ISTA GERMINATION COMMITTEE

ACTIVITY REPORT 2025 - 2026

Presenter: David M. Johnston, GER TCOM Chair

Outline of Report

- Germination Committee Members
- GER TCOM Support Efforts
- Editorial Changes/Rule Proposals
- ISTA and AOSA Harmonization Efforts
- Germination Presentations
- Projects: Active/Planned/Under Consideration
- Media Maximum Water Holding Capacity Questions
- Proficiency Tests - Germination
- Germination Toolbox
- Publications
- Workshops
- Acknowledgments

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Germination Committee Members 2026

	COMMITTEE MEMBERSHIP LIST		
1	CHAIR: David Johnston	United States of America	
2	Vice-CHAIR: Gillian Musgrove	United Kingdom	
3	VICE-CHAIR: Erik van Egmond	Netherlands	
4	Ignacio Aranciaga	Argentina	
5	Janek Bartel	Canada	
6	Sarah Dammen	United States of America	
7	Gillian Durrant	United Kingdom	
8	Meriam Dekalo-Keren	Israel	
9	Sylvie Ducournau	France	
10	Lesly Gonzalez	Chile	
11	Aidin Hamidi	Iran	
12	Andrea Jonitz	Germany	
13	Augusto Martinelli	Argentina	
14	Takayuki Okuda	Japan	
15	Elena Perri	Italy	
16	Dot Vittrup Pedersen	Denmark	
17	Melissa Phillips	United States of America	
	Ruel Gesmundo	Philippines	ECOM Liaison Officer
	Irena Gera	Poland	ECOM Liaison Officer

16 Members - 13 Countries

(Will be considering new members soon.)

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Germination Committee Support Efforts

Vital role of the Committee is supporting the efforts of laboratories, ISTA auditors, ECOM, ISTA TCOMS and others when they have germination related questions.

Ever year *numerous* questions are received and answered by the Germination Committee.

Question sources include:

- Questions related to the ISTA Rules and the Handbook on Seedling Evaluation
- Testing issues and difficulties laboratories encounter
- Questions from ISTA auditors as well as laboratories being audited
- Assisting laboratories with addressing audit findings
- Supporting and working with the ISTA PT Committee
- Assisting laboratories with poor PT performance
- Requests for testing species not in the ISTA Rules

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ISTA Rules:
Germination Related
Editorial Changes & Rule Proposals for 2027

- **Editorial Changes – 3**

- **Rule Proposals – 5**

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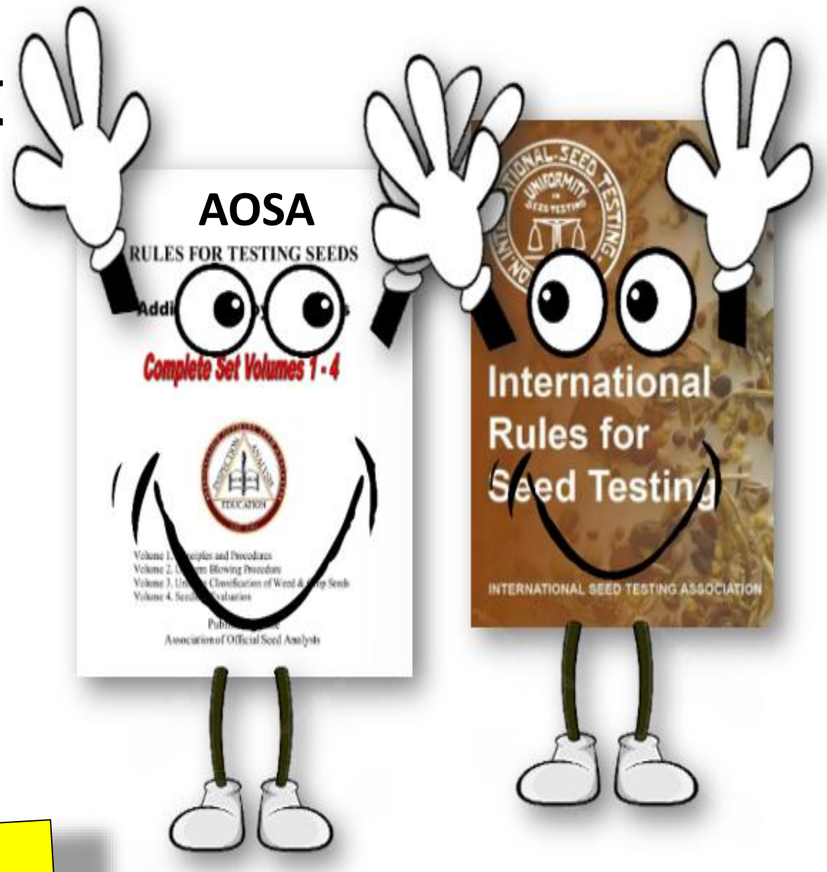
ISTA Harmonization Efforts with AOSA

- When ISTA Rule proposals are created, it is required to state how the proposal will harmonize with the AOSA Rules.

- Both **AOSA and ISTA rule proposals** are **required to have a harmonization statement** included with a rule proposal.



The GER TCOM has been actively seeking to harmonize the ISTA Rules and the AOSA Rules for well over a decade.

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ISTA/AOSA Harmonization Efforts/Opportunities

3. Proposed Rule:

Table 6A. Methods of Testing for Laboratory Germination

Kind of Seed	Substrata[a]	Temperature (°C)	First Count (Days)	Final Count (Days)	Specific Requirements and Notes	Dormant Seed[f]
Ocimum basilicum Sweet Basil	B, T, TB	20-30		14	KNO_3. Make first count when necessary or desirable.	

***Ocimum basilicum* – AOSA Rule proposal to add TP test method, same as ISTA Rules.**

Proposed rule:

Table 6A. Method of testing for laboratory germination

Kind of Seed	Substrata	Tempearature (C)	First Count (days)	Final Count (days)	Specific requirements and nots	Dormant seed
Phalaris canariensis canarygrass	B, T	20-30 15-25	7	14		

***Phalaris canariensis* – AOSA Rule proposal to add 15-25C to test method, same as ISTA Rules. New AOSA count days would be 7 and 14 with ISTA being 7 and 21.**

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Germination Related Editorial Changes

1) 5.7 Retesting e. – Editorial change added to **clarify the process for retesting** and **reporting** test results, when the **range of replicates exceeds** the maximum **tolerated range**.

2) Table 5A Part1 *Beta vulgaris* drying temperature – Editorial change to amend the **drying temperature for prewashed** *Beta vulgaris* in Table 5A Part1 to **match** the drying instructions stated in **5.6.3.3**.

3) Table 5A Part1 *Brassica perviridis* – Editorial change required due to ***Brassica perviridis* now** being **included under *Brassica rapa*** in Table 5A Part1. The *Brassica perviridis* entry will be removed from Table 5A Part1. A note will be added to Table 5A Part1 column 6, stating that the use of **KNO3 was never validated** to break dormancy for ***Brassica perviridis***.

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Germination Related Rule Proposals

C.5.1 Alternating temperatures 20 ⇔ 30C

C.5.2 Cautionary statement when using potassium nitrate (KNO3)

C.5.3 Add ethephon as a dormancy-breaking procedure for *Helianthus annuus* and report dormancy breaking solution concentrations

C.5.4 Add drying instructions for pre-soaked *Beta vulgaris*

C.5.5 Add new tolerance tables for 25 and 50 seed replications

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Editorial Change – 5.7 e. Retesting

Retesting section e clarification

Editorial change required at 5.7 e. to clarify the process for retesting and reporting test results when the range of replicates exceeds the maximum tolerated range.

This proposal is not in harmony with the AOSA Rules. The AOSA Rules Volume 1 section 6.7.b.(2) states that the replicates of retests, same as with the initial test, must be within tolerance for the retest results to be considered valid and usable.

This proposal was submitted by the Germination Committee.

GER Committee Votes	Yes:	16	No:	0	Abstain/Absent:	0

ISTA Rules 5.7 lists 6 specific circumstances for when a retest is to be conducted. They are listed as a, b, c, d, e, f.

This proposal is an attempt to clarify circumstance "e" where a replicate/s in a test, are out of tolerance.

PROPOSED VERSION

5.7 Retesting

….

e. When the range for the replicates exceeds the maximum tolerated range in Table 5B, a retest must be carried out using the same test method and/or an alternative method.

- If the results of the retest using the same method are compatible with the first (i.e. the difference does not exceed the tolerance indicated in either Table 5C, 5D or 5E), the average of the test results must be reported on the ISTA Certificates (see 5.8.1 Tolerances). If the results of the retest using the same method are not compatible with the first test see Figure 5.3 and conduct a third test.
- If an alternative method is used and if the results are better and within accepted tolerances (according to Table 5B), then these better results must be reported on the ISTA Certificates (see 5.8.1 Tolerances) and must not be averaged with the previous test results.

When retesting is carried out under the circumstances a., b., d., or e. (with an alternative method), the best results achieved must be indicated on the ISTA Certificate. The results of the other tests do not have to be reported on the ISTA Certificate, except on specific

Editorial Change – 5.7 e. Retesting (cont.)

Cause	a) result not reliable b) difficulty in deciding correct evaluation d) sample does not respond satisfactorily	e) range for replicates exceeds the maximum tolerated range (Table 5B)		c) evidence of errors
Method	one or more alternative methods	same method or	alternative method	same method or alternative method
Check results of retest		compatible with first results? (Table 5C, 5D, or 5E)*	within tolerances? (Table 5B)*	
Report	best result	average of the test results	best results	results of retest
Remark		*in case results are not in tolerance, see figure 5.3	*if better results are not in tolerance with Table 5B, see Figure 5.3	

Editorial Change – *Beta vulgaris* drying temperature

This editorial change is to change the drying temperature for prewashed *Beta vulgaris* in Table 5A Part 1 to match the instructions in 5.6.3.3.

This proposal does not harmonise with the AOSA Rules, which does not have a prewashing method for this species.

This proposal was submitted by the Rule Chair and supported by the Germination Committee.

GER Committee Votes	Yes:	12	No:	2	Abstain/Absent:	3	

CURRENT VERSION

Species	Substrate	Temperature* (°C)	First count (d)	Final count (d)	Recommendations for breaking dormancy	Additional directions	Additional advice	Seedling Evaluation Group
1	2	3	4	5	6	7	8	9
Beta vulgaris	TP; BP; S	20<=>30; 15<=>25; 20	4	14	Presoak (2 h; 250 ml water per 100 seeds); prewash (multigerm: 2 h; genetic monogerm: 4 h); dry at ~~max.~~ 25 °C	–	–	A-2-1-1-1

5.6.3.3
… After washing, the seeds must be dried at a temperature of 20 to 25C (e.g., *Beta vulgaris*)…

PROPOSED VERSION

Species	Substrate	Temperature* (°C)	First count (d)	Final count (d)	Recommendations for breaking dormancy	Additional directions	Additional advice	Seedling Evaluation Group
1	2	3	4	5	6	7	8	9
Beta vulgaris	TP; BP; S	20<=>30; 15<=>25; 20	4	14	Presoak (2 h; 250 ml water per 100 seeds); prewash (multigerm: 2 h; genetic monogerm: 4 h); dry at 20-25 °C	–	–	A-2-1-1-1

Editorial Change – *Brassica perviridis*

Brassica perviridis

Brassica perviridis is now included in *Brassica rapa* and has not been included in Table 2C for many years. The validation study for *B. perviridis* did not include KNO_3 for a dormancy-breaking procedure, so it is not an exact separate entry that can be deleted from Table 5A. An editorial change to remove the separate entry for *B. perviridis* and add a note regarding KNO3 to the *B. rapa* entry is proposed by the Rules Committee and supported by the Germination Committee.

This proposal does not harmonise with the AOSA Rules, which does not have an equivalent of Table 2, and has *Brassica rapa* subsp. *napposinica* var. *perviridis* as a separate entry for germination.

This proposal was submitted by the Germination Committee.

GER Committee Votes	Yes:	15	No:	0	Abstain/Absent:	1	

CURRENT VERSION

Species	Substrate	Temperature* (°C)	First count (d)	Final count (d)	Recommendations for breaking dormancy	Additional directions	Additional advice	Seedling Evaluation Group
1	2	3	4	5	6	7	8	9
~~*Brassica perviridis*~~	~~BP; TP~~	~~20<=>30; 20~~	~~5~~	~~7~~	~~Pre-chill~~	~~–~~	~~–~~	~~A-2-1-1-1~~
Brassica rapa	BP; TP	20<=>30; 20	5	7	KNO_3; pre-chill	–	–	A-2-1-1-1

PROPOSED VERSION

Species	Substrate	Temperature* (°C)	First count (d)	Final count (d)	Recommendations for breaking dormancy	Additional directions	Additional advice	Seedling Evaluation Group
1	2	3	4	5	6	7	8	9
~~*Brassica perviridis*~~	~~BP; TP~~	~~20<=>30; 20~~	~~5~~	~~7~~	~~Pre-chill~~	~~–~~	~~–~~	~~A-2-1-1-1~~
Brassica rapa	BP; TP	20<=>30; 20	5	7	KNO_3*; pre--chill *KNO_3 not recommended for *Brassica rapa* var. *perviridis*)	–	–	A-2-1-1-1

Rule Proposal –
C.5.1 Alternating Temperature Change

There is a change required at 5.6.2.3 regarding alternating temperatures. The word “should” has been removed and replaced with “must” to make it clearer that alternating temperatures are 16 hours at the low temperature and 8 hours at the high temperature (changeover period permitted). This aligns with the text in the footnote at the bottom of all the pages for Table 5A that states "...alternating temperature regimes: 1st temperature, 16 h; 2nd temperature 8 h."

