin Composition and content in rye plants with different grain color. Molecules. 23(4):948. doi: 10.3390/molecules23040948. PMID: 29671758; PMCID: PMC6017340.

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October 15, 2024

Proposal 8

Heidi Jo Larson, Laura Donaldson, David Johnston, Kathy Mathiason, Marija Topic, Riad Baalbaki

Anthocyanin Rule Proposal-Cereals

PURPOSE OF RULE PROPOSAL: The purpose of this proposal is to add a note, under Poaceae Grass Family I-Cereals in AOSA Rules for Testing Seeds Volume 4, clarifying the anthocyanin color that can be present in *Secale cereale* and *x Triticosecale* seedlings.

PRESENT RULE:

ABNORMAL SEEDLING DESCRIPTIONS

Shoot:

.
.
. (see also notes 1 and 2)

Seedling:

.
.
. seedlings with badly thickened and shortened roots and shoots due to injury from chemical treatment (see note 3).

NOTES

1. Seedlings grown in the dark or in low intensity light will exhibit increased elongation of the coleoptile and in some cases the mesocotyl. In towels, there may be considerable twisting of the shoot.

2. Splitting of the coleoptile tip occurs naturally as a result of expansion of the leaves inside and occurs after emergence and after the coleoptile ceases to elongate upon exposure to light.

3. Seedlings with badly thickened and shortened roots and shoots due to injury from chemical treatment are to be classified as abnormal. If such seedlings are difficult to evaluate on paper substrata, the interpretation should be based on the seedling performance in sand, or soil, or organic growing media.

PROPOSED RULE:

ABNORMAL SEEDLING DESCRIPTIONS

Shoot:

.
.
. (see also notes 1, 2, and 3)

Seedling:

.
.
. seedlings with badly thickened and shortened roots and shoots due to injury from chemical treatment (see note 4).

NOTES

1. Seedlings grown in the dark or in low intensity light will exhibit increased elongation of the coleoptile and in some cases the mesocotyl. In towels, there may be considerable twisting of the shoot.

2. Splitting of the coleoptile tip occurs naturally as a result of expansion of the leaves inside and occurs after emergence and after the coleoptile ceases to elongate upon exposure to light.

3. In *Secale cereale* and *xTriticosecale*, there may be a reddish to purplish color present in the coleoptile or leaves of the seedlings. Less frequently, this color can also be observed in other cereals. This color is due to the presence of anthocyanins and is to be evaluated as normal.

4. Seedlings with badly thickened and shortened roots and shoots due to injury from chemical treatment are to be classified as abnormal. If such seedlings are difficult to evaluate on paper substrata, the interpretation should be based on the seedling performance in sand, or soil, or organic growing media.

HARMONIZATION AND IMPACT STATEMENT:

The Federal Seed Act, Canada M&P, and ISTA Rules do not include notes on evaluating anthocyanins in seedling tissues.

SUPPORTING EVIDENCE:

While reviewing the results of the first Seedling Evaluation Survey (Poaceae, Grass Family-Cereals), it was evident there was confusion among analysts how to handle seedlings that had anthocyanins present. A significant number of analysts wrongly classified seedlings with anthocyanins as abnormal. Anthocyanins are water soluble pigments found in different types of plant tissues and can range in color from blue, purple, to red. In many grass species, seed coloration is partially due to anthocyanin pigmentation in the aleurone or pericarp. Under field conditions, anthocyanin development is usually the result of a combination of low temperature stress and high light intensity, producing the 'purpling' effect observed in turfgrasses leaves. In germination tests, first leaves of grasses, especially the tips, as well as coleoptiles, sometimes exhibit purplish-red coloration indicative of anthocyanin presence. As seedling development progresses, this purplish-red color disappears upon exposure to light and increased chlorophyl production. Among the cereals, anthocyanin development is most noticeable in first leaves and coleoptiles of *Secale cereale* and *x Triticosecale* seedlings.

Petrella, D.P., J.D. Metzger, J.J. Blakeslee, E.J. Nangle, and D.S. Gardner. 2016. Anthocyanin production using rough bluegrass treated with high intensity light. HortScience. 51(9) 1111-1120. doi:10.21273/HORTSCI10878-16.

Zykin, P.A., E.A. Andreeva, A.N. Lykholay, N.V. Tsvetkova, and A.V. Voylokov. 2018. Anthocyanin Composition and content in rye plants with different grain color. Molecules. 23(4):948. doi: 10.3390/molecules23040948. PMID: 29671758; PMCID: PMC6017340.

