



How to present a Laboratory's scope of accreditation and report on ISTA Certificates

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How to present a Laboratory's scope of accreditation and report on ISTA Certificates

Introduction

The purpose of this document is to provide guidance as to how a laboratory can generate its own scope of accreditation and what the resulting scope will mean for the issuance of ISTA Certificates. The ISTA International Rules for Seed Testing are hereafter referred to as 'the Rules'.

The way of presenting a laboratory's scope of accreditation should be clear and uniquely stated and not lead to mistakes and thereby non-conformities during an audit. The number of combinations of tests and species is nearly un-limited and it is the aim of this document to ensure a unique form of presenting the scope of accreditation.

The ISTA Accreditation Standard requires a list of species or groups of species and analyses for which the laboratory claims competence. By granting accreditation to a laboratory on the basis of that list, ISTA approves the list as an unambiguous reference to what the laboratory is competent to do, which infers that the accreditation assessment covered all the elements of that scope to an appropriate extent.

A test/species matrix has become an established format in many laboratories to present the scope. While it is easy to handle for very limited scopes, with a few species and a testing range including sampling, purity and germination, it becomes increasingly complicated and ambiguous with larger scopes. The documentation effort with a high number of species names, nomenclature updates, risk for typos seems incommensurate looking at the benefits of such a list.

The traditionally popular way of characterising a method by the number of a Rules chapter is ambiguous as some chapters contain a range of distinctive methods. An even more pronounced limitation of the concept becomes obvious where Rules chapters contain sections of other chapters, such as moisture determination as part of vigour testing or a tetrazolium test at the end of a germination analysis.

In order to provide for explicitly defined scopes of accreditation the presentation of accreditation centred on testing principles and species or species groups is described in this document.

A laboratory's scope of accreditation will be administered through the Accreditation Department data base. Prior to an on-site audit visit, each laboratory will receive a generic form, which contains all possible methods. The laboratory will have to select the methods to be covered by accreditation and return the form. This is the basis for the on-site assessment in order to ensure that the audit team and the laboratory have a common understanding of what will be subject to assessment. The information provided by the laboratory will be fed into the data base and each laboratory's scope of accreditation will be automatically generated and sent to the laboratory as an appendix to the Accreditation Certificate.

Related Documents

- ISTA Seed Testing Laboratory Accreditation Standard
- ISTA International Rules for Seed Testing
- ISTA Proficiency Test Programme

Definitions

Scope of accreditation: Defines the activities for which a laboratory has demonstrated competence in performing. Activities are described and documented in a system to ensure confidence in the laboratory's ability to meet established criteria. The scope of accreditation is a summary of the laboratory's work with enough details to distinguish between the different elements and applications. It is based on individual methods and species or groups of species, as applicable.

Accredited test: Test covered by a laboratory's scope of accreditation.

Testing principle: Key features that can be used to characterise a test and that are the basis for achieving the test objective.

Field of application: The total number of species to which an accredited test may be applied.

Crop group: Classification of species into groups with similar features as defined in the ISTA Proficiency Test Programme.

The ISTA Accreditation Standard

The ISTA Accreditation Standard (version 5.0) reads as follows with regards to the scope of accreditation:

1. Purpose and scope [...]

1.2: *The current version of the ISTA Rules for Seed Testing forms an integral part of the standard, as the Rules define the methods, which must be used for the issuance of ISTA Certificates by accredited laboratories. Accreditation can only be granted for methods stated in the ISTA Rules including performance approved methods as defined therein. [...]*

3. Management requirements

An accredited ISTA laboratory must [...]

3.10. *provide a list of species or groups of species and analyses for which the laboratory claims competence, i.e. the scope of accreditation. [...]*

Rules

The Rules read as follows in regard to scope of accreditation and issuance of ISTA Certificates:

1.3 General conditions for issuance

[...] An ISTA International Seed Analysis Certificate may be issued only by the seed testing laboratory which either carried out all the tests to be reported or subcontracted sampling and/or some of the tests to be reported (see 2.1.4.2 and 1.4.3), and under the conditions listed below:

(1) the issuing laboratory must be currently authorized to do so by the Executive Committee.