This proposal harmonises with the AOSA Rules.

This proposal originates from the ISTA Accreditation department and is supported by the Germination Committee.

GER Committee Votes	Yes:	15	No:	0	Abstain/Absent:	1	

CURRENT VERSION

5.6.2.3 Temperature

….

Where alternating temperatures are indicated, the lower temperature ~~should~~ be maintained for 16 h and the higher for 8 h. A gradual changeover lasting no more than 3 h may be satisfactory...

….

PROPOSED VERSION

5.6.2.3 Temperature

….

Where alternating temperatures are indicated, the lower temperature must be maintained for 16 h and the higher for 8 h. A gradual changeover lasting no more than 3 h may be satisfactory...

….

Rule Proposal – C.5.2 Add Cautionary Statement for KNO3 Usage to 5.6.3.1

A change for 5.6.3.1 by adding a seedling evaluation cautionary statement when using potassium nitrate solution to break physiological dormancy. The use of a potassium nitrate (KNO3) solution for germination testing has been known to cause shortened roots and root damage for some species. It is critical for laboratories to be informed of this test artifact possibility and to use caution when evaluating seedlings that have been exposed to a KNO3 solution. Retesting is recommended when root injury may have been caused by using the KNO3 solution.

The following supporting evidence has been provided to support this proposal:
AOSA Rules contain a cautionary statement regarding the possible negative effects of KNO3 solution on seedling roots; Proof of concept study conducted by Takayuki Okuda confirmed shortened roots can be a side effect of KNO3 use; ISTA Rules 5.6.3.1 Gibberellic acid (GA3) provides a cautionary statement when using GA3 for dormancy breaking, regarding the potential negative impact of GA3 on seedling development. See Appendix 1.

This proposal harmonises with the AOSA Rules Volume 1 Section 6.9.a. and AOSA Rules Volume 4 POACEAE, GRASS FAMILY V – OTHER kinds Notes 1. cautionary statements.

This proposal was submitted by the Germination Committee.

GER Committee Votes	Yes:	16	No:	0	Abstain/Absent:	0	

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Rule Proposal – C.5.2 Add Cautionary Statement for KNO3 Usage to 5.6.3.1

CURRENT VERSION

5.6.3.1 Procedures for breaking physiological dormancy

....

Potassium nitrate (KNO3): Instead of water, up to 0.2 % KNO3 solution, prepared by dissolving up to 2 g KNO3 in 1 litre of water, is used to saturate the germination substrate at the beginning of the test. Water is used for moistening thereafter.

....

PROPOSED VERSION

5.6.3.1 Procedures for breaking physiological dormancy

....

Potassium nitrate (KNO3): Instead of water, up to 0.2 % KNO3 solution, prepared by dissolving up to 2 g KNO3 in 1 litre of water, is used to saturate the germination substrate at the beginning of the test. Water is used for moistening thereafter. The use of KNO3 may cause shortened or damaged roots and promote fungal growth for some species and for some germination tests. If these observed symptoms are suspected due to the use of KNO3, it is recommended to retest on substrate moistened with ~~water~~ a lower concentration of KNO3.

....

C.5.2 - Supporting Evidence Presentation

Potassium Nitrate (KNO_3) Solution: Potential Side Effects at Higher Concentrations

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Possible Effects of Using KNO_3 Solution

Presenter: Takayuki Okuda

TAKII & COMPANY, LIMITED - Japan

Effect of KNO_3 for Breaking Dormancy

Comparative study

- **Seed material (Expected dormant samples)**
  - *Brassica juncea*
  - *Viola tricolor*
  - *Poa pratensis*

- **Test method**

  KNO_3 concentration:

  0%(Water), 0.1%, 0.2%, 0.3%, 0.4%

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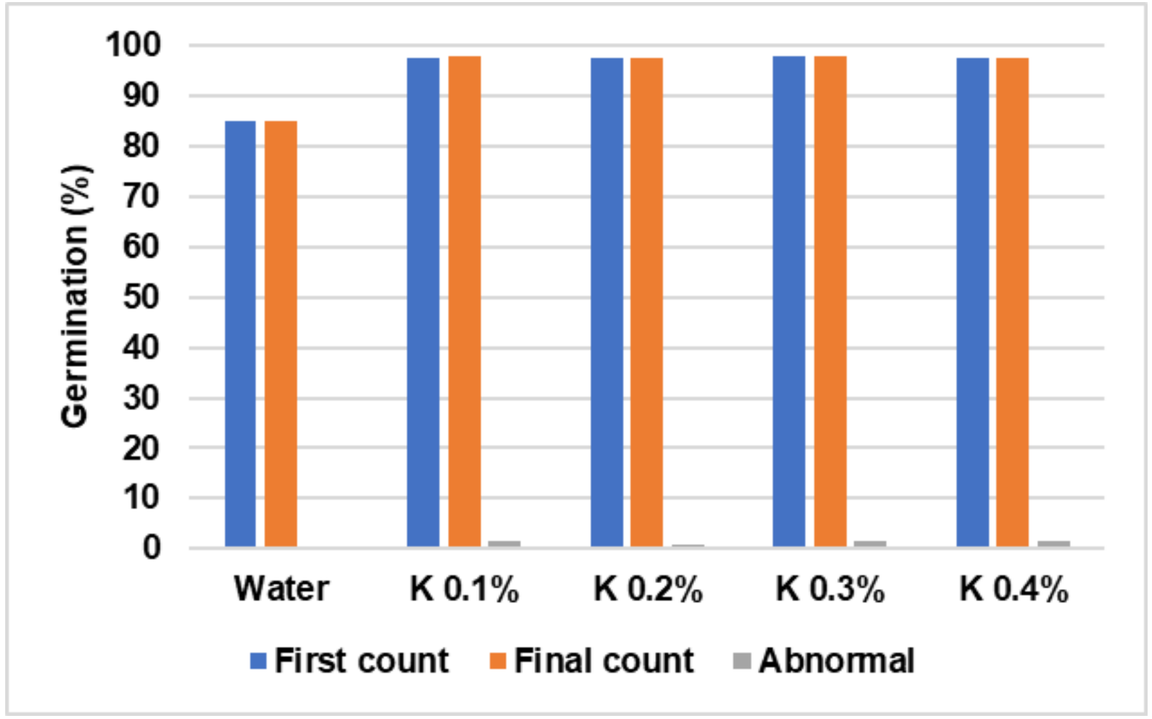
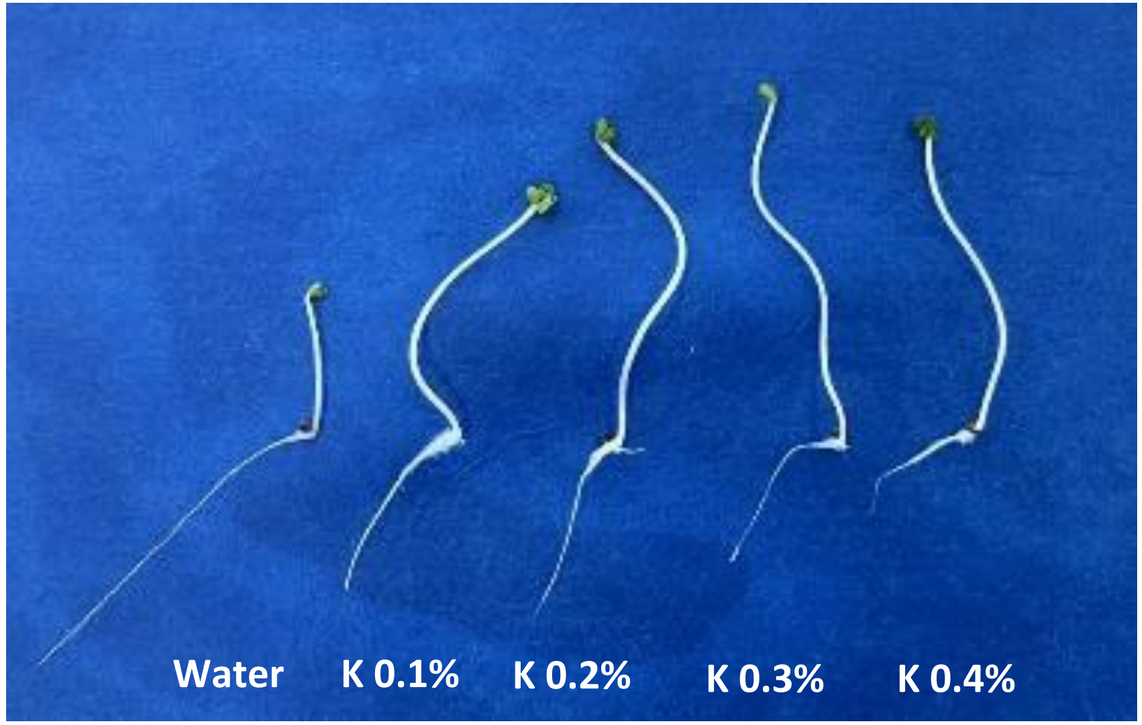
Effect of KNO_3 for Breaking Dormancy

➢ Result

Brassica juncea



Typical seedling



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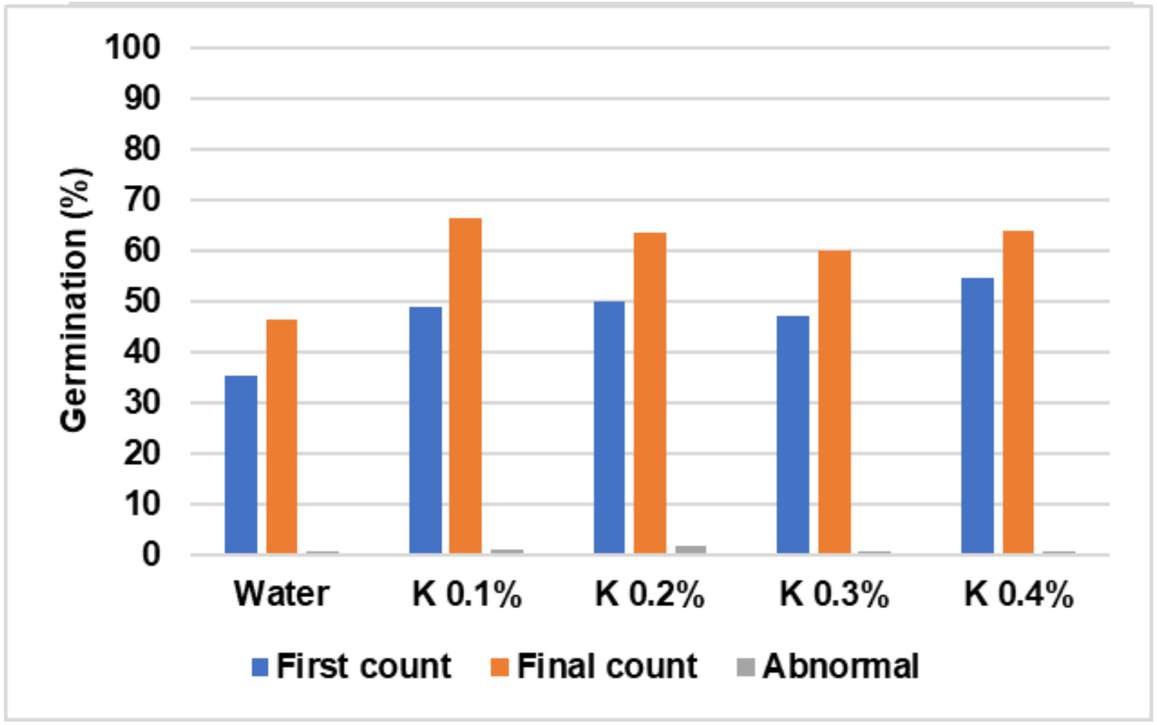
Effect of KNO_3 for Breaking Dormancy

