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International Rules for Seed Testing 2024

Chapter 7: Seed health testing

Including changes and editorial corrections adopted at the Ordinary General Meeting 2023 in Verona, Italy

Effective from 1 January 2024

Note on the use of the translations

The electronic version of the International Rules for Seed Testing includes the English, French, German and Spanish versions. If there are any questions on interpretation of the ISTA Rules, the English version is the definitive version.

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Contents

Preface to the 2024 edition of the ISTA Rules

Since 2014, the *International Rules for Seed Testing* (ISTA Rules) are primarily available in electronic format. The ISTA Rules can be downloaded as a complete PDF file or as individual chapters from:

www.ingentaconnect.com/content/ista/rules.

If required, users of the ISTA Rules can print their own copies. For further information on the ISTA Rules, see:

www.seedtest.org/rules.

The electronic version includes the English, French, German and Spanish versions of the ISTA Rules. If there are any questions on interpretation of the ISTA Rules, the English version is the definitive version.

Seed health testing methods

Previously, the seed health testing methods were published as a separate Annexe to Chapter 7 of the ISTA Rules. They are now available as separate method sheets from the ISTA website at:

www.seedtest.org/seedhealthmethods.

Details of changes

The 2024 changes are editorial corrections or Rules changes adopted at the Ordinary General Meeting held in Verona, Italy in June 2023. Edits were made in Adobe InDesign by Vanessa Sutcliffe of HeartWood Editorial (www.heartwoodeditorial.co.uk).

The changes in the text content from the previous edition of the ISTA Rules are listed below. They can be displayed with yellow highlight boxes as a 'layer' over the English version within the electronic copy, with comments on what has changed.

For the previous history of amendments to the ISTA Rules, see the Prefaces for 2003 to 2023 on the ISTA website.

Ernest Allen, ISTA Rules Committee Chair

Susan Alvarez, ISTA Rules Committee Vice-Chair

ISTA Secretariat

Changes to the ISTA Rules for 2024

Introduction

I-1: New address for ISTA Secretariat updated.

I-2.2: Standard method provided to determine working weight of purity and other seed determination (OSD) for adding a new taxon [taxa] to Table 2C, including data rounding rules. Statistical methods applied and experimental design recommended in the Calculator developed by Statistics TCOM. Proposal submitted by Bulking & Sampling and Purity TCOMs, and approved by majority vote.

Form 1: Revision of form to improve procedures and guidance for proposing a new taxon to Table 2C. Section 2 updated with newly developed 'Calculator for adding working weights to Table 2C'. Section 3 revised to clarify purpose of providing morphological features for PSD (not for identification). New section 4 added to provide validated working weight for a new taxon or group of taxa. Proposal approved by Purity TCOM through vote.

Chapter 1

1.3: Revision of maximum sublot size allowance for *Solanum lycopersicum* L. Proposal supported by experimental data, a summary report and analysis supplied by Statistics TCOM. Recommendation that a maximum of 20 sublots should be set for homogenous seed lots of tomato, accounting for a low level of other seed content. This would assure buyers and sellers that test results represent what is traded, and provides a practical solution for companies producing tomato seed lots. Proposal approved by Statistics TCOM and unanimous vote of Bulking & Sampling TCOM and ECOM-VSI WG.

1.4.1: Revision to allow weight of original seed lot and weight of sublot to be recorded in same place on ISTA Certificate. Proposal approved by Statistics TCOM and unanimous vote of Bulking & Sampling TCOM and ECOM-VSI WG.

1.4.2: Revision to allow weight of original seed lot and weight of sublot to be recorded in same place on ISTA Certificate. Statement 'l' deleted and subsequent statements relabelled sequentially. Proposal approved by Statistics TCOM and unanimous vote of Bulking & Sampling TCOM and ECOM-VSI WG.

1.5.2.2: Inconsistency with requirements in 3.6.1.3 identified by an ISTA member laboratory. Proposal submitted by Purity TCOM and approved by vote.