(2) the seed tested must be of a species in Table 2A, (Lot and sample weights), of the ISTA Rules. Where in other tables, such as Table 5A and Table 6A, methods are prescribed as being for a group of species, only those species specifically listed in Table 2A shall be considered to be covered [...]

(3) the tests must be carried out in accordance with the ISTA Rules. However, additionally and on request, results of tests not covered by these Rules may be reported on an ISTA Certificate (see 1.5.3.9) [...]

General Conditions

Accreditation is defined as a procedure by which an authoritative body gives formal recognition that a body or person is competent to carry out specific tasks (ISO Guide 2, 1996). These specific tasks are summarized under a laboratory's scope of accreditation. The scope of accreditation comprises test methods for which a laboratory seeks recognition, (eg. accreditation).

In 2001 at the ISTA Congress in Angers it was decided that a laboratory can only be accredited for species and methods covered by the Rules. Accreditation cannot be granted for in-house methods or methods described in ISTA handbooks or other references only, e.g. cold test on maize. Since 2006, the Rules have had provisions for performance approved methods. In a specified field, laboratories may be eligible to attain accreditation for tests that are not standardised in the Rules.

Single elements of a laboratory's scope of accreditation are presented in the order of the ISTA Rules chapters. Some chapters cover several distinct ways of testing seed. This is why the testing principle has been chosen as an additional feature for differentiating between tests.

A range of tests requires the use of procedures described in other Chapters, for instance, tetrazolium tests are performed on a representative working sample obtained in accordance with Chapter 2 and on the pure seed fraction retrieved according to Chapter 3.

Where accredited tests involve activities that are also subject to potential accreditation (e.g. moisture determination in an Accelerated Ageing Test or retrieving the pure seed fraction for all determinations made on pure seed), an accredited laboratory must demonstrate its competence and hold accreditation for each of the procedures concerned. An exception to this is a tetrazolium test or embryo excision performed on the fresh seeds which remain after a germination test.

A laboratory may only issue ISTA Certificates on species and methods if it holds a valid accreditation for it. It is not permissible to report test results for ISTA Rules methods on ISTA Certificates for which a laboratory has not been granted accreditation. Where a laboratory does not have accreditation for a particular test, it may report results of tests performed by subcontractors if the subcontractor holds a valid accreditation for the test in question.

A laboratory may, however, report results of test methods not covered by the Rules provided it is for species listed in Table 2A and reporting is done in conjunction with at least one accredited test (1.5.3.9).

Documentation of a Laboratory's Scope of Accreditation

Standardised ISTA Rules methods

As the scope of ISTA accreditation comprises many species and methods, laboratories are required to document their scope of accreditation in sufficient detail or make reference to the Annex to the Accreditation Certificate in their quality documentation. The scope of accreditation shall be documented in an unmistakable manner to allow staff members, auditors and clients to clearly identify the species and corresponding methods the laboratory seeks accreditation for and the tests it may issue ISTA Certificates for. This is also very important for proficiency test participation as mandatory participation rests upon the approved scope of accreditation.

Some accredited tests are limited to a choice of species from Table 2A (e.g. vigour), others may be applied to all species (e.g. sampling). Additional information may be requested to specify the scope in sufficient detail, such as germination tests also being applied to coated seeds.

The column "Field of application" in Appendix 1 indicates the totality of species to which a test may be applied whereas the column "Accredited test defined to the level of:" explains to which degree of detail the species to be covered shall be documented, e.g. species, groups of species, ISTA Rules tables. It has to be noted that a mere reference to a Rules chapter and a range of species does not explicitly define the scope.

Laboratories may also make reference to the scope of accreditation as it is appended to the Accreditation Certificate. An example is illustrated in Appendix 2.