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October 15, 2024

Proposal 9

Heidi Jo Larson, Laura Donaldson, David Johnston, Kathy Mathiason, Marija Topic, Riad Baalbaki

Detached Coleoptile Tip Rule Proposal-Cereals

PURPOSE OF RULE PROPOSAL: The purpose of this proposal is to add a sketch and clarify how a detached coleoptile tip should be evaluated for members of the Poaceae Grass Family I-Cereals, AOSA Rules for Testing Seeds, Vol. 4.

PRESENT RULE:

ABNORMAL SEEDLING DESCRIPTIONS

Shoot:

.
.
. (see also notes 1 and 2)

Seedling:

.
.
. seedlings with badly thickened and shortened roots and shoots due to injury from chemical treatment (see note 3).

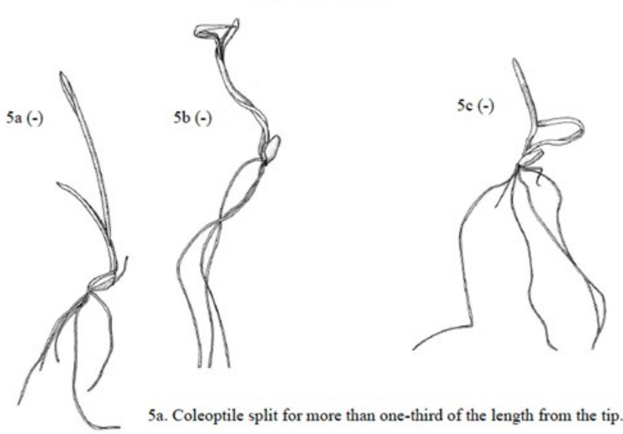
NOTES

1. Seedlings grown in the dark or in low intensity light will exhibit increased elongation of the coleoptile and in some cases the mesocotyl. In towels, there may be considerable twisting of the shoot.

2. Splitting of the coleoptile tip occurs naturally as a result of expansion of the leaves inside and occurs after emergence and after the coleoptile ceases to elongate upon exposure to light.

3. Seedlings with badly thickened and shortened roots and shoots due to injury from chemical treatment are to be classified as abnormal. If such seedlings are difficult to evaluate on paper substrata, the interpretation should be based on the seedling performance in sand, or soil, or organic growing media.

Fig. 5 Leaf defects.



5a. Coleoptile split for more than one-third of the length from the tip.

5b. Coleoptile damaged with leaf emerging through side split.

5c. Coleoptile split near base, with leaf bursting out.

PROPOSED RULE:

ABNORMAL SEEDLING DESCRIPTIONS

Shoot:

.
.
. (see also notes 1, 2, and 3)

Seedling:

.
.
. seedlings with badly thickened and shortened roots and shoots due to injury from chemical treatment (see note 4).