1.5.2.3: Consequential change due to update to sections of Chapter 11, reflecting advancements in available seed treatments. Clarifications added on how and what to report when testing coated seeds. Proposal approved by majority vote of Purity TCOM.

1.5.2.7: Consequential change due to improvements made to germination information in Chapter 11, rewording general principles, evaluation and reporting results. Proposal originates from and is supported by Germination TCOM.

1.5.2.12: Clarification on reporting moisture tests for pelleted seeds and for coated seeds (mats and tapes), to align with Chapter 11. Proposal originates from and is supported by Moisture TCOM.

1.5.2.15: Consequential change due to improvements made to germination information in Chapter 13, rewording calculation and expression of results, and reporting results. Proposal originates from and is supported by Germination TCOM, following consultation with Forest Tree and Shrub Seed TCOM.

1.5.2.16: Consequential change due to revision and updating of Chapter 14 to improve clarity. Previous information obsolete due to new generations of X-ray machines and applications of digital technology. Significant changes are focused on equipment and its operation, as well as clarification on reporting. Proposal developed and approved by Advanced Technologies, Forest Tree & Shrub Seed and Purity TCOMs.

1.5.2.21: Section updated to reflect changes on how to report results of GMO testing in 19.7.

1.5.3: Change necessary to achieve consistency with 19.7 in reporting uncertainty of measurement when testing genetically modified organisms. Proposal approved by vote within GMO TCOM.

Chapter 2

2.2.2: Revision of maximum sublot size allowance for *Solanum lycopersicum* L. Proposal supported by experimental data, a summary report and analysis supplied by Statistics TCOM. Recommendation that a maximum of 20 sublots should be set for homogenous seed lots of tomato, accounting for a low level of other seed content. This would assure buyers and sellers that test results represent what is traded, and provides a practical solution for companies producing tomato seed lots. Proposal approved by Statistics TCOM and unanimous vote of Bulking & Sampling TCOM and ECOM-VSI WG.

2.5.2.1: Revision to provide standard method to determine working weight of purity and other seed determination (OSD) for adding new weights to Table 2C, including data rounding rules. Working weight determinations developed based on statistically recognised methods for estimating variables such as lots, variety and testing laboratories, and removing data outliers. Proposal provided by Bulking & Sampling and Purity TCOMs, and approved by majority vote. Statistical methods applied and experimental design recommended in the Calculator were developed by Statistics TCOM.

Table 2C Part 1: Revision following survey of ISF members producing tomato seed lots, concluding that 200 kg is a maximum lot size for international trade in tomato seed. Proposal discussed in depth within Bulking & Sampling TCOM, approved by Statistics TCOM, and approved by close majority vote of Bulking & Sampling TCOM and ECOM-VSI WG.

Chapter 3

3.5.2.4: Clarification regarding identification of indistinguishable species. Procedures only apply when seed is deemed by laboratories as 'indistinguishable', with discretion. Proposal supported by majority vote of Purity TCOM.

3.7: Correction of inconsistency with requirements in 3.6.1.3, as identified by an ISTA member laboratory. Proposal submitted by Purity TCOM and approved by vote.

Table 3B Part 2: Definition of PSD 15 made more inclusive for species where schizocarp could be broken and present in a sample. Schizocarp more than one-half original size is added. Proposal developed and approved by Purity TCOM.

Table 3B Part 2: Revision to correct discrepancy between PSD 33 (Fig. 3.1) and the *ISTA Handbook on Pure Seed Definitions* (Fig. 33.1), including multiple seed units with both fertile and sterile florets. Proposal developed and approved by Purity TCOM.

Chapter 4

4.5.3.2, 4.6, 4.7, 4.8, Table 4B [newly named], Table 4B [newly named]: Clarification on reporting sample weight of determination of other seeds to a fixed decimal place. Misleading use of 'minimum' deleted. Table given caption, subsequent tables renamed and cross references updated. Proposal developed and approved by Purity TCOM.