The laboratory may combine the scope of accreditation table with those method/species combinations that are not covered by the Rules to form the laboratory's scope of testing, provided that a clear indication on what belongs to the scope of ISTA accreditation is given.

Methods approved under the Performance Based Approach

Methods that are not published in the Rules can be the basis for accredited tests as long as they are approved by the laboratory and have a test object compatible with Rules Chapter 8, i.e. testing for the presence of specified traits.

Due to the breadth of the approach, each accredited test needs to be defined according to Appendix 3 stating the species, method and the trait. In addition it may have to be stated whether it is a detection (qualitative) or quantitative determination and the kind of performance evaluation the laboratory used for approving the method. The information provided must be adequate for identifying the individual method/species/trait combination and distinguish it from others.

Scope of Accreditation and Proficiency Test Participation

The scope of accreditation also defines to what extent laboratories must participate in the ISTA Proficiency Test (PT) Programme. Where accredited tests are defined by groups of species (cf. last column of Appendix 1), this grouping also applies to PT participation. If for instance, a laboratory's accreditation includes germination testing of a particular cereal species, then it is mandatory to participate in any proficiency test round which includes the crop group 'cereals'. When individual species need to be stated to define an accredited test, a laboratory must participate in a proficiency test only if a species used in a test round is also included in its scope of accreditation for that test objective. This applies, for example to laboratories which are accredited for vigour testing on *Pisum sativum* using the conductivity method.

The relevant groups or lists of species are appended to this document (Appendix 4, and 5).

Addition to the Scope of Accreditation

A laboratory may apply for an addition to its scope of accreditation on the occasion of its regular on-site assessment. The laboratory shall give prior notice to the Secretariat's Accreditation Department if it intends to enlarge the scope of accreditation as this may affect the nomination of a suitable auditor.

It may also be possible, upon request to enlarge the scope of accreditation prior to the next scheduled on-site assessment. This request shall be communicated in writing to the Secretariat Accreditation Department. The application form is available on the ISTA website. The requests will be reviewed on a case-by-case basis, and depending on the content of the request it will be assessed by either the system auditors employed at the Secretariat or by appointed technical auditors. The laboratory will be asked to provide relevant documentation

including records of e.g. in-house or inter-lab ring testing, to show that it is competent in any methods and procedures applied.

If the scope of accreditation is to be expanded to incorporate additional test methods, a new Certificate of Accreditation will be issued. The laboratory will be requested to return the superseded Certificate of Accreditation.

Laboratories will be charged according to the costs incurred, determined on an hourly rate.

Publication on the ISTA Web Site

As information about a laboratory's scope of accreditation is of interest to a broad spectrum of the public including ISTA members, Technical Committees and laboratory customers, the scope will be published and made available on the ISTA website.

Appendix 1: Possible elements of a seed testing laboratory's scope of accreditation (ISTA Rules methods)