➢ Result

Viola tricolor



Typical seedling

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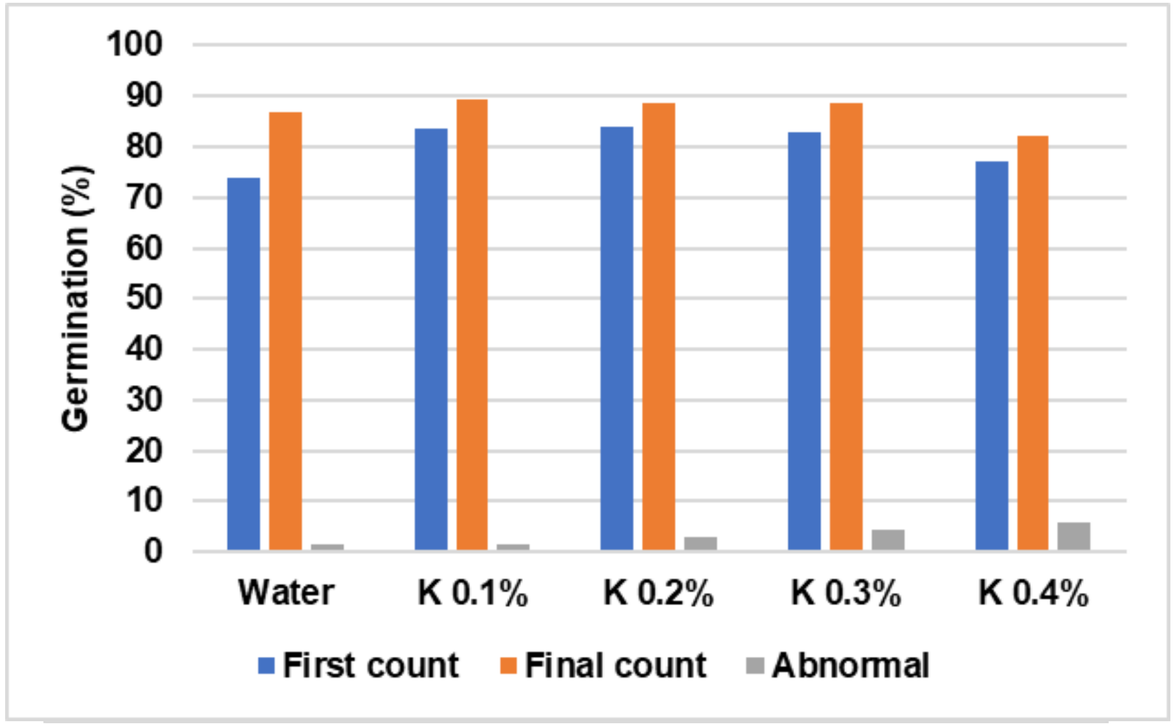
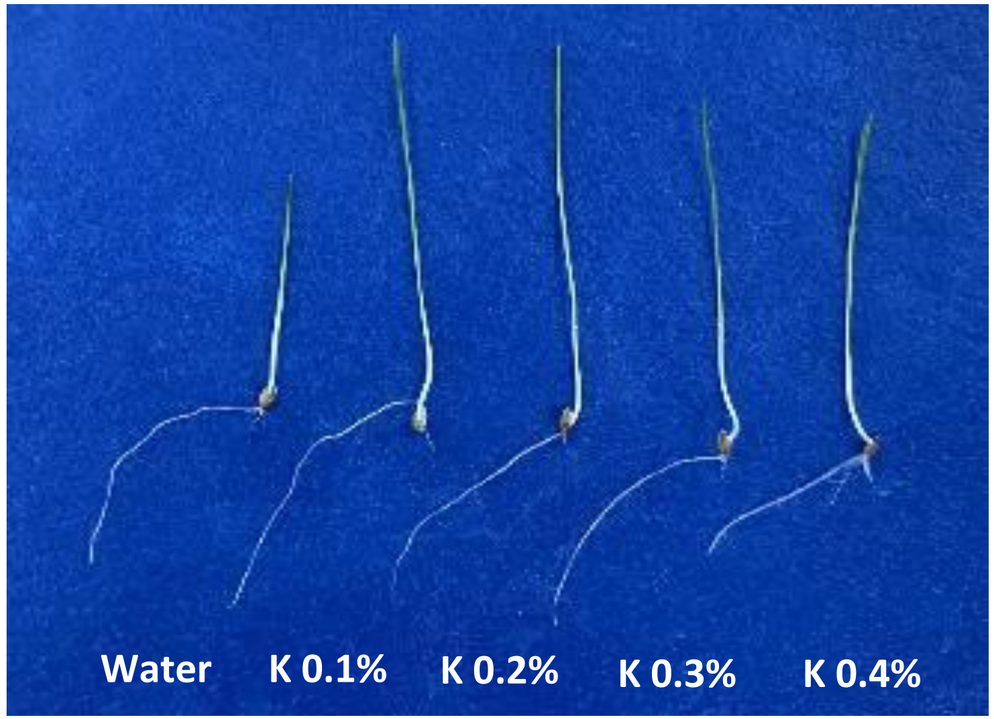
Effect of KNO_3 for Breaking Dormancy

➢ Result

Poa pratensis



Typical seedling



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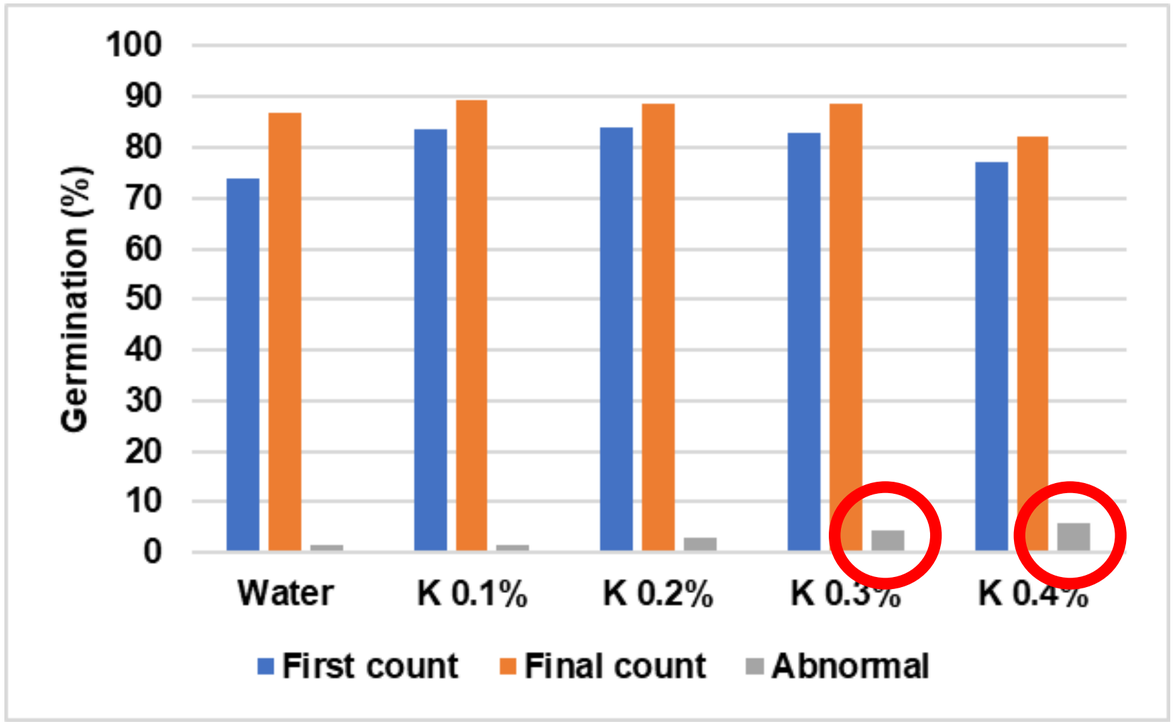
Effect of KNO_3 for Breaking Dormancy

➢ Result

Poa pratensis



Abnormal seedling (Decayed)
found in 0.3%, 0.4%

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Effect of KNO_3 for Breaking Dormancy

➢ Result

- In the samples used in this test, even a concentration of 0.1% was sufficient to break dormancy

- In test section with concentrations of 0.3% or higher in *Poa pratensis*, abnormal seedlings due to decayed were observed

- When KNO_3 is applied, the primary root becomes shorter and the hypocotyl becomes longer, and this tendency becomes stronger as the concentration increases.

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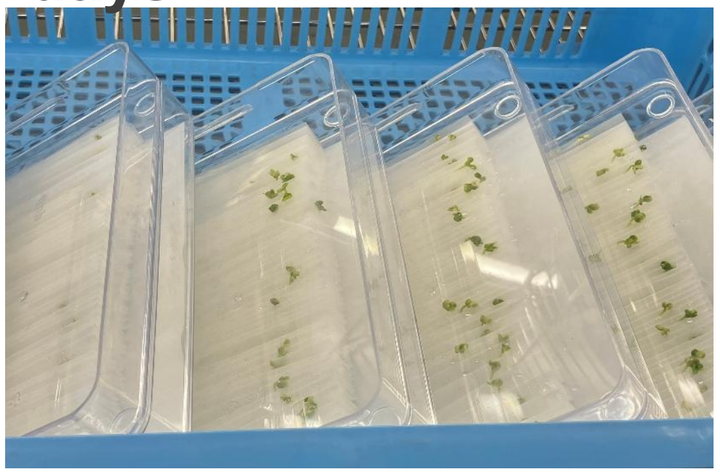
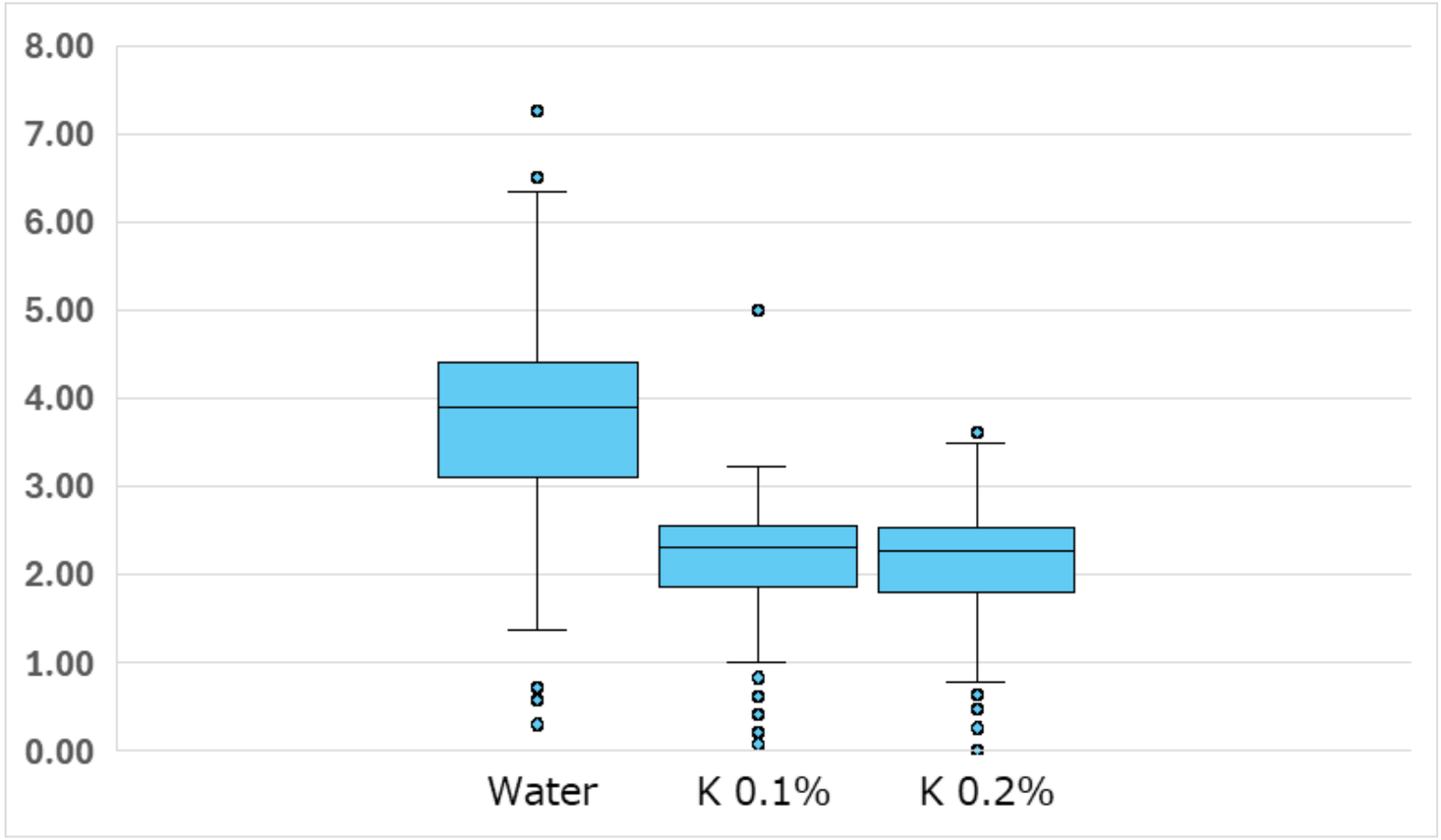
Side effect of KNO_3

- **Root/Hypocotyl ratio**
  - ***Brassica oleracea***
  - **100 seed each**
  - **Use PP**
  - **Measure length at 5 days**





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Consideration / Recommendation

- The use of potassium nitrate may cause shortened or damaged primary root and promote fungal growth for some species and for some tests.

- If excessive fungal growth and/or shortened roots are observed, if root injury is suspected or evident due to the use of KNO_3, it is recommended to retest on substrate moistened with a lower concentration of KNO_3 or water to aid with the evaluation of seedlings.

This recommendation harmonizes with the AOSA Rules

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Thank you!

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Rule Proposal – C.5.3 Add Ethephon for Breaking Dormancy in *Helianthus annuus* and Add Requirement to Report Concentration of Dormancy Breaking Solutions

The purpose of this proposal is to add a dormancy breaking procedure using ethephon, to more efficiently overcome physiological dormancy of *Helianthus annuus* L. seeds and require the reporting of dormancy breaking solutions on certificates.

Immediately after harvesting sunflower, seed dormancy is sometimes very deep and ISTA methods recommended break dormancy of sunflower (i.e., prechilling and preheating) do not completely release the dormancy. It is in that case impossible to assess the full germination potential of the seeds with a germination test. Preliminary experiments and a validation study involving 7 laboratories on 10 sunflower seed samples have demonstrated that ethephon is particularly efficient when high levels of physiological dormancy occur.