Chapter 5

5.6.3.1, 5.6.5.3, 5.7: Revision of rules on retesting when fresh seed present. Purpose of proposal is to address issue of considering test results of initial germination test 'unsatisfactory' and instruction to not report these test results and to require a retest when dormancy is suspected. Laboratories should have option to either report % germination and % fresh seeds determined by the initial test, or to not report results of initial test and to conduct additional testing using dormancy-breaking procedures listed in Table 5A. When fuller assessment is requested by customer or desired by laboratory, test results are not reported and a retest would be conducted. ISTA Rules should allow for same testing and reporting option for 'fresh seeds' as for 'hard seeds' (5.6.3.2). At end of test period, if ungerminated seeds are determined to be 'fresh', % fresh seeds is reported. Proposal originates from and is supported by Germination TCOM.

5.10: Editorial change clarifying column to be checked in Table 5A Part 2 for 'double tests'.

Table 5A Part 1: Editorial change to correct alphabetical order of two *Centrosema* species.

Chapter 6

Table 6A Part 2: Addition of method to test *Ulmus* spp. seeds with tetrazolium salts. Proposal approved by Tetrazolium TCOM and supported by method validation study.

Chapter 7

All seed health methods: Sample size description revised for consistency across methods.

Methods 7-001a, 7001b, 7-002a, 7-002b, 7-003, 7-005, 7-007, 7-013a, 7-014, 7-016: Figure images updated and captions revised.

Method 7-013b: Figure and caption added.

Methods 7-019a, 7-019b, 7-020, 7-021, 7-023: Editorial changes to harmonise description of dilutions under Methods.

Methods 7-019a, 7-019b, 7-020, 7-021, 7-023, 7-029: Editorial changes to harmonise description of recording colony-forming units (cfu).

Method 7-019b: Editorial change to delete *X. c.* pv. *amoraciae* from classification of *Xanthomonas*.

Chapter 9

9.2.4.7, 9.2.5.1, 9.2.5.2, 9.2.5.3, 9.2.5.4, 9.2.5.5, 9.2.5.6, 9.2.5.7, 9.2.6.2: Updating of cross reference to Table 9A. Parts 1 and 2 of Table 9A merged due to changes in crop groups, to allow easier inclusions and modifications in future. Some species renamed according to Table 2C and additional information included for species new to taxonomy. Proposal originates from and is supported by Moisture TCOM.

9.2.5.7: Prescribed drying temperatures explicitly given, as in 9.1.2 and 9.1.3. Proposed tolerated range for high temperature method (127–133 °C) aligns with that prescribed by AOSA. Comparison conducted in two laboratories; Statistics TCOM analysed data and supports proposed change. Proposal originates from and is supported by Moisture TCOM.

9.2.6.2, Table 9B: Deletion of word 'initial' before 'moisture content'. Proposal originates from and is supported by Moisture TCOM.

9.2.7: Clarification on reporting moisture tests for pelleted seeds and for coated seeds (mats and tapes), to align with Chapter 11. Proposal originates from and is supported by Moisture TCOM.

Table 9A: Parts 1 and 2 of Table 9A merged due to changes in crop groups (e.g. *Malva* transferred from tree & shrub to flower crop group), to allow easier inclusions and modifications in future. Some species renamed according to Table 2C and additional information included for species new to taxonomy. Proposal originates from and is supported by Moisture TCOM.

Chapter 11

11.1.2 [newly numbered], 11.3.2.2, 11.3.7, 11.10: Update to sections of Chapter 11 to reflect advancements in available seed treatments. Cross references to recent changes in Chapter 10 included. Clarifications added on how and what to report when testing coated seeds. Proposal approved by majority vote of Purity TCOM.

11.4.6: Cross reference to Table 4A updated due to relabelling of tables in Chapter 4.

11.5.3, 11.5.6.5, 11.5.8: Improvements made to germination information in Chapter 11 by rewording general principles, evaluation and reporting results. Proposal originates from and is supported by Germination TCOM.

Chapter 13

13.7: Improvements made to germination information in Chapter 13 by rewording calculation and expression of results, and reporting results. Proposal originates from and is supported by Germination TCOM, following consultation with Forest Tree and Shrub Seed TCOM.