Test: Object	Testing principle	Reference (Chapter)	Field of application	Accredited test defined to the level of
Sampling: Obtain a representative sample				
	Sampling from the lot: manual	2, 11	All species of Table 2A	Crop groups, coated seeds: yes/no
	Sampling from the lot: automatic	2, 11	All species of Table 2A	Crop groups, coated seeds: yes/no
Purity and determination of other seeds: Determine percentage composition and identity of species, determine the number of seeds of other species				
	Separation, weighing of fractions and identifying other seeds; other seed determination	2, 3, 4, 11, 1	All species of Table 2A	Crop groups, coated seeds: yes/no
	Separation by using a General Seed Blower, weighing of fractions and identifying other seeds; other seed determination	2, 3, 4, 11, 1	<i>Poa pratensis</i> , <i>Poa trivialis</i> , <i>Dactylis glomerata</i>	Species for which blowing is mandatory
Germination: Determine max. germination potential				
	Germination on 400 seeds	2, 3, 5, 6, 11, 1	All species of Table 5A	Crop groups applicable for Table 5A, coated seeds: yes/no
	Germination by weighed replicates	2, 3, 5, 6, 13, 1	All species of Table 13A and 13 B	All species of Table 13A All species in Table 13B
Viability: Estimate viability in general and of dormant seeds				
	TTC (Biochemical viability test)	2, 3, 6, 1	All species of Table 6A	Crop groups applicable for Table 6A, coated seeds: yes/no
	Embryo excision	2, 3, 12, 1	All species of Chapter 12	Species listed in Chapter 12
Seed Health: Determine health status				
	Blotter, malt agar	2, 7, 7-001a,b, 1	<i>Alternaria dauci</i> on <i>Daucus carota</i>	Given by the field of application
	Blotter, malt agar	2, 7, 7-002a,b, 1	<i>Alternaria radicina</i> on <i>Daucus carota</i>	Given by the field of application
	Blotter	2, 7, 7-003, 1	<i>Botrytis cinerea</i> on <i>Helianthus annuus</i>	Given by the field of application
	Blotter	2, 3, 7, 7-004, 1	<i>Leptosphaeria maculans</i> on <i>Brassicaceae</i>	Given by the field of application
	Malt agar or potato dextrose agar (PDA)	2, 7, 7-005, 1	<i>Ascochyta pisi</i> on <i>Pisum sativum</i>	Given by the field of application
	Paper towelling	2, 7, 7-006, 1	<i>Colletotrichum lindemuthianum</i> on <i>Phaseolus vulgaris</i>	Given by the field of application
	Malt agar	2, 7, 7-007, 1	<i>Botrytis cinerea</i> on <i>Linum usitatissimum</i>	Given by the field of application
	Water agar	2, 7, 7-008, 1	<i>Caloscypha fulgens</i> on <i>Picea engelmannii</i> and <i>Picea glauca</i>	Given by the field of application
	Blotter	2, 7, 7-009, 1	<i>Fusarium moniliforme</i> var. <i>subglutinans</i> on <i>Pinus taeda</i> and <i>Pinus elliottii</i>	Given by the field of application
	Blotter	2, 7, 7-010, 1	<i>Drechslera oryzae</i> on <i>Oryza sativa</i>	Given by the field of application
	Blotter	2, 7, 7-011, 1	<i>Pyricularia oryzae</i> on <i>Oryza sativa</i>	Given by the field of application

