



International Rules for Seed Testing 2022

Chapter 7: Seed health testing

**Including changes and editorial corrections adopted
at the online Ordinary General Meeting 2021**

Effective from 1 January 2022

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.

Published by
The International Seed Testing Association (ISTA)
Zürichstr. 50, CH-8303 Bassersdorf, Switzerland

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Online ISSN 2310-3655

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Preface to the 2022 edition of the ISTA Rules

Since 2014, the *International Rules for Seed Testing* (ISTA Rules) are primarily available in electronic format only. 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 web site at:

www.seedtest.org/seedhealthmethods.

Details of changes

The 2022 changes are editorial corrections or Rules changes adopted at the online Ordinary General Meeting held in June 2021. 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 2021 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 2022

Chapter 1

- 1.5.2.2:** Removal of obsolete website information, as proposed by Purity TCOM.
- 1.5.2.4:** Addition of the *ISTA List of Stabilised Plant Names* as the primary source for reporting other seeds. Proposal developed by the Purity TCOM and approved by majority vote.

Chapter 2

- 2.2.12:** Proposal submitted by the Bulking and Sampling TCOM for clarification that additives used to treat or coat seed may contain more than one of the listed ingredients.
- 2.2.13:** Proposal submitted by the Bulking and Sampling TCOM for clarification that additives used to treat or coat seed may contain more than one of the listed ingredients.
- 2.5.2.1:** Correction of reference to 2.2.12 which defines treated seeds.
- 2.5.2.2.1:** Proposal submitted by the Bulking and Sampling TCOM. Changes requested to enable a more accurate description of the various types of dividers that may be used for sample reduction.
- 2.5.3:** Proposal submitted by the Bulking and Sampling TCOM following consultation with the Purity TCOM. Change requested to insert cross-reference to Chapters 3 and 4 for clarification on how the different fractions of working samples should be stored after testing.
- Table 2C Part 1:** Addition of *Chenopodium quinoa* proposed by the Germination TCOM, following an ISTA method validation study and with input from the Bulking and Sampling TCOM and the Purity TCOM.
- Table 2C Part 1:** Proposal submitted by the Bulking and Sampling TCOM following consultation with the Purity TCOM. ISTA accredited laboratories have requested that *Salvia hispanica* is moved to Table 2C Part 1, as it should be regarded as an agricultural crop. Consequently, the maximum seed lot size is adjusted to the maximum for small seeded agricultural species, i.e. 10 000 kg. From data supplied by the Purity TCOM in 2019, the average TSW is 0.13 g, therefore the minimum submitted sample size and other seed by number working sample are increased to 35 g so that

the sample would contain at least 25 000 seeds, and is consistent with other species in Table 2C Part 1 where the OSD is 10× the PUR.

Table 2C Part 1: Editorial change to correct wrongly labelled table section.

Table 2C Part 3: Proposal submitted by the Bulking and Sampling TCOM following consultation with the Purity TCOM. ISTA accredited laboratories have requested that *Salvia hispanica* is moved to Table 2C Part 1, as it should be regarded as an agricultural crop.