It is therefore proposed to add this procedure to break sunflower seed dormancy. It requires adding the description of the procedure in 5.6.3.1 Procedures for breaking physiological dormancy, and to include the recommendation for sunflower in Table 5A. Part 1.

This proposal would also amend 1.5.2.6 and 5.9 requiring the reporting of the concentration of solutions used for promoting germination, such as ethephon.

The proposal is supported by a validation study that has been reviewed and approved by the STATS TCOM.

This proposal does not harmonise with the AOSA Rules. There are no dormancy breaking recommendations or requirements listed in AOSA Rules Volume 1 Table 6A for *Helianthus annuus*. The AOSA Rules do not require reporting the use of germination promoting solution concentrations.

This proposal was submitted by the Germination Committee

GER Committee Votes	Yes:	16	No:	0	Abstain/Absent:	0	

Rule Proposal – C.5.3 Study Method & Conclusions (cont.)

General conclusion

This study shows the value of adding the dormancy breaking method using Ethrel to the ISTA rules. When dormancy is observed, as in lots 7 and 10, the two laboratories demonstrate the effectiveness of the Ethrel method. The Ethrel method is just as effective as the preheating method and better than the prechilling method.

Across all lots and laboratories, the Ethrel method was found to be as effective as the two official methods for lifting dormancy.

METHOD:

- **Dilute 0.6 ml of Etheverse (Bayer ©) in one litre of water and shake for 10 seconds. Ethephon concentration in Etherverse is 480 g/l (40% m/m). Refer to safety data sheet for use of this product.**

- **Pour the solution over the seeds, so that they are completely covered - Soak the seeds for 18 hours (± 1 hour) at room temperature.**

- **Drain the seeds in a beaker.**

- **The seeds are then placed onto an absorbent paper and wiped twice.**

Rule Proposal – C.5.3 (cont.)

CURRENT VERSION
5.6.3.1 Procedures for breaking physiological dormancy .... When a fuller germination assessment is required by the laboratory or upon the request of the customer, retesting utilising a procedure for removing dormancy is essential. The best result achieved must be reported and the procedure must be stated on the ISTA Certificate. [None - New section to be added before Prechilling] **Prechilling**: The replicates for germination are placed in...

PROPOSED VERSION
5.6.3.1 Procedures for breaking physiological dormancy .... When a fuller germination assessment is required by the laboratory or upon the request of the customer, retesting utilising a procedure for removing dormancy is essential. The best result achieved must be reported and the procedure must be stated on the ISTA Certificate. **Ethephon**: *Helianthus annuus* seeds are soaked in a 0.3 g/l (300 ppm) active ingredient ethephon solution for 18 hours (± 1 hour) at room temperature. After soaking, the seeds are drained, poured onto absorbent paper and wiped dry. The germination test must start promptly after drying. **Prechilling**: The replicates for germination are placed in...

Rule Proposal – C.5.3 (cont.)

CURRENT VERSION

Table 5A Part 1.

Species	Substrate	Temperature* (°C)	First count (d)	Final count (d)	Recommendations for breaking dormancy	Additional directions	Additional advice	Seedling Evaluation Group
1	2	3	4	5	6	7	8	9
Helianthus annuus	BP; TPS; S; O	20<=>30; 25; 20	4	10	Preheat; prechill	–	–	A-2-1-1-2

PROPOSED VERSION

Table 5A Part 1.

Species	Substrate	Temperature* (°C)	First count (d)	Final count (d)	Recommendations for breaking dormancy	Additional directions	Additional advice	Seedling Evaluation Group
1	2	3	4	5	6	7	8	9
Helianthus annuus	BP; TPS; S; O	20<=>30; 25; 20	4	10	Preheat; prechill; ethephon	–	PP not advisable with ethephon	A-2-1-1-2

Rule Proposal – C.5.3 (cont.)

Amend 1.5.2.6 and 5.9 - Require reporting of the concentration of solutions (e.g., KNO3, GA3, Ethephon) used to promote germination.

CURRENT VERSION
5.9 Reporting results
…. The following additional information must be reported under 'Other determinations': …. • any special treatment or method used for promoting germination (5.6.3); ….

PROPOSED VERSION
5.9 Reporting results
…. The following additional information must be reported under 'Other determinations': …. • any special treatment or method used for promoting germination (5.6.3), concentration of solutions used to promote germination (e.g., KNO3, GA3, Ethephon); ….

Consequential change to Chapter 1

CURRENT VERSION
1.5.2.6 Germination
…. The following additional information must be reported under 'Other determinations': …. • any special treatment or method used for promoting germination (5.6.3); ….

PROPOSED VERSION
1.5.2.6 Germination
…. The following additional information must be reported under 'Other determinations': …. • any special treatment or method used for promoting germination (5.6.3), concentration of solutions used to promote germination (e.g., KNO3, GA3, Ethephon); ….

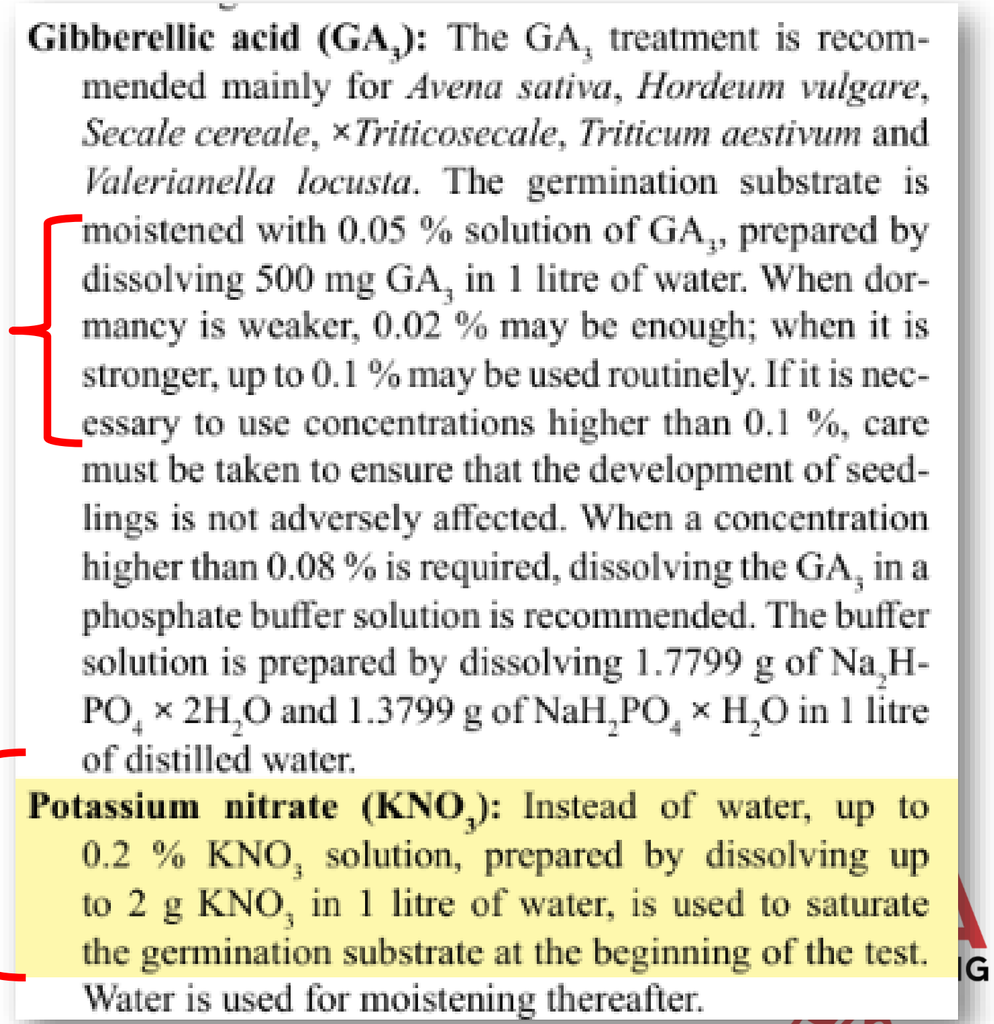
Rule Proposal – C.5.3 (cont.)

Amend 1.5.2.6 and 5.9 - Require reporting of the concentration of solutions (e.g., KNO3, GA3, Ethephon) used to promote germination.

ISTA Rules ***5.6.3.1 Procedures for breaking physiological dormancy***

- **GA3 solution** concentrations of **0.02%**, **0.05%**, **0.08%** and **0.1%+** are allowed, based on the level of dormancy.
- **KNO3 solution** concentrations of **up to 0.2%** are allowed, based on the level of dormancy.

NOTE: Knowing the solution concentration may help in understanding differences in germination test results between tests of the same seed lot.



Gibberellic acid (GA_3): The GA_3 treatment is recommended mainly for *Avena sativa*, *Hordeum vulgare*, *Secale cereale*, ×*Triticosecale*, *Triticum aestivum* and *Valerianella locusta*. The germination substrate is moistened with 0.05 % solution of GA_3, prepared by dissolving 500 mg GA_3 in 1 litre of water. When dormancy is weaker, 0.02 % may be enough; when it is stronger, up to 0.1 % may be used routinely. If it is necessary to use concentrations higher than 0.1 %, care must be taken to ensure that the development of seedlings is not adversely affected. When a concentration higher than 0.08 % is required, dissolving the GA_3 in a phosphate buffer solution is recommended. The buffer solution is prepared by dissolving 1.7799 g of $Na_2HPO_4 \times 2H_2O$ and 1.3799 g of $NaH_2PO_4 \times H_2O$ in 1 litre of distilled water.

Potassium nitrate (KNO_3): Instead of water, up to 0.2 % KNO_3 solution, prepared by dissolving up to 2 g KNO_3 in 1 litre of water, is used to saturate the germination substrate at the beginning of the test. Water is used for moistening thereafter.

Rule Proposal – C.5.4

A change is required at 5.6.3.3 and Table 5A Part 1 to add the drying temperature after presoaking to harmonise with drying temperature after prewashing. An editorial change is also needed to the prewashing drying temperature to align with 5.6.3.3. This proposal does not harmonise with the AOSA Rules.
This proposal was submitted by the Germination Committee.

GER Committee Votes	Yes:	12	No:	2	Abstain/Absent:	3	

CURRENT VERSION
5.6.3.3 Procedures for removing inhibitory substances …. Presoaking: Soak seeds in water for 2 h using 250 ml of water per 100 seeds. Rinse in running water and blot the surface dry. The temperature of the soaking and rinsing water must be 20–25 °C. Pelleted seed must not be presoaked. Prewashing: ... After washing, the seeds must be dried at a temperature of 20–25 °C (e.g. *Beta vulgaris*). Pelleted seed must not be prewashed.

PROPOSED VERSION
5.6.3.3 Procedures for removing inhibitory substances …. Presoaking: Soak seeds in water for 2 h using 250 ml of water per 100 seeds. Rinse in running water and blot the surface dry. The temperature of the soaking and rinsing water must be 20–25 °C. After soaking, the seeds must be dried at a temperature of 20–25 °C (e.g. *Beta vulgaris*). Pelleted seed must not be presoaked. Prewashing: ... After washing, the seeds must be dried at a temperature of 20–25 °C (e.g. *Beta vulgaris*). Pelleted seed must not be prewashed.

Rule Proposal – C.5.4 (cont.)

CURRENT VERSION

Table 5A Part 1.

Species	Substrate	Temperature* (°C)	First count (d)	Final count (d)	Recommendations for breaking dormancy	Additional directions	Additional advice	Seedling Evaluation Group
1	2	3	4	5	6	7	8	9
Beta vulgaris	TP; BP; S	20<=>30; 15<=>25; 20	4	14	Presoak (2 h; 250 ml water per 100 seeds); prewash (multigerm: 2 h; genetic monogerm: 4 h); dry at ~~max.~~ 25 °C	–	–	A-2-1-1-1

PROPOSED VERSION

Table 5A Part 1.

Species	Substrate	Temperature* (°C)	First count (d)	Final count (d)	Recommendations for breaking dormancy	Additional directions	Additional advice	Seedling Evaluation Group
1	2	3	4	5	6	7	8	9
Beta vulgaris	TP; BP; S	20<=>30; 15<=>25; 20	4	14	Presoak (2 h; 250 ml water per 100 seeds); dry at 20-25 °C prewash (multigerm: 2 h; genetic monogerm: 4 h); dry at 20-25 °C	–	–	A-2-1-1-1

Rule Proposal – C.5.5 Add Tolerance Tables for Replicates of 50 and 25 Seeds

The purpose of this proposal is to add five additional replicate to replicate tolerance tables to section 5.11 Part B for replicates of 50 seeds and 25 seeds. The following tolerance tables would be added: Table 5B Part 4. (Four reps of 50 seeds); Table 5B Part 5. (eight reps of 50 seeds); Table 5B Part 6. (four reps of 25 seeds); Table 5B Part 7. (eight reps of 25 seeds); Table 5B Part 8. (sixteen reps of 25 seeds).

The proposal provides laboratories with tolerance tables for germination tests that consist of replicates of 50 seeds and 25 seeds. Laboratories would no longer be permitted to combine replicates of less than 100 seeds to artificially create replicates of 100 seeds. The new tolerance tables will reduce the frequency of required retests due to replicates being out of tolerance.