Test: Object	Testing principle	Reference (Chapter)	Field of application	Accredited test defined to the level of
Blotter		2, 7, 7-012 , 1	<i>Alternaria padwickii</i> on <i>Oryza sativa</i>	Given by the field of application
Embryo washing		2, 7, 7-013 , 1	<i>Ustilago nuda</i> on <i>Hordeum vulgare</i>	Given by the field of application
Malt agar or potato dextrose agar (PDA)		2, 7, 7-014 , 1	<i>Septoria nodorum</i> on <i>Triticum aestivum</i>	Given by the field of application
Immunoblot (test kit)		2, 7, 7-015 , 1	<i>Neotyphodium coenophialum</i> on <i>Festuca arundinacea</i>	Given by the field of application
Acidified potato dextrose agar (PDA)		2, 7, 7-016 , 1	<i>Phomopsis complex</i> on <i>Glycine max</i>	Given by the field of application
Malt agar		2, 7, 7-017 , 1	<i>Alternaria linicola</i> on <i>Linum usitatissimum</i>	Given by the field of application
Malt agar		2, 7, 7-018 , 1	<i>Colletotrichum lini</i> on <i>Linum usitatissimum</i>	Given by the field of application
Dilution-plating assay		2, 7, 7-019 , 1	<i>Xanthomonas campestris</i> pv. <i>campestris</i> on <i>Brassica</i> spp.	Given by the field of application
Dilution-plating assay		2, 7, 7-020 , 1	<i>Xanthomonas hortorum</i> pv. <i>carotae</i> on <i>Daucus carota</i>	Given by the field of application
Dilution-plating assay		2, 7, 7-021 , 1	<i>Xanthomonas axonopodis</i> pv. <i>phaseoli</i> and <i>Xanthomonas axonopodis</i> pv. <i>phaseolis</i> var. <i>fuscans</i> on <i>Phaseolus vulgaris</i>	Given by the field of application
Malt agar or potato dextrose agar (PDA)		2, 7, 7-022 , 1	<i>Microdochium nivale</i> on <i>Triticum</i> spp.	Given by the field of application
Dilution-plating assay		2, 7, 7-023 , 1	<i>Pseudomonas savastanoi</i> pv. <i>phaseolicola</i> on <i>Phaseolus vulgaris</i>	Given by the field of application
ELISA		2, 7, 7-024 , 1	Pea Early-Browning Virus and Pea Seed-borne Mosaic Virus on <i>Pisum sativum</i>	Given by the field of application
Extraction of dehulled seeds		2, 7, 7-025 , 1	<i>Aphelenchoides besseyi</i> on <i>Oryza sativa</i>	Given by the field of application
ELISA		2, 7, 7-026 , 1	<i>Squash Mosaic Virus</i> , <i>Cucumber Green Mottle Mosaic Virus</i> , and <i>melon necrotic Spot Virus</i> in <i>Cucurbits</i>	Given by the field of application
Verification of species and variety: Verify if species/variety corresponds to the species/variety as requested				
Examination of seeds: ultra-violet light		2, 3, 8, 8.8.1 , 1	<i>Hordeum</i> , <i>Avena</i>	<i>Hordeum</i> and <i>Avena</i>
Examination of seeds: diagnostic differences in colour, size and shape by visual examination under daylight or ultra-violet light		2, 3, 8, 8.8.2 , 1	<i>Fabaceae</i> (<i>Leguminosae</i>), <i>Lolium</i> spp.	<i>Fabaceae</i> and <i>Lolium</i> spp
Examination of seeds: colour reaction in dilute phenol		2, 3, 8, 8.8.1 , 1	<i>Triticum</i>	Given by the field of application
Examination of seeds: presence/absence of alkaloid		2, 3, 8, 8.8.2 , 1	<i>Lupinus</i>	Given by the field of application
Polyacrylamide Gel Electrophoresis (PAGE)		2, 3, 8, 8.8.3 , 1	<i>Triticum</i> , <i>Hordeum</i>	<i>Triticum</i> , <i>Hordeum</i>
Polyacrylamide Gel Electrophoresis (PAGE)		2, 3, 8, 8.8.4 , 1	<i>Pisum</i> , <i>Lolium</i>	<i>Pisum</i> , <i>Lolium</i>
Ultrathin-layer Isoelectric Focusing (UTLIEF)		2, 3, 8, 8.8.5 , 1	<i>Zea mays</i>	Given by the field of application
Polyacrylamide Gel Electrophoresis (PAGE)		2, 3, 8, 8.8.6 , 1	<i>Avena sativa</i>	Given by the field of application
Ultrathin-layer Isoelectric Focusing (UTLIEF)		2, 3, 8, 8.8.7 , 1	<i>Helianthus annuus</i>	Given by the field of application