Chapter 14

Revision and updating of chapter to improve clarity. Previous information obsolete due to new generations of X-ray machines and applications of digital technology. Significant changes are focused on equipment and its operation, as well as clarification on reporting. Proposal developed and approved by Advanced Technologies, Forest Tree & Shrub Seed and Purity TCOMs.

Chapter 18

18.8: Addition of section regarding reporting moisture content of seed mixtures. Subsequent sections in chapter renumbered and cross references updated. Proposal originates from and is supported by Moisture TCOM.

Chapter 7: Seed health testing

7.1 Object

The object of a seed health test is to determine the health status of a seed sample, and by inference that of the seed lot.

Health testing of seed is important for four reasons:

a. Seed-borne inoculum may give rise to progressive disease development in the field and reduce the commercial value of the crop.
b. Imported seed lots may introduce diseases into new regions. Tests to meet quarantine requirements may therefore be necessary.
c. Seed health testing may elucidate seedling evaluation and causes of poor germination or field establishment and thus supplement germination testing.
d. Seed health test results can/may indicate the necessity to carry out/perform seed lot treatment(s) in order to eradicate seed-borne pathogens or to reduce the risk of disease transmission.

7.2 Definitions

7.2.1 Seed health

Health of seed refers primarily to the presence or absence of disease-causing organisms, such as fungi, bacteria and viruses, and animal pests, including nematodes and insects, but physiological conditions such as trace element deficiency may be involved.

7.2.2 Pretreatment

Any physical or chemical laboratory treatment of the working sample preceding incubation, given solely to facilitate testing.

7.2.3 Seed treatment

See 2.2.12. For seed health testing, a seed lot may be treated for the purpose of controlling plant pathogens or insect pests, or correcting trace element deficiencies.

7.2.4 ISTA Seed Health Method Validation Programme

Before publication in the *International Rules for Seed Testing*, the ISTA seed health testing methods (new or equivalent) are validated. The principles and factors which should be considered in the validation of methods for the detection of seed-borne pathogens are described in the *ISTA Technical Guidelines for Organising and Analysing Results of Proficiency Tests (PT) and Interlaboratory Tests for Validation of Methods (CT)*.

7.3 General principles

Seed health testing should be performed using methods and equipment which have been tested to ensure they are fit for purpose. Different methods of testing are available, varying in sensitivity and reproducibility and in the amount of training and equipment required. The method used will depend on the pathogen or condition to be investigated, the species of the seed, and the purpose of the test. Selection of the method and evaluation of the results requires knowledge and experience of the methods available. The presence or absence of disease organisms, pests and deleterious physiological conditions specified by the sender is estimated as accurately as the method used permits.

7.4 Procedures

7.4.1 Working sample

The entire submitted sample, or a proportion of it, depending on the test method, may be used as a working sample. The sample should be packaged and submitted in a manner which will not alter its seed health status.

Exceptionally, a submitted sample larger than that prescribed in 2.8 may be required and in such cases the sampler must be instructed accordingly.

When a portion of the submitted sample is required as a working sample, the reduction must be carried out in accordance with 2.5.2, taking appropriate precautions to avoid cross-contamination.

Normally the working sample must not be less than that specified in the method description.

Replicates containing a specified number of seeds, if required, must be taken at random from a subsample after thorough mixing.

7.4.2 Seed treatment

Test results may be influenced by treatment applied to the seed lot. Seed health tests on treated seeds will generally deliver unreliable test results caused by masking or inhibition of the growth of the target organism. Individual Method Sheets will determine whether the testing of treated seeds is acceptable.

7.4.3 Sample storage

The microflora of seed, in the lot or the sample, may change considerably during storage in conditions in which seed viability is satisfactorily maintained. The selection of the appropriate storage conditions must take into account the optimal storage temperature and container in order to maintain sample integrity.