NOTES

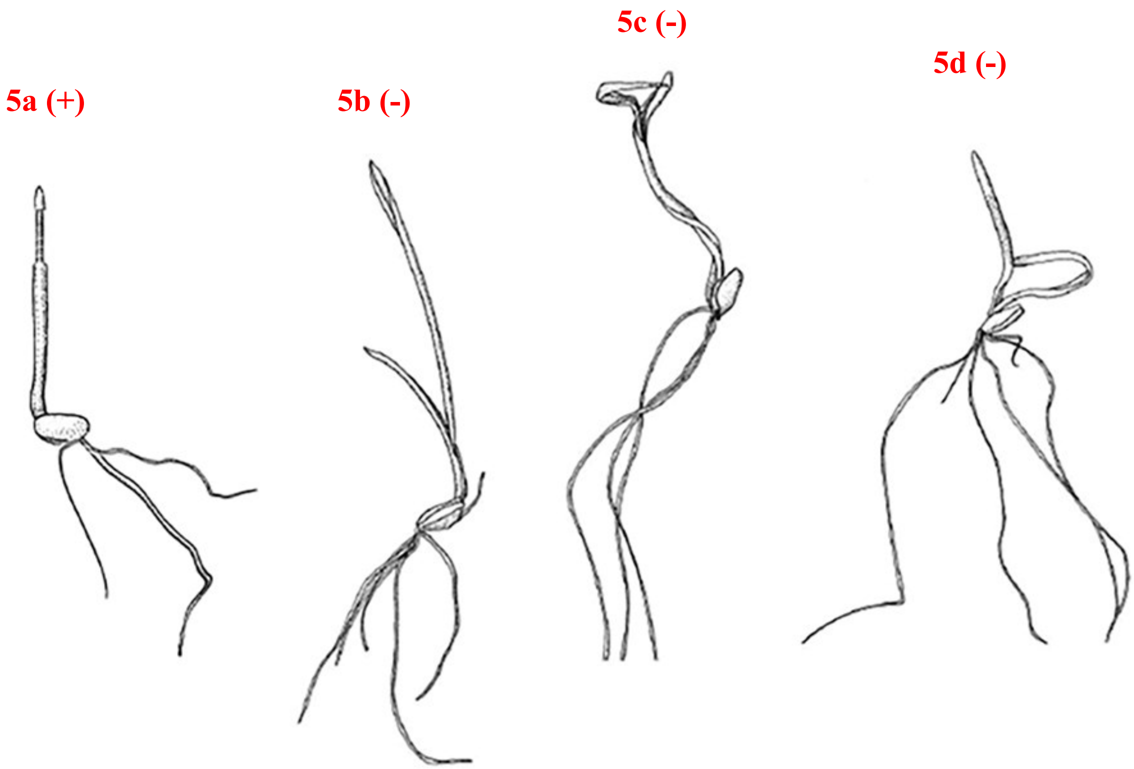
1. Seedlings grown in the dark or in low intensity light will exhibit increased elongation of the coleoptile and in some cases the mesocotyl. In towels, there may be considerable twisting of the shoot.

2. Splitting of the coleoptile tip occurs naturally as a result of expansion of the leaves inside and occurs after emergence and after the coleoptile ceases to elongate upon exposure to light.

3. In some cases, the senescing tip of the coleoptile (1-5 mm) will detach instead of splitting, persisting as a "cap" on the first leaf. In such cases, the coleoptile should be evaluated as normal. The coleoptile "cap" is not observed under field conditions and is to be regarded as a test condition. When assessing such seedlings, the "cap" must be removed before the first leaf is evaluated.

4. Seedlings with badly thickened and shortened roots and shoots due to injury from chemical treatment are to be classified as abnormal. If such seedlings are difficult to evaluate on paper substrata, the interpretation should be based on the seedling performance in sand, or soil, or organic growing media.

Fig. 5 Coleoptile and leaf defects.



5a. Coleoptile tip detached but leaf is not damaged (see note 3).

5b. Coleoptile split for more than one-third of the length from the tip.

5c. Coleoptile damaged with leaf emerging through side split.

5d. Coleoptile split near base, with leaf bursting out.

HARMONIZATION AND IMPACT STATEMENT:

The Federal Seed Act, Canada M&P, and ISTA Rules do not include notes on evaluating cereal seedlings with detached coleoptile tips.

SUPPORTING EVIDENCE:

To the best of our knowledge, detached coleoptile tips have not been reported under field conditions, strongly indicating that this is a test condition. Since coleoptiles provide protection to the emerging leaf and, more importantly, determine the direction of shoot growth towards the light or soil surface, the question is whether detached coleoptile tips can negatively impact leaf development. The scientific literature provides well-documented evidence that senescence of coleoptiles and loss of the above two functions precedes splitting or detachment, and therefore has no impact on subsequent normal or abnormal leaf development.

The onset of coleoptile senescence in rye seedlings (*Secale cereale*), characterized by protein, RNA and DNA breakdown, decreased dry mass and sugar content, and cessation of elongation, takes place after emergence of the primary leaf, and is enhanced by exposure to light (Sossinka and Feierabend, 1978; Fröhlich and Kutschera, 1995). This senescence process, starting at the tip, causes coleoptiles to lose two of their main functions, protection and directional growth, while maintaining their ability to remobilize nutrients to the growing leaf. Therefore, at this stage, neither splitting nor detachment of the tip would have any effect on subsequent development of the first leaf. Related results were also reported when coleoptile development of corn (*Zea mays*), oats (*Avena sativa*), wheat (*Triticum aestivum*), barley (*Hordeum vulgare*), as well as rye, were investigated (Kutschera and Fröhlich, 1992). Inada et al. (2000), studying rice (*Oryza sativa*) coleoptiles, reported on the differences in tissue development and composition between the inner and outer epidermal cells, which might explain the observed detachment rather than splitting of many coleoptile tips during rice germination testing. Likewise, O'Brien and Thimann (1965) had reported on histological differences in coleoptile tips of oat and wheat. More recently, Gao et al. (2008) determined that extension growth of wheat coleoptiles was closely related to the activity and expression of expansins, the main regulators of wall extension, with the implication that breakdown of those expansins might produce the rigid effect resulting in tip detachment. In conclusion, tip detachment can be explained based on accumulated research studies investigating coleoptile development and elongation, with a general agreement that at the senescence stage coleoptile tips lose their functions that would otherwise cause abnormal development of non-senescing coleoptiles. Accordingly, detached tips in the absence of any leaf defects should be evaluated as normal.