Test: Object	Testing principle	Reference (Chapter)	Field of application	Accredited test defined to the level of
	Examination of seedlings (colour of coleoptile)	2, 3, 8, 8.9.1 , 1	Cereals	Cereals
	Examination of seedlings (colour of seedling)	2, 3, 8, 8.9.2 , 1	<i>Beta</i> spp.	Given by the field of application
	Examination of seedlings (colour of cotyledons)	2, 3, 8, 8.9.3 , 1	<i>Brassica</i> spp.	Given by the field of application
	Examination of seedlings (fluorescence of root traces)	2, 3, 8, 8.9.4 , 1	<i>Lolium</i> spp.	Given by the field of application
	Examination of seedlings (fluorescence of root traces)	2, 3, 8, 8.9.5 , 1	<i>Festuca</i> spp.	Given by the field of application
	Examination of plants in field plots	2, 3, 8, 8.10.1 , 1	Cereals, legumes and oil plants	Cereals, legumes and oil plants
	Examination of plants in field plots	2, 3, 8, 8.10.2 , 1	Herbage plants	Herbage plants
Moisture content: Determine moisture content				
	Low and high constant temperature oven method: fine grinding	2, 9 , 1	Species of Table 9A Part 1	Relevant species of Table 9A Part 1
	Low and high constant temperature oven method: coarse grinding	2, 9 , 1	Species of Table 9A Part 1 and 2	Relevant species of Table 9A Part 1 and 2
	Low and high constant temperature oven method: cutting	2, 9 , 1	Species of Table 9A Part 1 and 2	Relevant species of Table 9A Part 1 and 2
	Low and high constant temperature oven method: no grinding	2, 9 , 1	Species of Table 9A Part 1 and 2	Relevant species of Table 9A Part 1 and 2
	Moisture meter	2, 9 , 1	Species of Table 9A Part 1 and 2	Relevant species of Table 9A Part 1 and 2
Weight determination: Determine weight per 1000 seeds				
	Counting and weighing	2, 3, 10 , 11, 1	All species of Table 2A	Crop groups
X-ray test: Identify if seeds is filled				
	X-ray	2, 3, 14 , 1	All species of Table 2A	Crop groups
Vigour: Estimate planting value and/or storage potential				
	Conductivity test	2, 3, 5, 9, 15, 15.8.1 , 1	<i>Pisum sativum</i> , <i>Phaseolus vulgaris</i>	Given by the field of application
	Accelerated ageing (AA)	2, 3, 5, 9, 15, 15.8.2 , 1	<i>Glycine max</i>	Given by the field of application
	Controlled deterioration (CD)	2, 5, 9, 15, 15.8.3 , 1	<i>Brassica</i> spp.	Given by the field of application
Size grading: Determine percentage mass composition according to seed size				
	Size grading with screens	2, 16 , 1	All species of Table 2A	Crop groups

Appendix 2: Example Appendix to the Certificate of Accreditation (ISTA Rules methods)

INTERNATIONAL SEED TESTING ASSOCIATION
ASSOCIATION INTERNATIONALE D'ESSAIS DE SEMENCES
INTERNATIONALE VEREINIGUNG FÜR SAATGUTPRÜFUNG

Secretariat, Zürichstrasse 50, 8303 Bassersdorf, CH-Switzerland -
 Phone: +41-44-838 60 00 - Fax: +41-44-838 60 01 - Email: ista.office@ista.ch - <http://www.seedtest.org>

Scope of ISTA Accreditation**Annex to the Accreditation Certificate - ISTA Standard Methods**