Chapter 3

- 3.2.1:** Rewording by Purity TCOM following an ISTA member's inquiry about use of the term 'ergot'. Proposal agreed by Seed Health TCOM and approved by majority vote.
- 3.5.2:** Improvement to text submitted by the Accreditation Working Group, related to proposal C.2.3 (Storage of the samples). Changes clarify the intent of 3.5.2 and harmonise it with wording in 4.5.2.
- 3.7:** Removal of obsolete website information, as proposed by Purity TCOM.
- Table 3B Part 1:** Editorial corrections of nomenclature changes approved in the 2019 *ISTA List of Stabilised Plant Names*. Removal from table of *Anagallis*, *Dorotheanthus*, *Osteospermum*, *Piptatherum* and *Stachys*.
- Table 3B Part 1:** Proposal developed by the Purity TCOM and the Rules TCOM. Editorial corrections of nomenclature changes approved in the 2019 *ISTA List of Stabilised Plant Names*.
- Table 3B Part 1:** Addition of *Chenopodium* proposed by the Germination TCOM, following an ISTA method validation study and with input from the Bulking and Sampling TCOM and the Purity TCOM.
- Table 3B Part 1:** Result of changes to the *ISTA List of Stabilised Plant Names* used in Table 2C for *Megathyrus maximus* and *Thinopyrum elongatum*.
- Table 3B Part 2:** Proposal developed by the Purity TCOM to assign a PSD to *Ornithopus sativus*, a species with comparable morphology to *O. compressus*.
- Table 3B Part 2:** Result of changes to the *ISTA List of Stabilised Plant Names* used in Table 2C for *Megathyrus maximus*.

Chapter 4

4.7: Addition of the *ISTA List of Stabilised Plant Names* as the primary source for reporting other seeds. Proposal developed by the Purity TCOM and approved by majority vote.

Chapter 5

5.2.8.1: Proposal supported by the Germination TCOM to add the seedling abnormality criterion 32/07 to *Allium* spp. regarding primary infection.

5.4.2, 5.4.3.4, 5.6.2.1, 5.6.2.2, 5.10: Consequential changes resulting from the addition of agar (A) as a primary media for *Pinus sylvestris* in Table 5A Part 2. Proposal supported by the Germination TCOM and the Forest Tree and Shrub Seed TCOM following a method validation study.

5.6.1: Request to change colon (:) symbol to a forward slash (/) to denote division in proportional calculations. Change supported by the Germination TCOM.

5.6.2.1.1: Proposal supported by the Germination TCOM to remove the word ‘upright’ regarding the top of paper (TP) method.

5.10: A method validation study has been conducted to determine the suitability of using crepe cellulose paper (CCP) as a primary media for the top of paper (TP) method. The purpose of this study was to harmonise the ISTA Rules with the *AOSA Rules for Testing Seeds*. Proposal supported by the Germination TCOM.

Table 5A Part 1: Addition of *Chenopodium quinoa* proposed by the Germination TCOM, following an ISTA method validation study and with input from the Bulking and Sampling TCOM and the Purity TCOM.

Table 5A Part 1: A method validation study has been conducted to determine the suitability of using crepe cellulose paper (CCP) as a primary media for the top of paper (TP) method for *Glycine max*. The purpose of this study was to harmonise the ISTA Rules with the *AOSA Rules for Testing Seeds*. Proposal supported by the Germination TCOM.

Table 5A Part 1: Proposal developed by the Purity TCOM and the Rules TCOM. Editorial corrections of nomenclature changes approved in the 2019 *ISTA List of Stabilised Plant Names*.

Table 5A Part 1: Proposal submitted by the Bulking and Sampling TCOM following consultation with the Purity TCOM. ISTA accredited laboratories have re-

quested that *Salvia hispanica* is moved to Table 5A Part 1, as it should be regarded as an agricultural crop.

Table 5A Part 1: Statement for use of CCP for TP method moved from ‘Additional advice’ column to ‘Additional directions’ for *Zea mays*. Proposal supported by the Germination TCOM and a method validation study.

Table 5A Part 2: A method validation study was conducted to determine the suitability of using agar as a primary media for *Pinus sylvestris*. Results showed good repeatability and reproducibility for temperatures of 20 °C and 20<=>30 °C in combination with top of paper (TP) and agar (A). Proposal supported by the Germination TCOM and the Forest Tree and Shrub Seed TCOM.

Table 5A Part 3: A new method validation study on *Eustoma exaltatum* carried out in 2019 has re-evaluated the germination temperature of 20 °C, given its importance to laboratories testing seed for cut flowers in Japan and the inclusion of this temperature in the *AOSA Rules for Testing Seeds*. The study showed that 20 °C produces results comparable to those resulting from the standard method using 20<=>30 °C. Proposal supported by the Flower Seed Testing TCOM and the Germination TCOM.