Abundant development of saprophytic moulds including 'storage fungi' in tests can be an indication that the seed is not of good quality due to unfavourable harvesting, processing or storage conditions, or to ageing. Some fungi (such as *Rhizopus* spp.) spread rapidly over tests on blotters and may rot originally healthy seedlings or may interfere with outgrowth of the pathogen from the plated infected seeds. Pretreatment as described in the specific method may be advisable.

7.4.4 Specific directions

Specific seed health testing methods are published online on the ISTA web site at:

www.seedtest.org/seedhealthmethods

Seed health methods are normally based on one host, and one pathogen, but multi-pathogen methods may be included. Before publication, all seed health test methods must be validated through the ISTA Seed Health Method Validation Programme. Methods validated in this way at the time of printing are listed in Table 7A. Additions, updates and deletions to this list can be found on the ISTA web site (www.seedtest.org/seedhealthmethods). The definitive list is held by the ISTA Secretariat. It is the responsibility of the laboratory using the method to consult this list.

7.5 Calculation and expression of results

Results are expressed either qualitatively or quantitatively as specified in the individual prescribed methods.

7.6 Reporting results

The results of a test for seed health must be reported under 'Other determinations' as follows:

- either qualitative or quantitative results, as specified in the individual methods;
- negative and positive results, as specified in the individual methods;
- the scientific name of the pathogen detected;
- the percentage of infected seeds;
- the method used, including any pretreatment (7.2.2);
- the size of the sample or fraction examined;
- any additional permitted procedure used.

The absence of a statement concerning the health condition of the seed does not necessarily imply that the health condition is satisfactory.

Table 7A. ISTA official seed health testing methods

7-001a: Detection of *Alternaria dauci* in *Daucus carota* (carrot) seed by blotter method
Host: *Daucus carota* L.
Pathogen(s): *Alternaria dauci* (J.G.Kühn) J.J.Groves & Skolko, syn. *A. porri* f.sp. *dauci* (J.G.Kühn) Neerg., syn. *A. carotae* (Ellis & Langlois) Stevenson & Wellman
Date approved: 2024
Review due: 2029

7-001b: Detection of *Alternaria dauci* in *Daucus carota* (carrot) seed by malt agar method
Host: *Daucus carota* L.
Pathogen(s): *Alternaria dauci* (J.G.Kühn) J.J.Groves & Skolko, syn. *A. porri* f.sp. *dauci* (J.G.Kühn) Neerg., syn. *A. carotae* (Ellis & Langlois) Stevenson & Wellman
Date approved: 2024
Review due: 2029

7-002a: Detection of *Alternaria radicina* in *Daucus carota* (carrot) seed by blotter method
Host: *Daucus carota* L.
Pathogen(s): *Alternaria radicina* Meier, Drechsler & E.D.Eddy, syn. *Stemphylium radicinum* (Meier, Drechsler & E.D.Eddy) Neergaard
Date approved: 2024
Review due: 2029

7-002b: Detection of *Alternaria radicina* in *Daucus carota* (carrot) seed by malt agar method
Host: *Daucus carota* L.
Pathogen(s): *Alternaria radicina* Meier, Drechsler & E.D.Eddy, syn. *Stemphylium radicinum* (Meier, Drechsler & E.D.Eddy) Neergaard
Date approved: 2024
Review due: 2029

7-003: Detection of *Botrytis cinerea* in *Helianthus annuus* (sunflower) seed
Host: *Helianthus annuus* L.
Pathogen(s): *Botrytis cinerea* Pers. ex Pers. (Perfect state *Botryotinia fuckeliana* (de Bary) Whetzel, syn. *Sclerotinia fuckeliana* (de Bary) Fuckel.)
Date approved: 2024
Review due: 2029

7-004: Detection of *Leptosphaeria maculans* and *Plenodomus biglobosus* in *Brassica* spp. seed
Host: *Brassica* spp.
Pathogen(s): *Leptosphaeria maculans* (Tode ex Fr.) Ces. & de Not (previously *Phoma lingam*) or *Plenodomus biglobosus* (Shoemaker & H. Brun) (previously *Leptosphaeria biglobosa*)
Date approved: 2024
Review due: 2029