Fröhlich, M., and U. Kutschera. 1995. Changes in soluble sugars and proteins during development of rye Coleoptiles. J. Plant Physiol. 146(1-2): 121-125. https://doi.org/10.1016/S0176-1617(11)81977-2.

Gao, Q., M. Zhao, F. Li, Q. Guo, S. Xing, and W. Wang. 2008. Expansins and coleoptile elongation in wheat. Protoplasma. 233: 73-81. https://doi.org/10.1007/s00709-008-0303-1.

Inada, N., A. Sakai, H. Kuroiwa, and T. Kuroiwa. 2000. Senescence in the nongreening region of the rice (*Oryza sativa*) coleoptile. Protoplasma. 214: 180–193. https://doi.org/10.1007/BF01279062.

Kutschera, U., and M. Fröhlich. 1992. Osmotic relations during elongation growth in coleoptiles of five cereal species. J. Plant Physiol. 139(5): 519-522. https://doi.org/10.1016/S0176-1617(11)80362-7.

O'Brien, T.P. and K.V. Thimann. 1965. Histological studies on the coleoptile I. Tissue and cell types in the coleoptile tip. Am. J. Bot. 52: 910-918. https://doi.org/10.1002/j.1537-2197.1965.tb07265.x.

Sossinka, J., and J. Feierabend. 1978. Influence of cytokinin and light on nucleic acid and protein metabolism of senescing coleoptiles. Biochem. Physiologie Pflan. 173(6): 505-513. https://doi.org/10.1016/S0015-3796(17)30529-2.

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October 15, 2024

Lost Resources

Jennifer Pernsteiner

Jennifer J. Pernsteiner, age 65, of Fall Creek WI, passed away peacefully after a courageous battle with cancer on Sunday, December 22, 2024 at her home surrounded by her loving family. Services were held January 3, 2025 at Trinity Lutheran Church in Vesper, WI. Pastor Ryan Anderson will officiate. Burial will be in Immanuel Lutheran Cemetery in Arpin. Visitation will be from 4:00 p.m. to 8:00 p.m. on Thursday, January 2, 2025 at Herman-Taylor Funeral Home and Friday at 9:00 a.m. until the time of service Friday at the church. Jennifer Joan Pernsteiner (nee Tomfohrde) was born on January 9, 1959 in Marshfield, WI to Gerald (Butch) and Carol (Lubeck) Tomfohrde. She graduated from Lincoln High School in 1977 and received a Bachelor of Science in Plant Science from the University of Wisconsin River Falls in 1981.