Table 5A Part 3: Proposal submitted by the Bulking and Sampling TCOM following consultation with the Purity TCOM. ISTA accredited laboratories have requested that *Salvia hispanica* is moved to Table 5A Part 1, as it should be regarded as an agricultural crop.

Chapter 7

Methods 7-005, 7-006, 7-014, 7-016 and 7-022: Changes to achieve harmony between pretreatment descriptions for several similar methods, supported by validation studies carried out by the Seed Health TCOM.

Methods 7-013a and 7-013b: Proposal approved and supported by the Seed Health TCOM to allow the optional use of methyl blue stain to aid visualisation of fungal hyphae. This option is based on a method validation study carried out by SASA for the Seed Health TCOM, coupled to a PT.

Method 7-019a: Correction of the temperature for DNA extraction indicated in the validation report.

Chapter 8

8.8.1: Editorial change to divide section into two sub-sections.

Chapter 9

9.2.7, 9.3.2.7: Cross-reference to 1.5.2.22 gives clear advice on how to report moisture results for species listed in Table 2C but not listed in Table 9A. Proposal developed and approved by a majority vote of the Moisture TCOM.

Chapter 18

18.8.1: Clarification on how to report purity content of seed mixtures. This proposal was approved for the 2020 edition of the ISTA Rules. The change, however, was placed in the wrong place within 18.8.1. This editorial change corrects the error.