ISTA Lab code XY01

Address Example company
 Example street
 Example city
 Example country

Issued on 21.09.2009

Valid to 15.02.2012

Test: Object - Testing principle	Laboratory specific field of application includes species of:	ISTA Rules Chapter
Sampling from the lot: Obtain a representative sample - Manual sampling	Grasses Cereals	2
Sampling from the lot: Obtain a representative sample - Automatic sampling	Grasses	
Purity and identification of other seeds: Determine the percentage composition and identity of species - Separation and weighing of fractions, determination of other seeds	Grasses Poa and Dactylis Cereals	3/4
Germination: Determine the germination potential - Germination on 400 seeds	Grasses Cereals	5
GermGER weighed replicates: Determine the germination potential - Germination by weighed replicates	Chloris gayana	13
Viability: Estimate viability in general and of dormant seeds - Biochemical viability test (TTC)	Grasses Cereals	6
Seed Health: Determine health status - Extraction and clearing of embryos	Ustilago nuda on Hordeum vulgare	7-013
Seed Health: Determine health status - Extraction of dehulled seeds	Aphelenchoides besseyi on Oryza sativa	7-025
Verification of species and variety: Verify if species/variety corresponds to the species/variety as requested - Polyacrylamide Gel Electrophoresis (PAGE)	Triticum spp., Hordeum spp.	8.8.3
Moisture content: Determine moisture content - Constant temperature oven method: fine grinding	Species of Table 9A Part 1 as applicable	9
Moisture content: Determine moisture content - Constant temperature oven method: no grinding	Species of Table 9A Part 1 and 2 as applicable	
Moisture content: Determine moisture content - Constant temperature oven method: coarse grinding	Species of Table 9A Part 1 and 2 as applicable	
Moisture content: Determine moisture content - Moisture meter	Species of Table 9A Part 1 and 2 as applicable	
Weight determination: Determine weight per 1000 seeds - Counting and weighing	Grasses Cereals	10

XY01

The approved and most recent version of this document can be viewed on the ISTA website: www.seedtest.org

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Appendix 3: Documentation of a laboratory's scope of accreditation (Performance Approved Methods)

Testing for the presence of specified traits: Test for the presence of traits in the submitted sample as specified by the applicant

<i>Species</i>	<i>Testing principle</i>	<i>Reference to method and/or laboratory documentation</i>	<i>Trait/Screening element/Construct element</i>	<i>Detection/quantitative</i>	<i>ISTA PDE / OC</i>
<i>Glycine max</i>	PCR	SOPGM-101	35S Promotor	detection	PDE
	Rt-PCR	SOPGM-102		quantitative	PDE
<i>Zea mays</i>	PCR	SOPGM-103	NOS Terminator	detection	PDE
<i>Brassica napus</i>	PCR	SOPGM-104	PAT gene (GS40/90)	detection	PDE
<i>Zea mays</i>	PCR	SOPGM-105	MON810	detection	OC
	Rt-PCR	SOPGM-106		quantitative	PDE
<i>Brassica napus</i>	Bioassay (spray test)	SOPGM-107	Glyphosate herbicide resistance (GT73/RT73)	detection	OC
<i>Gossypium spp.</i>	ELISA (protein based)	SOPGM-108	EPSPS protein	detection	PDE

PDE=Performance Data Evaluation; OC=Other Check; Rt-PCR=Real-time PCR

Appendix 4: Crop groups for purity, other seed determination and germination tests. Group 1 to 6 covers species/genera of Table 2A, Part 1.