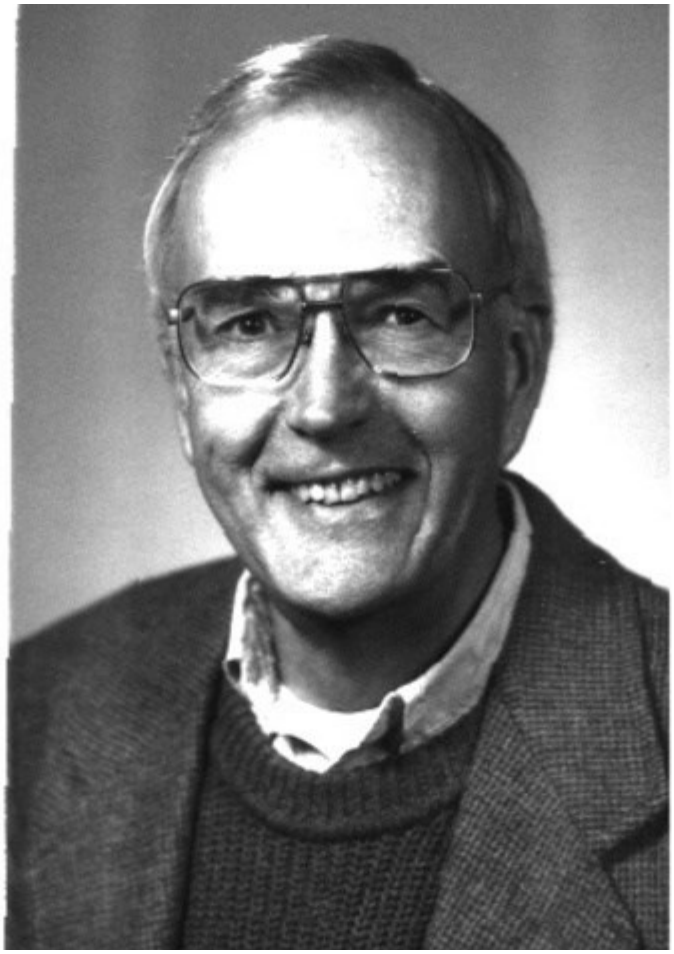
She married Steven Gregory Pernsteiner on December 29, 1979. She is survived by her husband Steve, Mother Carol Tomfohrde, two children, Andrew Pernsteiner and Rachel (Chris) Beckner, five grandchildren Sophie, Kiera, Maeve, Guinevere and Jonathan, siblings Cindy (Larry) Lutz, Patti (Andre) Nicholas. She was preceded in death by her father Gerald (Butch), and brothers Jeffrey and Mitchell. During her lifetime she was a church musician at numerous churches.

She was a 4-H Program Support Worker starting in 1989 and stayed in that role until she moved to River Falls, WI to support her husband Steve's career. In 2000 she started her career as a seed analyst. After 2 years of training, she received her certification as a Registered Seed Technologist, eventually becoming a co-manager at Minnesota Crop Improvement where she trained several beginning analysts. As a member of the Society of Commercial Seed Technologists where she contributed as a co-chair of the handbook committee and served on the board of directors. In 2018 at the age of 59, she retired, and Steve and Jennifer moved to Inverness, Fl part time, while keeping a home in Fall Creek, WI for the warmer months. Jennifer enjoyed growing flowers, crafting, visiting with her children and grandchildren and traveling together with her husband. The family would like to thank St. Croix Hospice for the exceptional care given to her and to the family at this most difficult time.

Many of you have known Jennifer for years as a steadfast pillar within the seed industry, and she has remained a cherished friend to all who have crossed paths with her.—Laura Donaldson, Kari Fiedler

Lost Resources

Harold 'Rodger' Danielson



October 31, 1938 - January 4, 2025

It is with deep sadness that we announced the passing of Harold "Rodger" Danielson of Millersburg, Oregon on January 4, 2025.

Rodger and his twin sister Lynnea were born in Redding, California to Harold and Mildred Danielson. In his youth, the family lived in Redding, California, then moved to Eureka, Bolinas and finally to Larkspur, California in 1947 where he graduated from Sir Francis Drake High School in 1956.

Rodger started college at Whitman College in Walla Walla, WA. He transferred to Montana State University, graduating with a BA in Botany in 1961. While at Missoula, Rodger met Nancy Gilroy, who he married on August 20, 1961.

The couple moved to Sacramento where Rodger began work with the California Department of Agriculture as a seed analyst. Their first two children were born during this time, Teri, born in 1963 and Amy, born in 1965. In 1966, Rodger and Nancy built their first home in the Sacramento.

Debi was born in 1968, just as Rodger accepted a position as a Germination Supervisor at Oregon State University. In 1969, they bought a home on Oak Dell Place, where they would live for almost 50 years. In 1973 Rodger obtained his Masters Degree in Seed Technology and was promoted to assistant director of the Oregon State Seed Lab. In 1980, he became the seed lab manager.

During his tenure at OSU, Rodger taught courses in the Crop Science Department, advised students, worked with the Crop Science Club, coached crop judging teams and accompanied them to contests in Chicago and Kansas City. He received the Crop Science Outstanding Teacher Award in 1977. Rodger conducted a variety of research projects and published numerous articles throughout his career. He was very active in his national organization, Association of Official Seed Analysts. He served as president of that organization in 1984 and was a member of their executive board for five years. He gained the associations certification of expertise in both purity and germination in 1985 in 1992. Rodger was awarded AOSA's award of merit for his service to the association. Rodger retired in 1996.