The STATS TCOM created the proposed additional tolerance tables and supports this proposal. If this proposal is adopted, the STATS TCOM will update the related tolerance calculation tools in the GER TCOM Toolbox.

This proposal does not harmonise with the AOSA Rules. AOSA Volume 1 section 6.6 states sub-replicates of 25 or 50 seeds are required to be combined to form replicates of 100 seeds, since section 14.5 Germination tolerances does not include tolerance tables for replicates of less than 100 seeds.

This proposal was submitted by the Germination Committee.

GER Committee Votes	Yes:	16	No:	0	Abstain/Absent:	0	

Rule Proposal – C.5.5 (cont.)

CURRENT VERSION
5.11 Tolerance tables
Table 5B gives the maximum tolerated differences between the highest and lowest germination percentages of the replicates of a germination test, allowing only for random sampling variation at a probability of 0.025. ~~To determine whether a test is reliable, calculate the average germination percentage over all replicates, to the nearest whole number. If necessary, in tests of 400 or 200 seeds, four or two replicates, respectively, of 100 seeds each can be formed by combining the subreplicates of 50 or 25 seeds which were closest together in the germinator. In tests of 100 seeds, two replicates of 50 seeds each can be formed by combining the subreplicates of 25 seeds which were closest together in the germinator, and multiplying the results of each of the two replicates by 2 to obtain an average germination percentage.~~ ….

PROPOSED VERSION
5.11 Tolerance tables
Table 5B gives the maximum tolerated differences between the highest and lowest germination percentages of the replicates of a germination test, allowing only for random sampling variation at a probability of 0.025. To determine whether a test is reliable, calculate the average germination percentage over all replicates, to the nearest whole number. ….

If these NEW tolerance tables are added to the ISTA Rules, laboratories will **no longer permitted to combine reps** of 25 and 50 seeds to form reps of 100 seeds.

ISTA ANNUAL MEETING 2026

Rule Proposal – C.5.5 (cont.)

CURRENT VERSION

Table 5B

....

Table 5B Part 3. Two replicates of 50 seeds

Average germination percentage of test		Tolerance
51–100 %	0–50 %	
99	2	5
98	3	7
97	4	8
96	5	9
95	6	10
94	7	11
92–93	8–9	12
90–91	10–11	13
89	12	14
86–88	13–15	15
84–85	16–17	16
81–83	18–20	17
78–80	21–23	18
74–77	24–27	19
70–73	28–31	20
63–69	32–38	21
51–62	39–50	22

Table 5C. Tolerances between results of two tests on the same or a different submitted sample when tests are made in the same laboratory (two-way test at the 2.5 % significance level)

Table 5C Part 1. Two tests of 400 seeds

....

PROPOSED VERSION

Table 5B

....

Table 5B Part 3. Two replicates of 50 seeds

Average germination percentage of test		Tolerance
51–100 %	0–50 %	
99	2	5
98	3	7
97	4	8
96	5	9
95	6	10
94	7	11
92–93	8–9	12
90–91	10–11	13
89	12	14
86–88	13–15	15
84–85	16–17	16
81–83	18–20	17
78–80	21–23	18
74–77	24–27	19
70–73	28–31	20
63–69	32–38	21
51–62	39–50	22

INSERT THE FOLLOWING TABLES HERE

Table 5C. Tolerances between results of two tests on the same or a different submitted sample when tests are made in the same laboratory (two-way test at the 2.5 % significance level)

Table 5C Part 1. Two tests of 400 seeds

Rule Proposal – C.5.5 New Tolerance Tables (cont.)

Table 5B Part 4. Four replicates of 50 seeds

Average germination percentage of test		Tolerance
51-100%	0-50%	
99	2	7
98	3	8
97	4	10
96	5	11
95	6	13
94	7	14
92-93	8-9	15
91	10	16
90	11	17
88-89	12-13	18
87	14	19
85-86	15-16	20
83-84	17-18	21
80-82	19-21	22
78-79	22-23	23
75-77	24-26	24
71-74	27-30	25
66-70	31-35	26
59-65	36-42	27
51-58	43-50	28

Table 5B Part 5. Eight replicates of 50 seeds

Average germination percentage of test		Tolerance
51-100%	0-50%	
99	2	8
98	3	10
97	4	12
96	5	13
95	6	15
94	7	16
93	8	17
92	9	18
91	10	19
89-90	11-12	20
88	13	21
87	14	22
85-86	15-16	23
83-84	17-18	24
81-82	19-20	25
79-80	21-22	26
77-78	23-24	27
74-76	25-27	28
71-73	28-30	29
67-70	31-34	30
62-66	35-39	31
51-61	40-50	32

Tolerance Tables for Replicates of 50 Seeds

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Rule Proposal – C.5.5 New Tolerance Tables (cont.)

NEW

Tolerance Tables for Replicates of 25 Seeds

Table 5B Part 6. Four replicates of 25 seeds

Average germination percentage of test		Tolerance
51-100%	0-50%	
99	2	9
98	3	12
97	4	14
96	5	16
95	6	18
94	7	19
93	8	21
92	9	22
91	10	23
90	11	24
89	12	25
88	13	26
87	14	27
86	15	28
84-85	16-17	29
83	18	30
81-82	19-20	31
79-80	21-22	32
77-78	23-24	33
75-76	25-26	34
73-74	27-28	35
70-72	29-31	36
67-69	32-34	37
62-66	35-39	38
52-61	40-49	39
51	50	40

Table 5B Part 7. Eight replicates of 25 seeds

Average germination percentage of test		Tolerance
51-100%	0-50%	
99	2	11
98	3	14
97	4	17
96	5	19
95	6	21
94	7	22
93	8	24
92	9	25
91	10	27
90	11	28
89	12	29
88	13	30
87	14	31
86	15	32
85	16	33
84	17	34
82-83	18-19	35
81	20	36
80	21	37
78-79	22-23	38
76-77	24-25	39
74-75	26-27	40
72-73	28-29	41
69-71	30-32	42
66-68	33-35	43
62-65	36-39	44
56-61	40-45	45
51-55	46-50	46

Table 5B Part 8. Sixteen replicates of 25 seeds

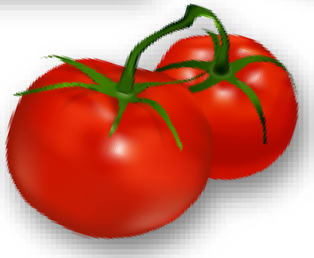
Average germination percentage of test		Tolerance
51-100%	0-50%	
99	2	12
98	3	16
97	4	19
96	5	21
95	6	23
94	7	25
93	8	27
92	9	28
91	10	30
90	11	31
89	12	33
88	13	34
87	14	35
86	15	36
85	16	37
84	17	38
83	18	39
81-82	19-20	40
80	21	41
79	22	42
77-78	23-24	43
76	25	44
74-75	26-27	45
72-73	28-29	46
69-71	30-32	47
67-68	33-34	48
63-66	35-38	49
59-62	39-42	50
51-58	43-50	51

Projects: Active

FAQ

- Create a Frequently Asked Questions (FAQ) Section for GER TCOM Page

- Add Germination Method for *Solanum torvum* to Table5
- Add 25C Temperature to Germination Method for *Solanum lycopersicum* to Table5 *(currently only 20⇔30C)*



- Reduce Test Duration for *Dactylis glomerata* and *Agrostis capillaris* and *A. stolonifera* in Table5 *(currently 21, 28, and 28 days)*

Participates Needed - Contact Dot dot@dlf.com

- Add Germination Method for *Moringa oleifera* to Table5

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Validation Study Results of *Solanum torvum*

Presenter: Erik van Egmond

Naktuinbouw, Netherlands

Validation study of Solanum torvum

Introduction

- Solanum torvum Sw. is a species belonging to the Solanaceae family.
- The Solanum torvum is used as rootstock for the Solanum melongena L
- The fruit has medicinal uses for diabetes control.
- Therefore, is necessary to internationally trade this species with an ISTA certificate

Solanum torvum

- U.S. National Seed Herbarium image
- (PI 3915) collected by C. T. Hanbury from Italy [photographed by Steve Hurst*]

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Validation study of Solanum torvum

Materials and Methods

- Used 6 lots, of 2 varieties, from 2 origins Thailand and Tanzania.
- 2 lots were Primed.
- 6 different ISTA labs from Europa, Canada and Japan.
- The methods for germination were
  - TP (top of paper) 20<=>30 °C
  - TP (top of paper) 20<=>30 °C with 0.2% KNO3
  - BP (between paper) 20<=>30 °C
  - S (Sand) 20<=>30 °C
- Evaluation days 5-7-10-14-21 and possibility to extent the test.
- Seedling Evaluation Group A.2.1.1.1

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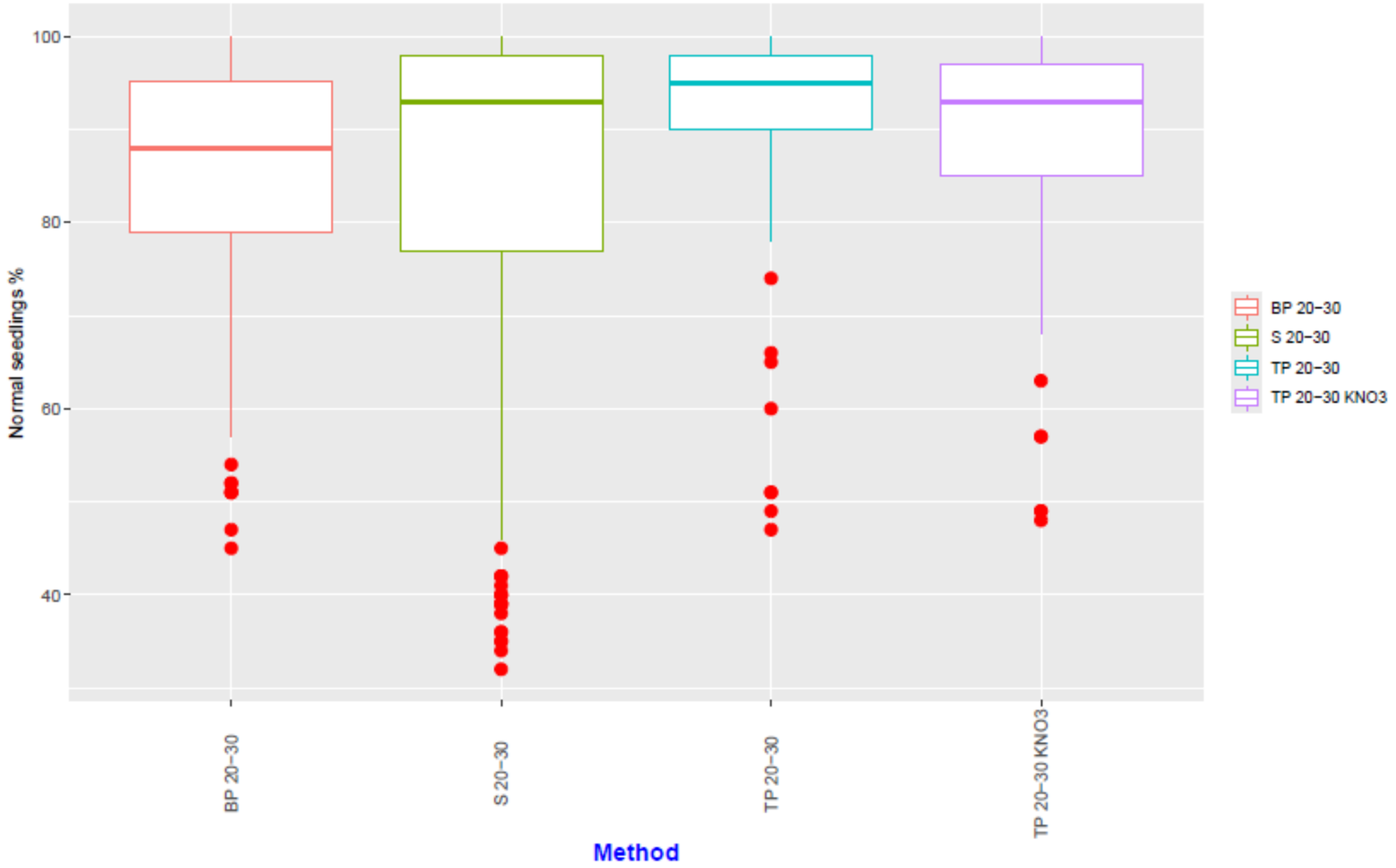
Validation study of Solanum torvum