Crop group	Size	Species belonging to the following genera
1 (grasses)	A	<i>Poa pratensis, Poa trivialis, Dactylis</i>
	B	<i>Agrostis, Anthoxanthum, Crambe, Cynodon, Cynosurus, Deschampsia, Eragrostis, Holcus, Phleum, Poa, Schizachyrium</i>
	C	<i>Agropyron, Alopecurus, Arrhenatherum, Beckmannia, Bromus, Ehrharta, Elymus, Elytrigia, Festuca, X Festulolium, Koeleria, Lolium, Paspopyrum, Phalaris, Piptatherum, Psathyrostachys, Pseudoroegneria, Trisetum, Zoysia</i>
	D	<i>Andropogon, Astrebla, Bothriochloa, Bouteloua, Cenchrus, Chloris, Dichanthium, Pennisetum, Sorghastrum</i>
	E	<i>Axonopus, Brachiaria, Digitaria, Echinochloa, Eleusine, Melinis, Panicum, Paspalum, Pennisetum glaucum, Setaria, Urochloa</i>
2 (cereals)	A	<i>Avena, Hordeum, Secale, Triticosecale, Triticum</i>
	B	<i>Oryza, Sorghum, Zea</i>
3 (small legumes)	A	<i>Aeschynomene, Alysicarpus, Anthyllis, Astragalus, Calopogonium, Centrosema, Chamaecrista, Coronilla, Crotalaria, Desmodium, Galega, Hedysarum, Kummerowia, Lespedeza, Leucaena, Lotus, Lotonis, Macroptilium, Macrotyloma, Medicago, Melilotus, Neonotania, Onobrychis, Ornithopus, Securigera, Trifolium, Trigonella</i>
4 (pulses)	A	<i>Vicia (small)</i>
	B	<i>Cajanus, Cicer, Lathyrus, Lens, Mucuna, Phaseolus coccineus, Pisum, Psophocarpus, Vicia (large)</i>
	C	<i>Arachis, Cyamopsis, Glycine, Lablab, Lupinus, Phaseolus, Pueraria, Vigna</i>
5 (other agricultural species)	A	<i>Beta, Brassica, Dichondra, Hibiscus, Linum, Plantago, Sinapis, Sparganium, Raphanus</i>
	B	<i>Cannabis, Carthamus, Fagopyrum, Helianthus</i>
6 (vegetables, including fruits, spices and condiments)	A	<i>Achillea, Anethum, Anthriscus, Apium, Arctium, Atriplex, Atropa, Camelina, Campanula, Carum, Chrysanthemum, Cichorium, Claytonia, Cuminum, Daucus, Eruca, Fragaria, Lactuca, Lepidium, Lycopersicon, Lycopersicon hybrids, Marrubium, Matricaria, Melissa, Mentha, Nasturtium, Nicotiana, Ocimum, Oenothera, Origanum, Papaver, Petroselinum, Phacelia, Physalis, Pimpinella, Portulaca, Rheum, Rosmarinus, Rumex, Satureja, Sesamum, Stylosanthes, Taraxacum, Thymus, Valerianella</i>
	B	<i>Allium, Asparagus, Capsicum, Corchorus, Coriandrum, Cynara, Foeniculum, Pastinaca, Raphanus, Sanguisorba, Scorzonera, Solanum, Spinacia, Tragopogon</i>
	C	<i>Abelmoschus, Borago, Cucumis, Cucurbita, Cucurbita hybrids, Citrullus, Gossypium, Ipomoea, Lagenaria, Luffa, Momordica, Ricinus, Tetragonia</i>
7 (forest species)	See Table 2A, Part 2	
8 (flower species)	See Table 2A, Part 3	

Appendix 5: Crop groups for viability tests using the tetrazolium method

Crop groups	Species belonging to the following genera
1 (grasses)	<i>Agropyron, Agrostis, Alopecurus, Anthoxanthum, Arrhenatherum, Brachiaria, Bromus, Cynosurus, Dactylis, Deschampsia, Elymus, Elytrigia, Eragrostis, Festuca, Holcus, Lolium, Panicum, Pascopyrum, Phalaris, Phleum, Poa, Pseudoroegneria, Setaria, Trisetum</i>
2 (cereals)	<i>Avena, Hordeum, Oryza, Secale, Sorghum, Triticum, X Triticosecale, Zea</i>
3 (small legumes)	<i>Lotus, Medicago, Melilotus, Onobrychis, Ornithopus, Trifolium</i>
4 (pulses)	-
5 (other agricultural species)	<i>Helianthus, Brassica</i>
6 (vegetables, including fruits, spices and condiments)	<i>Allium, Arctium, Cucumis, Lactuca, Lycopersicon, Lycopersicon hybrids, Ocimum</i>
7 (forest species)	<i>Abies, Acer, Amorpha, Calocedrus, Carpinus, Chamaecyparis, Chameacyparis, Cornus, Corylus, Cotoneaster, Crataegus, Elaeagnus, Euonymus, Fagus, Fraxinus, Ginkgo, Ilex, Juniperus, Koelreuteria, Ligustrum, Liriodendron, Mahonia, Malus, Malva, Pinus, Prunus, Pseudotsuga, Pyrus, Rosa, Sophora, Sorbus, Taxodium, Taxus, Tilia, Viburnum, Viburnum</i>
8 (flower species)	-