After retirement, Rodger and Nancy traveled to Norway and Sweden to visit the family farm of the Bjellands' (Danielson), Hvalls' and Gustafson's. Rodger and Nancy also took many trips around the U.S. gathering information to add to their genealogy documentation.

Rodger's interests included many outdoor activities, as well as volunteer opportunities. Early on, he enjoyed yearly fishing trips with his Dad into the Marble Mountain primitive area in Northern California. After moving to Oregon, he looked forward to yearly camping trips with friends and family to the Trout Creek Area. He developed an interest in horses and brought them on some of his on Elk hunting trips in North Eastern Oregon. Rodger enjoyed barbecuing and conducted chicken barbecues for the Crop Science Department for many years. He joined the Benton County/ Mary's Peak Search and Rescue and became a special deputy with the Benton County sheriffs department. He was a longtime member of Corvallis Elks. He also enjoyed delivering Meals on Wheels and working with Kiwanis Club.

In 2015, they moved to Millersburg, where they lived until Rodger's death. During those 10 years, he was an incredible caregiver for our mother after her stroke. Rodger was hospitalized in Albany shortly before his death and he passed away at Evergreen Hospice with his family at his side.

Many great memories will be cherished by his wife, daughters, and extended family of time spent together during holidays, family reunions, camping trips, crabbing adventures, trips to Depot Bay and of the countless "wine times" the last few years where we enjoyed listening to him recap stories from the past.

Rodger is survived by his wife Nancy, daughters Teri, Amy (Evan) and Debi, four grandchildren, two great grandchildren, sister Barbara Jean Menzel and many nieces and nephews.