- **Results:** Figure 1. Boxplots of all labs and lots per method



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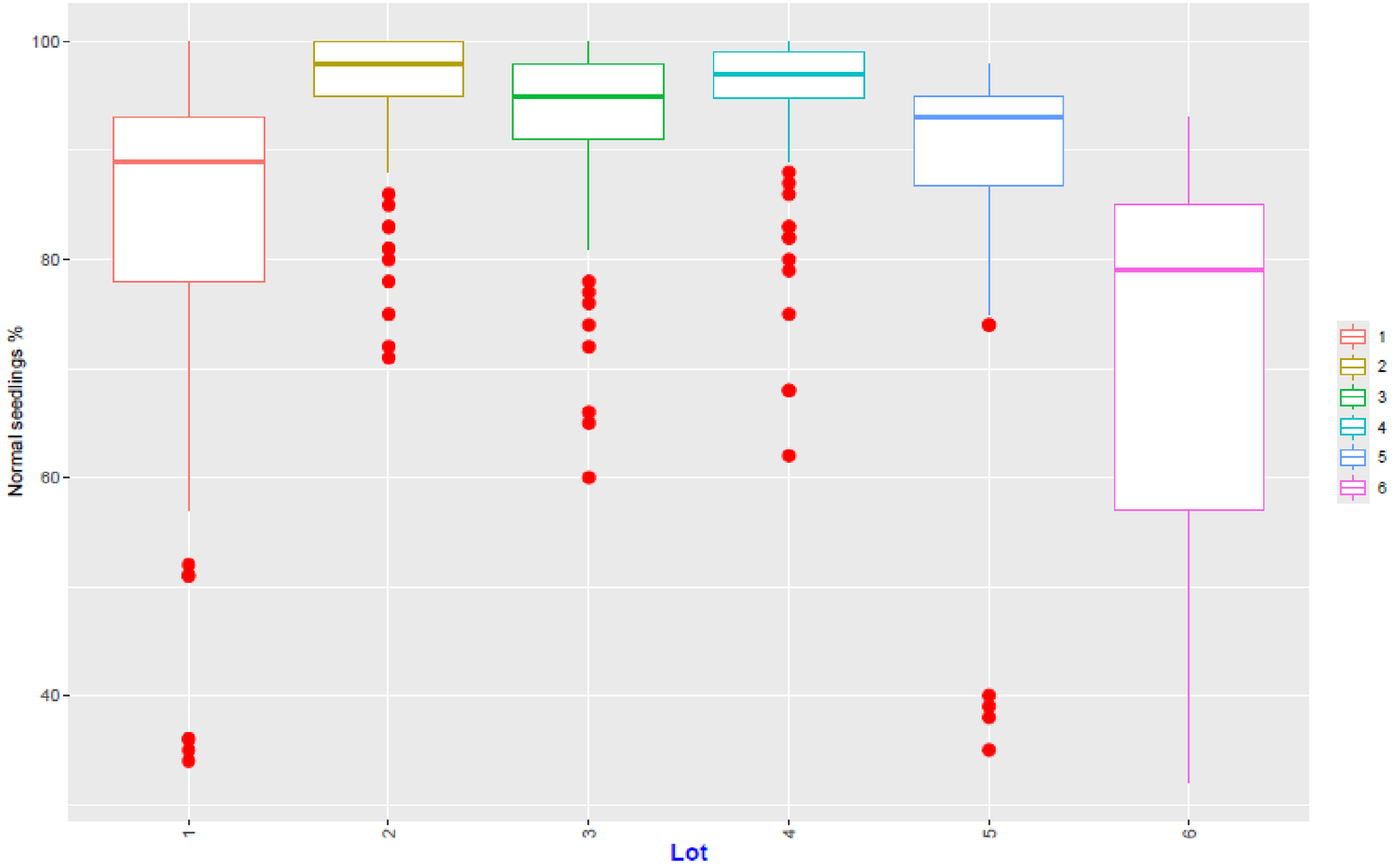
Validation study of Solanum torvum

- Figure 2. Result of all labs and methods per lot



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Validation study of Solanum torvum

- Table 1. Repeatability data for each method

Method	$\bar{p}_{...}$	$\hat{\sigma}_{Lab}$	$\hat{\sigma}_{Lot\times Lab}$	S_r	f_r	S_R
BP 20-30	85	9.92	5.71	3.77	1.05	11.6
S 20-30	83	9.01	13.86	2.92	0.78	16.6
TP 20-30	92	3.14	7.25	2.45	0.9	8
TP 20-30 KNO3	90	3.15	7.1	3.14	1.03	7.92

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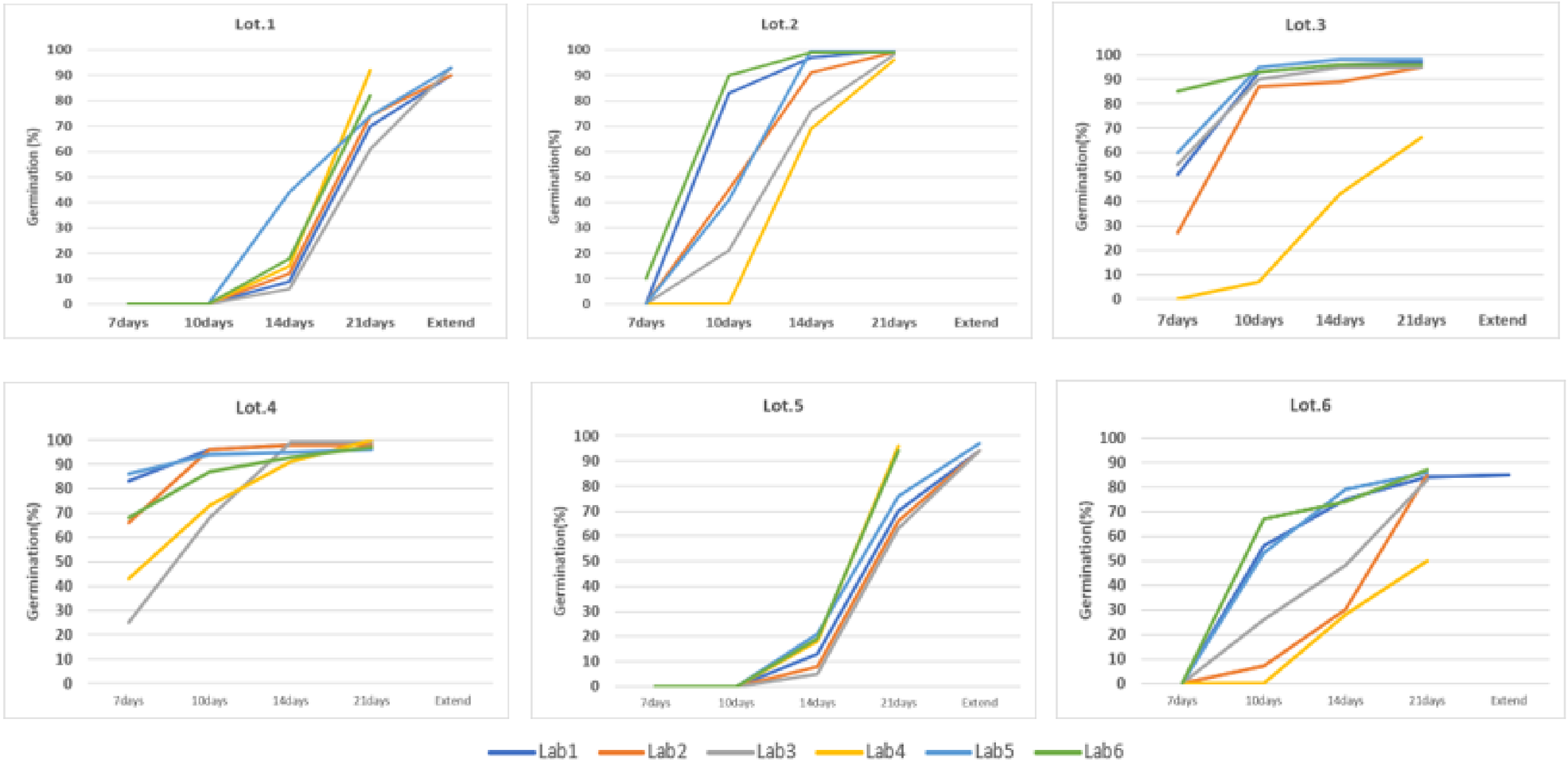
Validation study of Solanum torvum

- Result of germination time



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Validation study of Solanum torvum

Conclusion

- That Sand method was not easy to evaluate.
- The method TP 20-30 °C gives the best result, when you see all results
- The count of 5 days almost no seeds where germinated.
- The primed lots germinates faster, then non-primed lots.
- $KNO_{3.}$ did not make any difference, no dormancy was detected.

Validation study of Solanum torvum

Where are we now, what to do.

- The report is now going to technical and Statistical reviewers.
- In collaboration with Bulking en Sampling, weight for table 2C
- In collaboration with Purity TCOM, PSD must be established.
- Proposal for new species must be delivered to the Rules TCOM in October.
- Voting for new species in 2027.
- Solanum torvum in rules 2028.

Validation study of Solanum torvum

Acknowledgements

- Thanks to seed companies Rijkzwaan the Netherlands and Takii & Co Japan for supplying the seed lots.
- Thanks to all the labs that participated in this validation study, Naktuinbouw laboratories (the Netherlands), Takii & Co. Ltd. Quality Assurance Department (Japan) GEVES-SNES Station Nationale d Essais de Semences (France), SGS Canada Inc. (Canada), CREA Consigilio per la Riccerca in Agricoltura e l Analisi dell Economia Agraria (Italy) and Landwirtschaftiches Technologiezentrum Augustenberg (Germany).
- Thanks to Aurore Philibert and the Statistical Committee, for running the ISTAgermMV stat program with the data.

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Thank you!

Tomato Germination at 25°c

Prepared by: Melissa Phillips – Bayer CropScience, USA

Germination Committee Member

Ask of the committee:

- Member request - validate 25°c for germination of *Solanum lycopersicum*

- A proof-of-concept study was conducted to establish the chance of success if pursuing the project.

POC Experiment

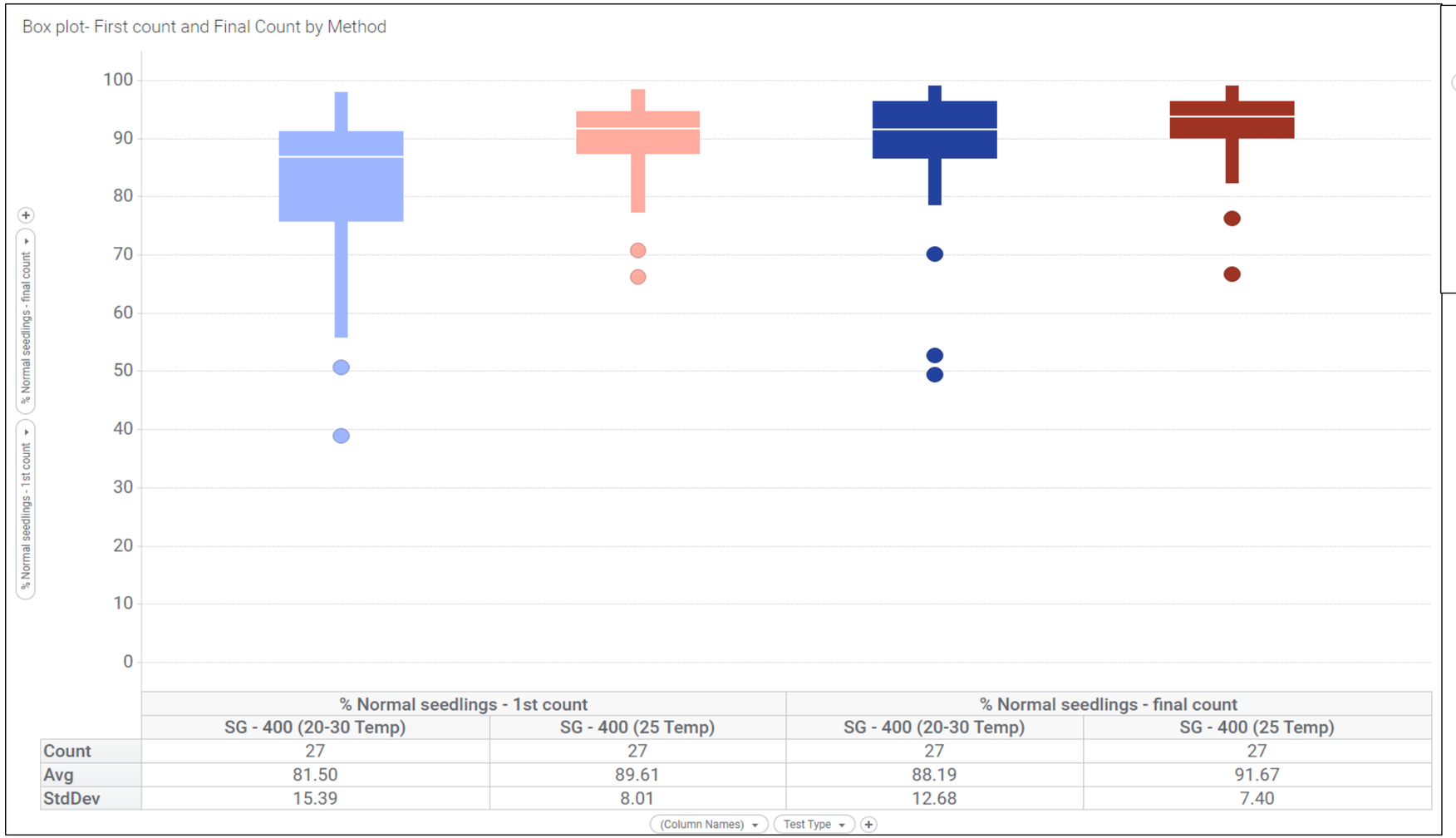
- Location Bayer CropScience Waterman Lab, Waterman, IL USA

- 29 samples of different batches of *Solanum lycopersicum* were selected of varying quality.
- 2 sets of 400 seed samples were planted between paper
- 1 set of samples were placed into 25°c
- 1 set of samples were placed into 20°c <=> 30°c

- Samples were first counted on day 5 after planting and final evaluation on day 14.