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

<p>7-001a: Detection of <i>Alternaria dauci</i> in <i>Daucus carota</i> (carrot) seed by blotter method Host: <i>Daucus carota</i> L. Pathogen(s): <i>Alternaria dauci</i> (J.G.Kühn) J.J.Groves & Skolko, syn. <i>A. porri</i> f.sp. <i>dauci</i> (J.G.Kühn) Neerg., syn. <i>A. carotae</i> (Ellis & Langlois) Stevenson & Wellman Date approved: 2012 Review due: 2017</p>	<p>7-004: Detection of <i>Leptosphaeria maculans</i> and <i>Plenodomus biglobosus</i> in <i>Brassica</i> spp. seed Host: <i>Brassica</i> spp. Pathogen(s): <i>Leptosphaeria maculans</i> (Tode ex Fr.) Ces. & de Not (previously <i>Phoma lingam</i>) or <i>Plenodomus biglobosus</i> (Shoemaker & H. Brun) (previously <i>Leptosphaeria biglobosa</i>) Date approved: 2017 Review due: 2022</p>
<p>7-001b: Detection of <i>Alternaria dauci</i> in <i>Daucus carota</i> (carrot) seed by malt agar method Host: <i>Daucus carota</i> L. Pathogen(s): <i>Alternaria dauci</i> (J.G.Kühn) J.J.Groves & Skolko, syn. <i>A. porri</i> f.sp. <i>dauci</i> (J.G.Kühn) Neerg., syn. <i>A. carotae</i> (Ellis & Langlois) Stevenson & Wellman Date approved: 2012 Review due: 2017</p>	<p>7-005: Detection of <i>Ascochyta pisi</i> in <i>Pisum sativum</i> (pea) seed Host: <i>Pisum sativum</i> L.s.l. Pathogen(s): <i>Ascochyta pisi</i> Lib. Date approved: 2022 Review due: 2027</p>
<p>7-002a: Detection of <i>Alternaria radicina</i> in <i>Daucus carota</i> (carrot) seed by blotter method Host: <i>Daucus carota</i> L. Pathogen(s): <i>Alternaria radicina</i> Meier, Drechsler & E.D.Eddy, syn. <i>Stemphylium radicinum</i> (Meier, Drechsler & E.D.Eddy) Neergaard Date approved: 2012 Review due: 2017</p>	<p>7-006: Detection of <i>Colletotrichum lindemuthianum</i> in <i>Phaseolus vulgaris</i> (bean) seed Host: <i>Phaseolus vulgaris</i> L. Pathogen(s): <i>Colletotrichum lindemuthianum</i> (Sacc. & Magn.) Briosi & Cav. Date approved: 2022 Review due: 2027</p>
<p>7-002b: Detection of <i>Alternaria radicina</i> in <i>Daucus carota</i> (carrot) seed by malt agar method Host: <i>Daucus carota</i> L. Pathogen(s): <i>Alternaria radicina</i> Meier, Drechsler & E.D.Eddy, syn. <i>Stemphylium radicinum</i> (Meier, Drechsler & E.D.Eddy) Neergaard Date approved: 2012 Review due: 2017</p>	<p>7-007: Detection of <i>Alternaria linicola</i>, <i>Botrytis cinerea</i> and <i>Colletotrichum lini</i> in <i>Linum usitatissimum</i> (flax, linseed) seed Host: <i>Linum usitatissimum</i> L. Pathogen(s): <i>Alternaria linicola</i> J.W.Groves & Skolko; <i>Botrytis cinerea</i> Pers. ex Pers. (Perfect state <i>Botryotinia fuckeliana</i> (de Bary) Whetzel, syn. <i>Sclerotinia fuckeliana</i> (de Bary) Fuckel.); <i>Colletotrichum lini</i> (Westerd.) Tochinai, syn. <i>C. linicola</i> Pethybr. & Laff. Date approved: 2012 Review due: 2017</p>
<p>7-003: Detection of <i>Botrytis cinerea</i> in <i>Helianthus annuus</i> (sunflower) seed Host: <i>Helianthus annuus</i> L. Pathogen(s): <i>Botrytis cinerea</i> Pers. ex Pers. (Perfect state <i>Botryotinia fuckeliana</i> (de Bary) Whetzel, syn. <i>Sclerotinia fuckeliana</i> (de Bary) Fuckel.) Date approved: 2011 Review due: 2016</p>	<p>7-008: Detection of <i>Caloscypha fulgens</i> in <i>Picea engelmannii</i> and <i>P. glauca</i> (spruce) seed Host: <i>Picea engelmannii</i> Engelm.; <i>Picea glauca</i> (Moench) Voss Pathogen(s): <i>Caloscypha fulgens</i> (Pers.) Boud. (Imperfect state <i>Geniculodendron pyriforme</i> Salt) Date approved: 2011 Review due: 2016</p>

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

7-009: Detection of *Fusarium circinatum* in *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: 2018
Review due: 2023

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: 2018
Review due: 2023

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: 2011
Review due: 2016

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: 2018
Review due: 2023

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: 2022
Review due: 2027

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: 2022
Review due: 2027

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: 2022
Review due: 2027

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: 2017
Review due: 2022

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: 2022
Review due: 2027

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: 2022
Review due: 2027

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: 2018
Review due: 2023

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: 2010

Review due: 2015

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: 2011

Review due: 2016

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: 2022

Review due: 2027

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: 2012

Review due: 2017

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: 2012

Review due: 2017

7-025: Detection of *Aphelenchoides besseyi* in *Oryza sativa* (rice) seed

Host: *Oryza sativa* L.

Pathogen(s): *Aphelenchoides besseyi* Christie

Date approved: 2019

Review due: 2024

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: 2014

Review due: 2019

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: 2011

Review due: 2016

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: 2012

Review due: 2017

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: 2012

Review due: 2017

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: 2014

Review due: 2019

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: 2017

Review due: 2022

7-032: Detection of *Verticillium dahliae* in *Spinacia oleracea* (spinach) seed

Host: *Spinacia oleracea* L.

Pathogen(s): *Verticillium dahliae* Kleb.

Date approved: 2017

Review due: 2022