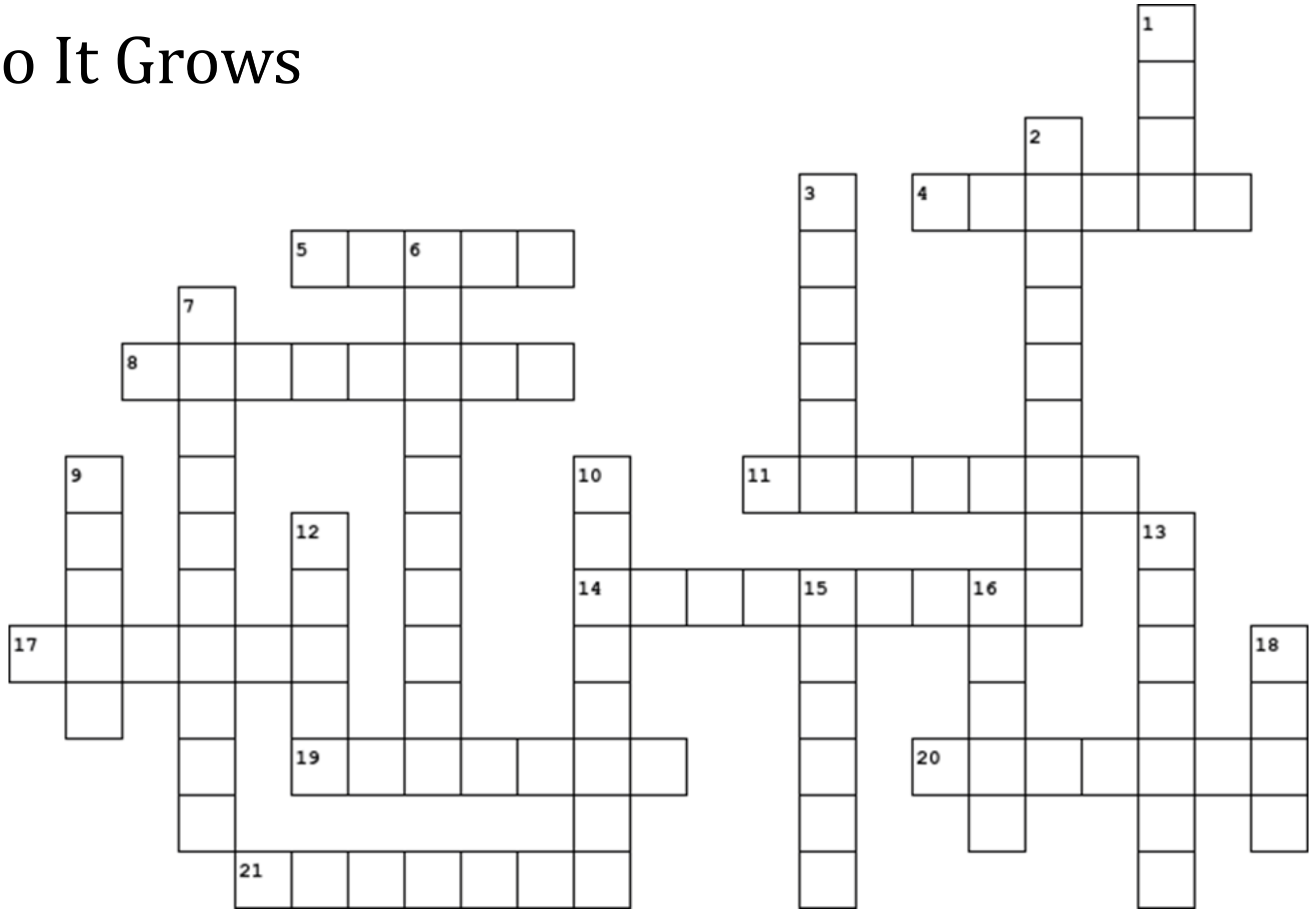
Helene Shoaf

Helene Shoaf, 79, passed away on Wednesday, February 13, 2025 at her residence in Battle Ground, Indiana.

Helene was born June 25, 1945 in Landshut, Germany to the late Benjamin and Eugenia (Wahl) Gruenke. She was married to Charles William Shoaf on August 3, 1968 in Lafayette. He preceded her in death on April 17, 2002. Professionally, Helene worked at Purdue University for over 24 years as a Certified Seed Analyst in Purity at the Office of Indiana State Chemist. She retired in 2005. She was a long-time member of St. James Lutheran Church. In addition, she was an avid animal lover and “took in” many strays over the years. Helene enjoyed spending time with her family and doing Simon and Schuster Mega crossword puzzles every day. She will be dearly missed.

She is survived by four children, Benjamin (Rhonda) Richardson of Lexington, KY, Juliana (Raymond) Gray of Lafayette, Kurt Richardson of Lafayette, and Travis (Peggy) Richardson of Frankfort; sister, Edith Grady of Florida; ten grandchildren, Kurt E. Richardson, Branden (Kim) Richardson, Amber (Brandon) Richardson Womble, Westley (Allyssa) Richardson, Jessica (Luke) McVay, Brooke (Zac) Williamson, Charlene (Kevin) Orozco, Kyle (Liz) Gray, Miranda (Lucas) Cord and Jacob Richardson; and eighteen great-grandchildren; and two great-great grandchildren; and her beloved dog Bruno and cat Buddy. In addition to her husband, she is preceded in death by a sister, Mary Gruenke, grandson, Kyle Richardson, and daughter in law, Nancy Richardson.

So It Grows



Across

4. An outdated name for Arecaceae.

5. When this declines Dianthus spp. may have shortened roots and/or hypocotyls.

8. USDA ______ 30 included some of the the first descriptions of normal and abnormal seedlings.

11. A generic term for one of the most common monocot seed groups.

14. Insufficient calcium availability during bean germination tests may cause this

17. This crop may be prone to developing yellowish areas on the hypocotyl or roots during testing

19. All cereal roots are referred to as this, the primary and secondary roots are indistinguishable

20. References to Graminae species will lead you to this updated family name in the Rules

21. In the Canada M&P any presence of physiological necrosis in this crop is considered abnormal

Down

1. A genus that may produce multiple seedlings, or the prefix to a groovy sound system

2. Rice samples with fungal development may be planted using this method.

3. An inflexible seed coat can cause cotyledon injury in this sweet or spicy crop kind.

6. Plant growth in response to gravity

7. This brainy-looking flower seed may produce multiple secondary epicotyls and still be considered normal

9. The general term for a seed with two attached cotyledons

10. During testing some species produce this, giving them a slimy or gooey appearance

12. _____ palustris seedlings must be exposed when planting in soil.

13. These types of dicots carry their cotyledons above the soil to find the light

15. This ghost-like seedling is always abnormal

16. This monocot may bring a tear to your eye

18. This is a crucial and unique part of Allium spp. seedlings.