Results

- 2 batches had a test with replicates out of tolerance.
  - With insufficient time to retest, these pairs were removed from the analysis
  - This changes the number of samples to 27 for analysis



	% Normal seedlings - 1st count		% Normal seedlings - final count	
	SG - 400 (20-30 Temp)	SG - 400 (25 Temp)	SG - 400 (20-30 Temp)	SG - 400 (25 Temp)
Count	27	27	27	27
Avg	81.50	89.61	88.19	91.67
StdDev	15.39	8.01	12.68	7.40

Current Method
Proposed Method

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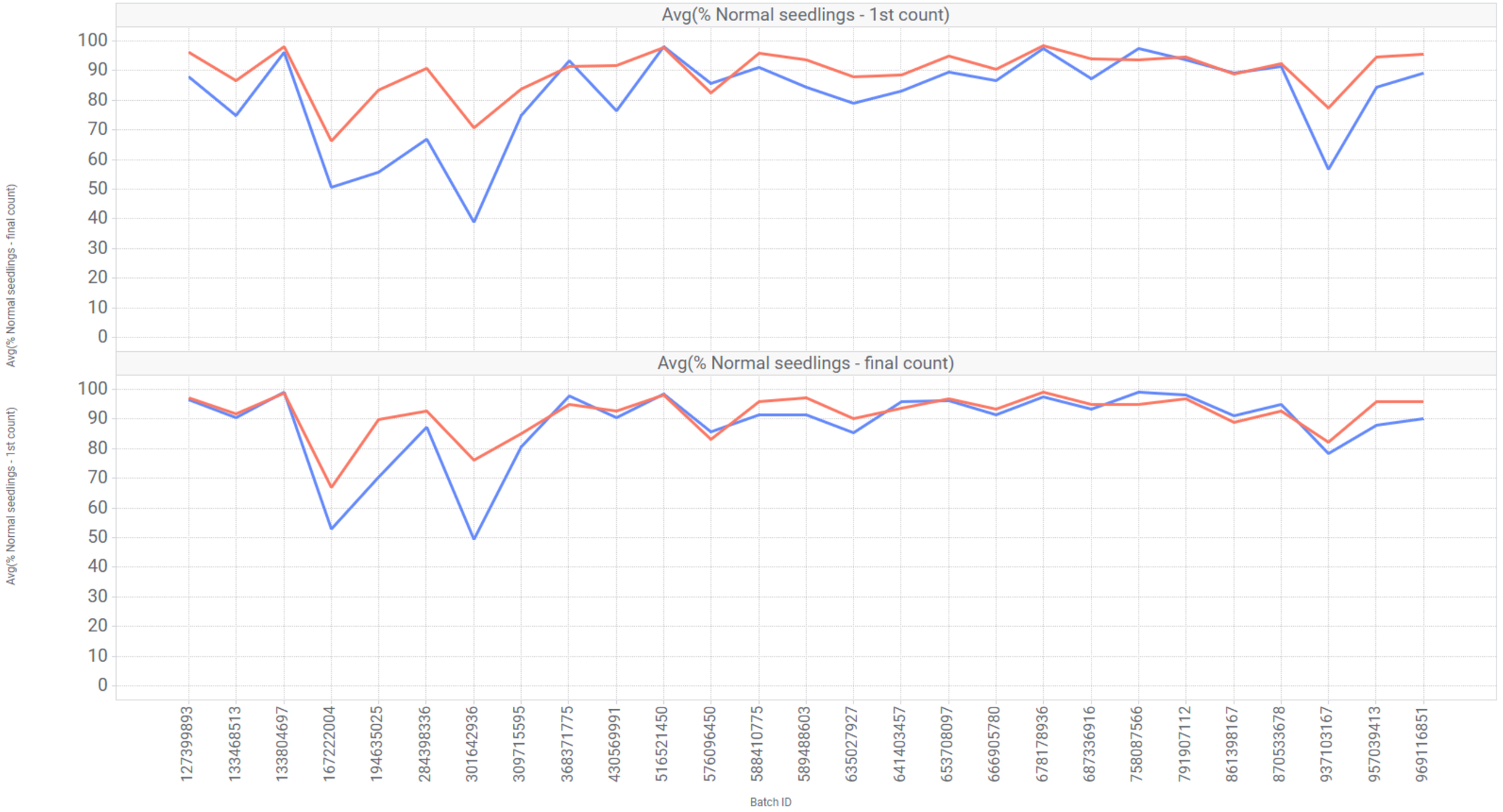
% Normal seedlings - 1st count, % Normal seedlings - final count – Batch ID



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Response LogitPct(% Normal seedlings - final count)

Summary of Fit

RSquare	0.886199
RSquare Adj	0.88401
Root Mean Square Error	0.485548
Mean of Response	2.605701
Observations (or Sum Wgts)	54

Parameter Estimates

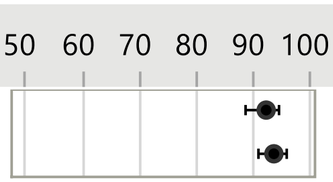
Term	Estimate	Std Error	DFDen	t Ratio	Prob>|t|
Intercept	2.6057005	0.194727	26	13.38	<.0001 *
Test Type[SG - 400 (20-30 Temp)]	-0.113603	0.066075	26	-1.72	0.0974

Effect Details

Test Type

Least Squares Means Table

Level	Least Sq Mean	Std Error
SG - 400 (20-30 Temp)	92.3586	0.2056
SG - 400 (25 Temp)	93.8156	0.2056



* Std Errors are on transformed Y's

Statistics support the alignment in the data

LSMeans Differences Student's t

Differences are on transformed Y's

α=0.050

Level		Least Sq Mean	Std Error
SG - 400 (25 Temp)	A	93.816	0.20563
SG - 400 (20-30 Temp)	A	92.359	0.20563

Levels not connected by same letter are significantly different.

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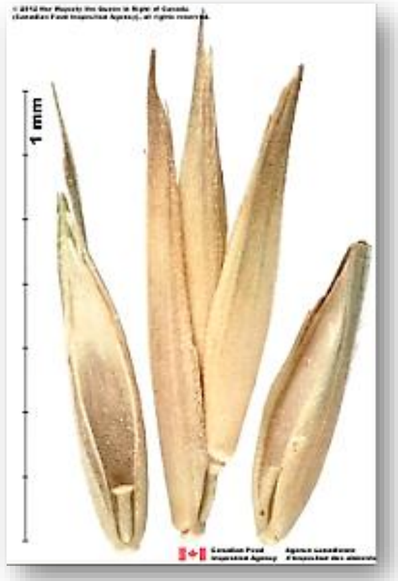
In Summary…

- The proof-of-concept experiment results support the continuation of the project.

- Next steps will be the preparation and execution of an official cross-lab validation study.

Thank you!

Study to Reduce Test Durations by 7+? Days



Dactylis glomerata

(Currently 21 days)

Agrostis capillaris

(Currently 28 days)

Agrostis stolonifera

(Currently 28 days)

Participates Needed
Contact Dot
dot@dlf.com

Photos Source: CFIA

Projects: Planned or Under Consideration

- Add 30C Temperature to Germination Method for *Citrullus lanatus* to Table5 for *C. lanatus (triploid) (currently 20⇔30C and 25C)*

- Add the BP Method to *Lolium multiflorum, Lolium perenne, and Lolium x hybridum* to Table5 *(currently only TP method)*

- Add Germination Method for *Guizotia abyssinica* to Table5

- Add 20C Temperature to Germination Method for *Solanum tuberosum* to Table5 *(currently only 20⇔30C)*

- Add Vermiculite + BP (i.e., rolled towel) method for *Glycine max* and *Zea mays* to Table5

Substrate Water Retention Specifications - ISTA Rules 5.4.2 Discussion

Do I REALLY need to know how much water my media will hold???

Photos Source: CFIA

5.4.2 Substrate Water Retention Specifications

5.4.2 Specifications

The following general specifications* apply for all growing media and **must be verified**: *(*i.e., Composition, Water retention, pH, Cleanness, Conductivity, Innocuity)*

…

Water retention characteristics: When the appropriate amount of water is added, the particles of the growing medium should have the capacity to hold sufficient water to provide continuous movement of water to the seeds and seedlings but also provide sufficient pore space for the aeriation required for optimal germination and root growth. The water content of the growing medium should be adjusted to correspond to the needs of the species being tested, based on the maximum water-holding capacity of the medium. The water retention is expressed as a percentage of the maximum retention.

…

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5.4.2 Substrate Water Retention Specifications

Seedling Evaluation Handbook

A5.3 Germination procedures – growing media specification checks: water retention

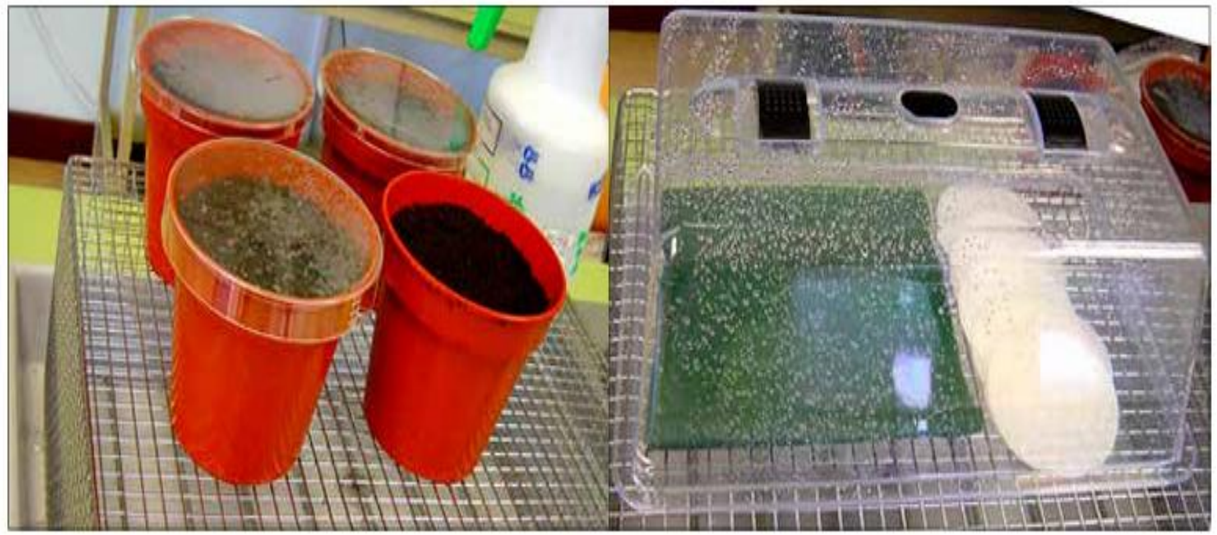

Figure A5.17 The germination media is saturated with water and allowed to freely drain for 12 hours with measures being taken to prevent evaporation. The saturated media is then weighed and the maximum amount of water held in the growing media as percentage of its dry weight is calculated.

Table A5-B Example calculations for paper, organic growing media and sand.

	Paper media	Organic growing media	Sand
Moisture content determined using high constant temperature oven method (130 °C for 1 hour) **(MC)**	**7.1 %**	**32.0 %**	**15.5 %**
Weight of Substrate used to determine water retention **(W_s)**	**144.5 g**	**257.2 g**	**620 g**
Weight of saturated substrate **(W_{FC})**	**602.0 g**	**508.4 g**	**740.5 g**
$(H_2O)_s = W_s \times (MC/100)$	= 144.5 × 0.071 **= 10.3 g**	= 257.2 × 0.32 **= 82.3 g**	= 620.0 × 0.155 **= 96.1 g**
$(DW)_s = W_s - (H_2O)_s$	= 144.5 – 10.3 **= 134.2 g**	= 257.2 – 82.3 **= 174.9 g**	= 620 – 96.1 **= 523.9 g**
$(H_2O)_{FC} = W_{FC} - W_s + (H_2O)_s$	= 602.0 – 144.5 + 10.3 = **467.8 g**	= 508.4 – 257.2 + 82.3 = **333.5 g**	= 740.5 – 620 + 96.1 **= 216.6 g**
$(H_2O)_{MAX} = [(H_2O)_{FC} / DW_s] \times 100$	= (467.8/134.2) × 100 = **348.6 %**	= (333.5/174.9) × 100 = **190.7 %**	= (216.6/523.9) × 100 = **41.3 %**

As an example, if the paper media indicated in Table A5-B is used for germination test and that due to experimental work in the laboratory, it has been demonstrated that the optimal amount of water for germination of Brassica species is 20 ml for 10 g of paper (dry weight (DW)-basis). Considering that this paper holds a maximum of (467.8/134.2) × 100 = 348.6 g of water for 100 g of paper (DW basis), it means that for this test condition the amount of water added to the paper corresponds to (200/348.6) × 100 = **57 % of the maximum water retention capacity of the media.**

Possible Rule Proposals for 5.4.2 and 5.4.5?