7-005: Detection of *Ascochyta pisi* in *Pisum sativum* (pea) seed
Host: *Pisum sativum* L.s.l.
Pathogen(s): *Ascochyta pisi* Lib.
Date approved: 2024
Review due: 2029

7-006: Detection of *Colletotrichum lindemuthianum* in *Phaseolus vulgaris* (bean) seed
Host: *Phaseolus vulgaris* L.
Pathogen(s): *Colletotrichum lindemuthianum* (Sacc. & Magn.) Briosi & Cav.
Date approved: 2024
Review due: 2029

7-007: Detection of *Alternaria linicola*, *Botrytis cinerea* and *Colletotrichum lini* in *Linum usitatissimum* (flax, linseed) seed
Host: *Linum usitatissimum* L.
Pathogen(s): *Alternaria linicola* J.W.Groves & Skolko; *Botrytis cinerea* Pers. ex Pers. (Perfect state *Botryotinia fuckeliana* (de Bary) Whetzel, syn. *Sclerotinia fuckeliana* (de Bary) Fuckel.); *Colletotrichum lini* (Westerd.) Tochinai, syn. *C. linicola* Pethybr. & Laff.
Date approved: 2024
Review due: 2029

7-008: Detection of *Caloscypha fulgens* in *Picea engelmannii* and *P. glauca* (spruce) seed
Host: *Picea engelmannii* Engelm.; *Picea glauca* (Moench) Voss
Pathogen(s): *Caloscypha fulgens* (Pers.) Boud. (Imperfect state *Geniculodendron pyriforme* Salt)
Date approved: 2024
Review due: 2029

Table 7A. ISTA official seed health testing methods (cont.)

7-009: Detection of *Fusarium circinatum* 1n *Pinus* spp. (pine) and *Pseudotsuga menziesii* (Douglas fir) seed
Host: *Pinus* spp.; *Pseudotsuga menziesii* (Mirb.) Franco
Pathogen(s): *Fusarium circinatum* Nirenberg & O'Donnell (syn. *Fusarium subglutinans* f. sp. *pini* Hepting, syn. *Fusarium lateritium* f. sp. *pini* Hepting, syn. *Gibberella circinata*)
Date approved: 2024
Review due: 2029

7-010: Detection of *Bipolaris oryzae* in *Oryza sativa* (rice) seed
Host: *Oryza sativa* L.
Pathogen(s): *Bipolaris oryzae* (Breda de Haan) Shoem., syn. *Drechslera oryzae*, syn. *Helminthosporium oryzae* Breda de Haan (Perfect state *Cochliobolus miyabeanus* (Ito & Kurib.) Drechsler ex Dastur, syn. *Ophiobolus miyabeanus* Ito & Kuribayashi)
Date approved: 2024
Review due: 2029

7-011: Detection of *Pyricularia oryzae* in *Oryza sativa* (rice) seed
Host: *Oryza sativa* L.
Pathogen(s): *Magnaporthe grisea* (Hebert) Barr (Imperfect state *Pyricularia oryzae* Cavara, syn. *P. grisea*)
Date approved: 2024
Review due: 2029

7-012: Detection of *Trichoconiella padwickii* in *Oryza sativa* (rice) seed
Host: *Oryza sativa* L.
Pathogen(s): *Trichoconiella padwickii* Ganguly, syn. *Alternaria padwickii* (Ganguly) Jain
Date approved: 2024
Review due: 2029

7-013a: Detection of *Ustilago nuda* in *Hordeum vulgare* subsp. *vulgare* (barley) seed by embryo extraction
Host: *Hordeum vulgare* L. subsp. *vulgare*
Pathogen(s): *Ustilago nuda* (Jens.) Rostr.
Date approved: 2024
Review due: 2029

7-013b: Detection of *Ustilago nuda* in *Hordeum vulgare* subsp. *vulgare* (barley) seed by dehulling and embryo extraction
Host: *Hordeum vulgare* L. subsp. *vulgare*
Pathogen(s): *Ustilago nuda* (Jens.) Rostr.
Date approved: 2024
Review due: 2029