2026 Proposal Withdrawn

CURRENT VERSION	PROPOSED VERSION
5.4.2 Specifications … The following gene ~~and must be verified~~: … Water retention characteristics: When the appropriate amount of water is added, the particles of the growing medium should have the capacity to hold sufficient water to provide continuous movement of water to the seeds and seedlings, but also provide sufficient pore space for aeration required for optimal germination and root growth. The water content of the growing medium should be adjusted to correspond to the needs of the species being tested~~, based on the maximum water-holding capacity of the medium~~. ~~The water retention is then expressed as a percentage of the maximum retention.~~ …	**5.4.2 Specifications** … The following general specifications apply for all growing media: … Water retention characteristics: When the appropriate amount of water is added, the particles of the growing medium should have the capacity to hold sufficient water to provide continuous movement of water to the seeds and seedlings, but also provide sufficient pore space for aeration required for optimal germination and root growth. The water content of the growing medium should be adjusted to correspond to the needs of the species being tested, as determined by the laboratory. Determining the maximum water-holding capacity of growing media is optional and is not a requirement but can be determined if desired.

5.4.5 Quality control

New deliveries of growing media must meet the requirements for the principal physical characteristics and be free of negative effects due to toxic substances or noxious microorganisms.

The characteristics **composition**, ~~**water retention,**~~ **pH**, **cleanness** and **innocuity** (freedom from phytotoxic effects and negative effects due to microorganisms) must be checked.

5.4.5 Quality control

New deliveries of growing media must meet the requirements for the principal physical characteristics and be free of negative effects due to toxic substances or noxious microorganisms.

The characteristics **composition**, **pH**, **cleanness** and **innocuity** (freedom from phytotoxic effects and negative effects due to microorganisms) must be checked. Determining the maximum water-holding capacity of the growing media is optional and is not a requirement but can be determined if desired.

*(NOTE: Would still **require** checking pH, Conductivity, Cleanness, Toxicity, Innocuity.)*

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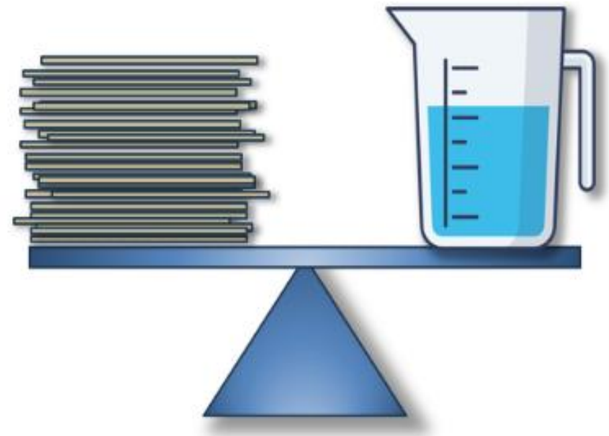
5.4.2 Substrate Water Retention Specifications

Thoughts to Consider:

Q1) If laboratories are **REQUIRED to determine** the maximum water-holding capacity (MWHC) of the media, should they also be **REQUIRED to determine what percentage of the MWHC** of the media they should use **for EACH species** they test?



<u>Precise</u> Media Moisturization

Q2) If a laboratory **does NOT use the MWHC** of the media to determine the volume of water to add to the media, **why are they REQUIRED to determine the MWHC** of the media?

<u>Imprecise</u> Media Moisturization

Q3) If laboratories are **not basing the amount of water** they add to the media on the MWHC of the media, **how are they determining how much water** to consistently add to the media?

Q4) Should determining the MWHC of media be made **optional**?

*(NOTE: Would still **<u>require</u>** checking pH, Conductivity, Cleanness, Toxicity, Innocuity.)*

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5.4.2 Substrate Water Retention Specifications

AOSA Rules

6.3 Moisture and aeration — The substratum must be moist enough and provide adequate seed-to-media contact to supply the needed moisture to the seeds at all times. When appropriate, gently pressing seeds into the germination media helps ensure adequate seed-to-media contact to allow for adequate and timely imbibition. Avoid supplying excessive moisture that will restrict aeration of the seeds. Except as provided for those kinds of seeds requiring high moisture levels in the germination media, the substrata should never be so wet that a film of water is formed around the seeds. For most kinds of seeds, blotters or other paper substrata should not be so wet that by pressing, a film of water forms around the finger. See section 6.9 b.

Q5) Consider harmonizing ISTA Rules with **AOSA Rules** Section 6.3 to at least **provide <u>minimal guidance</u>**?

"<u>Precise-ish</u>" Media Moisturization

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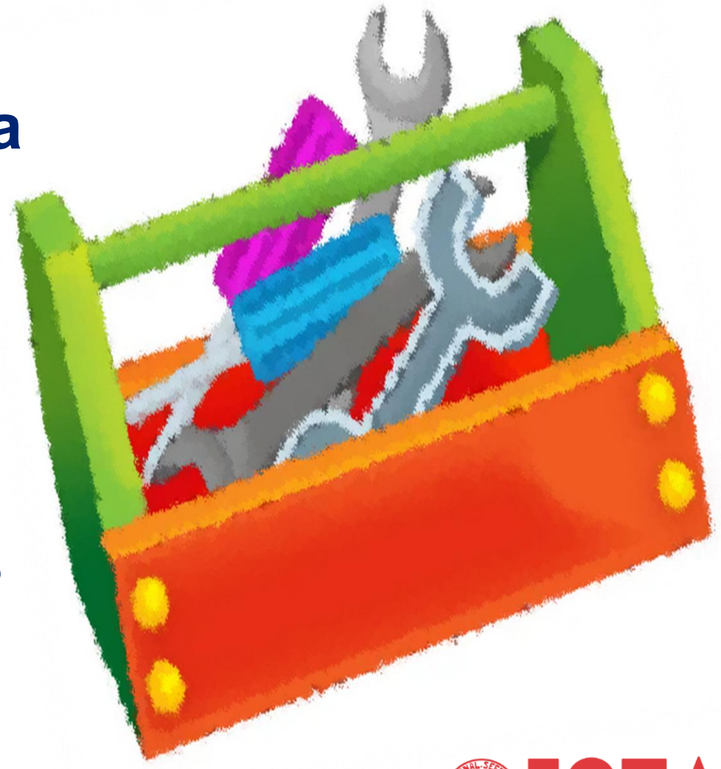
GER TCOM Toolbox – *It's ALL for FREE!!!*

Information & Programme Items Include:

- **Rounding Procedure for Germination Test Results**
- **Calculation of Water Retention of Germination Media**
- **Tolerance and Confidence Interval Calculator**
  (Within the Same Lab or Between Different Labs)
- **Germination Tolerances Calculation Programme**
- **Germination: Calculation and Expression of Results**



https://www.seedtest.org/en/services-header/tools/germination-committee/germination-toolbox.html

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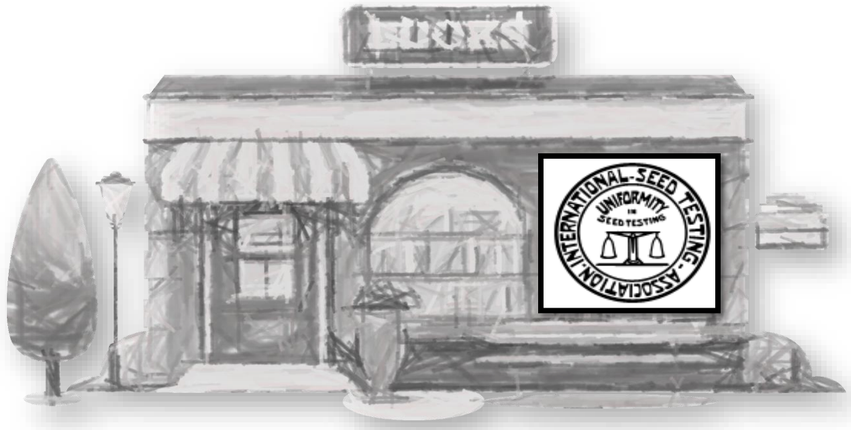
ISTA Proficiency Tests - Germination

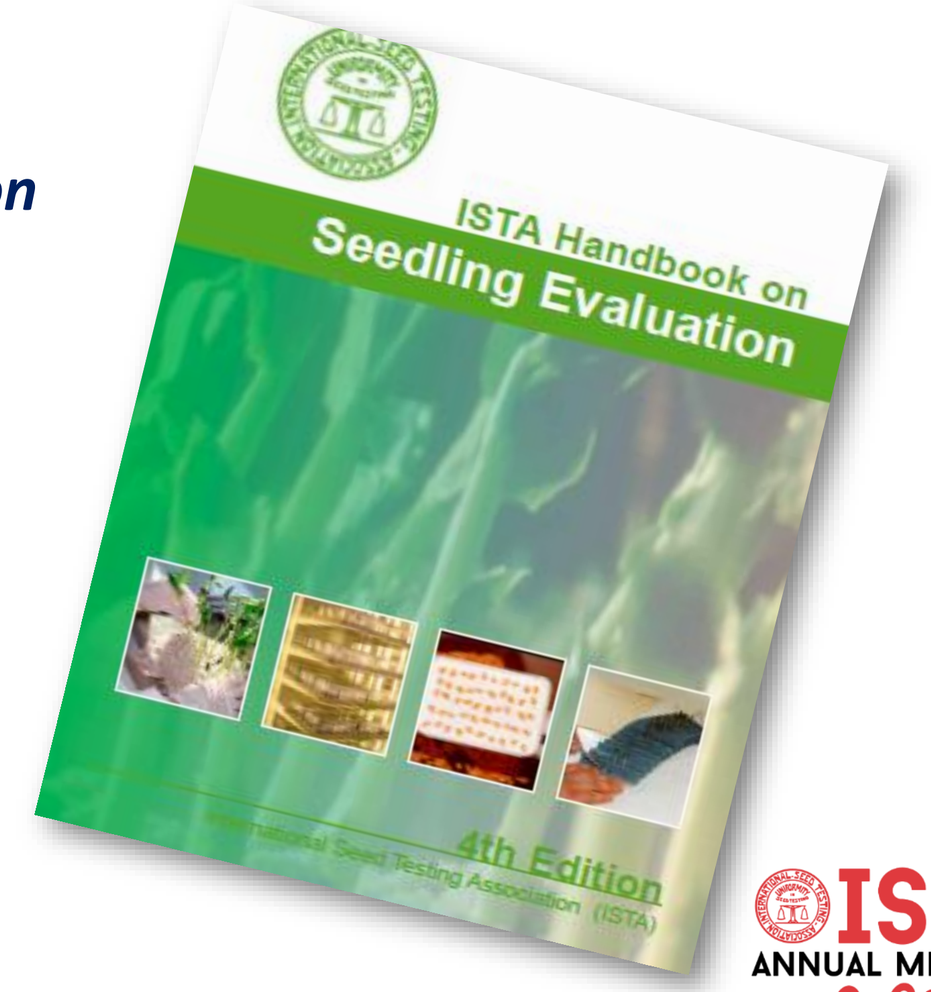
Round	Species	Test Round Scope	Crop Group No.	Crop Group
PT26-1	*Linum usitatissimum*	PUR, OSD, GER, OIC	5 and 8	Other Agri Crops and Flowers
PT26-2	*Hordeum vulgare subsp. vulgare*	PUR, OSD, GER, MOI, TSW, MIX	2	Cereals
PT26-3	*Lolium multiflorum*	PUR, OSD, GER, TZ	1	Grasses
PT27-1	*Pisum sativum*	GER, VIG (conductivity), MOI	4	Pulses
PT27-1	*Salvia spp.*	GER	5, 6 and 8	Other Agri Crops, Vegetables, and Flowers
PT27-2	*Trifolium incarnatum*	PUR, OSD, GER, TZ	3	Small Legume
PT27-3	*Helianthus annuus*	GER, TZ, MIX	5 and 8	Other Agri Crops and Flowers
PT27-3	*Glycine max*	GER, VIG (RE), MOI, OIC	4	Pulses

Publications

ISTA Handbook on Seedling Evaluation, 4th Edition, 2018

- *Revisions completed very soon*
- *Several edits and updates made to information*
- *Several NEW updated improved photos*
- *Release scheduled for January 1, 2027*





https://www.seedtest.org/en/handbooks/handbook-on-seedling-evaluation-4th-edition-2018-product-1016.html

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Workshops

Completed:

- **Germination and Vigour**

  Angers, France, 1 – 5 December 2025

  Alison Powell, Gillian Musgrove, GEVES Staff

Upcoming:

- **Germination and TZ**

  Oudtshoorn, South Africa, 10 – 12 November 2026

  Sergio Pasquini, Erik van Egmond, David Johnston

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- Members of the Germination Committee
- ISTA Secretariat Staff
- ECOM Liaison Officers – Irena Gera and Ruel Gesmundo
- ECOM
- ISTA Auditors, Statistics Committee, Proficiency Test Committee, Flower Seed Committee and all the other Committees for their support and collaboration
- Laboratories that support/participate with GER TCOM activities

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Thank you Sylvie!!!

Sylvie Ducournau

- Elected to the GER TCOM 2004
- Elected as Chair 2010 and served for 9 years
- Resigning from GER TCOM June 2026
- Over 20 years serving on the GER TCOM!!!

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Thank you for your kind attention and support!!!

- *Visit the GER TCOM page on the ISTA website for more information and for contacts*
- *We are always happy to support your efforts and answer your questions, as best we can*
- *Send your suggestions and/or needs to us*
- *Volunteer to be a Working Group Leader or Assist With a Validation Study*

GER TCOM Chair – David M. Johnston
david.m.johnstonrst@gmail.com

https://www.seedtest.org/en/technical-committees/germination-committee.html

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