7-014: Detection of *Parastagonospora nodorum* in *Triticum aestivum* subsp. *aestivum* (wheat) seed
Host: *Triticum aestivum* L. subsp. *aestivum*
Pathogen(s): *Parastagonospora nodorum* (Berk.) Quaedvl., Verkley & Crous 2013, syn. *Stagonospora nodorum*, syn. *Septoria nodorum* Berk. (Perfect state *Leptosphaeria nodorum* Mailer)
Date approved: 2024
Review due: 2029

7-015: Detection of *Epichloë coenophiala* in *Festuca* spp. (fescue) and of *Neotyphodium lolii* in *Lolium* spp. (ryegrass) seed
Host: *Festuca* spp., *Lolium* spp.
Pathogen(s): *Epichloë coenophiala* (Morgan-Jones & W. Gams) C.W. Bacon & Schardl; *Neotyphodium lolii* (Latch, M.J.Chr. & Samuels) Glenn, C.W.Bacon & Hanlin
Date approved: 2024
Review due: 2029

7-016: Detection of *Phomopsis* complex in *Glycine max* (soybean, soya bean) seed
Host: *Glycine max* (L.) Merr.
Pathogen(s): *Phomopsis longicolla* Hobbs, *Diaporthe phaseolorum* var. *sojae* (Lehm.) Wehm. (Imperfect state *P. phaseoli* (Desm.) Sacc., syn. *P. sojae* Lehmann); *Diaporthe phaseolorum* (Cke. & Ell.) Sacc. f. sp. *caulivora* (DPC), syn. *D. phaseolorum* var. *caulivora* Athow & Caldwell
Date approved: 2024
Review due: 2029

7-017: (Replaced by 7-007)

7-018: (Replaced by 7-007)

7-019a: Detection of *Xanthomonas campestris* pv. *campestris* and *Xanthomonas campestris* pv. *raphani* in *Brassica* spp. seed
Host: *Brassica* spp.
Pathogen(s): *Xanthomonas campestris* pv. *campestris* (Pammel) Dowson and *Xanthomonas campestris* pv. *raphani*
Date approved: 2024
Review due: 2029

7-019b: Detection of *Xanthomonas campestris* pv. *campestris* in disinfested/disinfected *Brassica* spp. seed
Host: *Brassica* spp.
Pathogen(s): *Xanthomonas campestris* pv. *campestris* (Pammel) Dowson
Date approved: 2024
Review due: 2029

Table 7A. ISTA official seed health testing methods (cont.)

7-020: Detection of *Xanthomonas hortorum* pv. *carotae* in *Daucus carota* (carrot) seed
Host: *Daucus carota* L.
Pathogen(s): *Xanthomonas hortorum* pv. *carotae* (Kendrick) Vauterin, Hoste, Kersters & Swings, syn. *X. campestris* pv. *carotae* (Kend) Dye
Date approved: 2024
Review due: 2029

7-021: Detection of *Xanthomonas axonopodis* pv. *phaseoli* and *X. axonopodis* pv. *phaseoli* var. *fuscans* in *Phaseolus vulgaris* (bean) seed
Host: *Phaseolus vulgaris* L.
Pathogen(s): *Xanthomonas axonopodis* pv. *phaseoli* (Smith) Vauterin, Hoste, Kersters & Swings, syn. *X. campestris* pv. *phaseoli* (Smith) Dye; *Xanthomonas axonopodis* pv. *phaseoli* var. *fuscans* Vauterin, Hoste, Kersters & Swings, syn. *X. campestris* pv. *phaseoli* var. *fuscans* (Burkholder) Starr & Burkholder
Date approved: 2024
Review due: 2029

7-022: Detection of *Microdochium nivale* and *M. majus* in *Triticum* spp. (wheat) seed
Host: *Triticum* spp.
Pathogen(s): *Microdochium nivale* Samuels & Hallett, syn. *Fusarium nivale* (Fr.) Rabenh. (Perfect state *Monographella nivalis* (Schaff.) Müller); *M. majus* (Wollenw.) Glynn & S.G.Edwards, syn. *M. nivale* var. *majus* (Wollenw.) Samuels & I.C.Hallett
Date approved: 2024
Review due: 2029

7-023: Detection of *Pseudomonas savastanoi* pv. *phaseolicola* in *Phaseolus vulgaris* (bean) seed
Host: *Phaseolus vulgaris* L.
Pathogen(s): *Pseudomonas savastanoi* pv. *phaseolicola* (Burkh.) Gardan, Bollet, Abu, Ghorrah, Grimont & Grimont, syn. *P. syringae* pv. *phaseolicola* (Burkh.) Young, Dye & Wilkie
Date approved: 2024
Review due: 2029

7-024: Detection of *pea early browning virus* and *pea seed-borne mosaic virus* in *Pisum sativum* (pea) seed
Host: *Pisum sativum* L.s.l.
Pathogen(s): *Pea early browning virus* (PEBV) and *pea seed-borne mosaic virus* (PSbMV)
Date approved: 2024
Review due: 2029

7-025: Detection of *Aphelenchoides besseyi* in *Oryza sativa* (rice) seed
Host: *Oryza sativa* L.
Pathogen(s): *Aphelenchoides besseyi* Christie
Date approved: 2024
Review due: 2029

7-026: Detection of *squash mosaic virus*, *cucumber green mottle mosaic virus* and *melon necrotic spot virus* in cucurbit seed
Host: Cucurbits
Pathogen(s): *Squash mosaic virus* (SqMV); *cucumber green mottle mosaic virus* (CGMMV); *melon necrotic spot virus* (MNSV)
Date approved: 2024
Review due: 2029

7-027: Detection of *Pyrenophora teres* and *P. graminea* in *Hordeum vulgare* subsp. *vulgare* (barley) seed
Host: *Hordeum vulgare* L. subsp. *vulgare*
Pathogen(s): *Pyrenophora teres* Drechsler (Imperfect state *Drechslera teres* (Sacc.) Shoem.); *Pyrenophora graminea* Ito & Kurib. (Imperfect state *D. graminea* (Rabenh. Ex Schlecht.) Shoem.)
Date approved: 2024
Review due: 2029

7-028: Detection of infectious *tobacco mosaic virus* and *tomato mosaic virus* in *Solanum lycopersicum* (tomato) seed by the local lesion assay (indexing) in *Nicotiana tabacum* plants
Host: *Solanum lycopersicum* L.
Pathogen(s): *Tobacco mosaic virus* (TMV); *tomato mosaic virus* (ToMV)
Date approved: 2024
Review due: 2029

7-029: Detection of *Pseudomonas syringae* pv. *pisi* in *Pisum sativum* (pea) seed
Host: *Pisum sativum* L.s.l.
Pathogen(s): *Pseudomonas syringae* pv. *pisi* (Sack.) Young, Dye & Wilkie
Date approved: 2024
Review due: 2029

7-030: Detection of *Acidovorax valerianellae* in *Valerianella locusta* (corn salad) seed
Host: *Valerianella locusta* (L.) Laterr.
Pathogen(s): *Acidovorax valerianellae* sp. nov.
Date approved: 2024
Review due: 2029

Table 7A. ISTA official seed health testing methods (cont.)

7-031: Filtration method for detection of *Ditylenchus dipsaci* in *Medicago sativa*; *D. dipsaci* and *D. gigas* in *Vicia faba*
Host: *Medicago sativa* L. and *Vicia faba* L.
Pathogen(s): *Ditylenchus dipsaci* Kuhn, 1857; *Ditylenchus gigas* n. sp.
Date approved: 2024
Review due: 2029

7-032: Detection of *Verticillium dahliae* in *Spinacia oleracea* (spinach) seed
Host: *Spinacia oleracea* L.
Pathogen(s): *Verticillium dahliae* Kleb.
Date approved: 2024
Review due: 2029