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International Rules for Seed Testing 2024

Chapter 2: Sampling

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 2: Sampling

2.1 Object

The object of sampling is to obtain a sample of a size suitable for tests, in which the probability of a constituent being present is determined only by its level of occurrence in the seed lot.

2.2 Definitions

2.2.1 Seed lot

A seed lot is a specified quantity of seed that is physically and uniquely identifiable.

2.2.2 Sublot

A sublot is a portion of not less than 20 % of the seed lot, except for a *Solanum lycopersicum* L. seed lot, which is not less than 5 % of the original seed lot. Each container of a sublot must be marked with the identification of the seed lot.

2.2.3 Primary sample

A primary sample is a portion taken from the seed lot during one single sampling action.

2.2.4 Composite sample

The composite sample is formed by combining and mixing all the primary samples taken from the seed lot.

2.2.5 Subsample

A subsample is a portion of a sample obtained by reducing a sample.

2.2.6 Submitted sample

A submitted sample is a sample that is to be submitted to the testing laboratory and may comprise either the whole of the composite sample or a subsample thereof. The submitted sample may be divided into subsamples packed in different material meeting conditions for specific tests (e.g. moisture or health).

2.2.7 Duplicate sample

A duplicate sample is another sample obtained for submission from the same composite sample and marked ‘Duplicate sample’.

2.2.8 Working sample

The working sample is the whole of the submitted sample or a subsample thereof, on which one of the quality tests described in these ISTA Rules is made and must be at least the weight prescribed by the ISTA Rules for the particular test.

2.2.9 Sealed

Sealed means that a container in which seed is held is closed in such a way, that it cannot be opened to gain access to the seed and closed again, without either destroying the seal or leaving evidence of tampering. This definition refers to the sealing of seed lots, as well as of seed samples.

2.2.10 Self-sealing containers

The ‘valve-pack’ bag is a specific type of self-sealing container. It is filled through a sleeve-shaped valve which is automatically closed by the completion of filling the bag.

2.2.11 Marked/labelled

A container of a seed lot can be considered as marked or labelled when there is a unique identification mark on the container, which defines the seed lot to which the container belongs. All containers of a seed lot must be marked with the same unique seed lot designation (numbers, characters or combination of both). Should the unique identification mark be indicated on a label attached to the container, it must not be possible to remove the label and replace it with another label without showing signs of tampering. Marking of samples and subsamples must ensure that there is always an unambiguous link between the seed lot and the samples and subsamples.

2.2.12 Treated seed

'Seed treatment' is a generic term which indicates that a seed lot has been subjected to:

a. the application of a compound including film coatings, polymers, pesticides, fungicides, biologicals, identifying colourants, dyes and/or other additives;
b. the application of a biological product including micro-organisms;
c. a process including wetting and drying; or
d. an energy form including heat, radiation, electricity or magnetism;

but does not specify the application method.

Seed treatment does not significantly change the shape and the general size of the untreated seed with only a minimal weight gain. Treated seeds are usually tested without removing the treatment and according to the same rules as untreated seeds.

2.2.13 Coated seeds

Coated seeds are seeds covered with material in such a way that in most cases the seeds cannot be identified without removing the covering material. The material may contain pesticides, fungicides, biologicals, identifying colourants, dyes and/or other additives. The following types of coated seeds are defined:

Seed pellets. More or less spherical units, usually incorporating a single seed with the size and shape of the seed no longer readily evident.

Encrusted seed. Units more or less retaining the shape of the seed with the size and weight changed to a measurable extent.

Seed granules. Units more or less cylindrical, including types with more than one seed per granule.

Seed tapes. Narrow bands of material, such as paper or other degradable material, with seeds spaced randomly, in groups or in a single row.

Seed mats. Broad sheets of material, such as paper or other degradable material, with seeds placed in rows, groups or at random throughout the sheets.

2.2.14 Small seed lots

Small seed lots are seed lots of high-value seed, where obtaining a submitted sample of standard size could have a substantial effect on the quantity of the remaining seed lot. High-value seed includes, but is not limited to, hybrid vegetable seeds that are sold per seed, or seed that is not commercially available and is used for research or for higher generation multiplication.

2.3 General principles

A composite sample is obtained from the seed lot by taking primary samples from different positions in the whole seed lot and combining them. From this composite sample, subsamples are obtained by sample reduction procedures at one or more stages forming the submitted sample and finally the working samples for testing. For issuing ISTA Certificates, specific requirements have to be fulfilled as given under 2.5.4. Further information on seed sampling can be found in the current *ISTA Handbook on Seed Sampling*.

2.4 Apparatus

Sampling and sample reduction must be performed using appropriate techniques and equipment that is clean and in good condition as described in 2.5.1 and 2.5.2.2.

Containers used to collect primary samples, composite samples and during mixing and dividing must be static-free to avoid chaff or small seeds adhering to the inside of the containers.

2.5 Procedures

2.5.1 Procedures for sampling a seed lot

2.5.1.1 Preparation of a seed lot and conditions for sampling

At the time of sampling, the seed lot must be as uniform as practicable. If the seed lot is found to be obviously heterogeneous, sampling must be refused or stopped. In cases of doubt heterogeneity can be determined as described under 2.9.

Seed may be sampled in containers or from the seed stream, either before or when it enters containers. The containers in which seed is held must be fit for purpose, i.e. must not damage the seed, must be clean to avoid cross contamination, and must be sealable. The containers must be labelled or marked before or just after sampling is completed.

The seed lot must be so arranged that each part of the seed lot is conveniently accessible.

2.5.1.2 Minimum sampling intensity

For seed lots in containers holding up to and including 100 kg, the minimum sampling intensity is the following:

a. For containers holding between 15 kg and 100 kg (inclusive) of seed, the number of primary samples according to Table 2A.
b. For containers holding less than 15 kg of seed, containers must be combined into sampling units not exceeding 100 kg, e.g. 20 containers of 5 kg, 33 containers of 3 kg or 100 containers of 1 kg. The sampling units must be regarded as containers as described in Table 2A.
c. For seed pellets, seed granules, seed tapes and seed mats, containers of less than 300 000 seed units must be combined to sampling units not exceeding 2 000 000 seeds. The sampling units must be regarded as containers as described in Table 2A.

Table 2A. Minimum sampling intensity for seed lots in containers holding up to and including 100 kg seed

Number of containers	Minimum number of primary samples to be taken
1–4	3 primary samples from each container
5–8	2 primary samples from each container
9–15	1 primary sample from each container
16–30	15 primary samples, one each from 15 different containers
31–59	20 primary samples, one each from 20 different containers
60 or more	30 primary samples, one each from 30 different containers

When sampling seed in containers holding more than 100 kg of seed, or from streams of seed entering containers, the sampling intensity according to Table 2B must be regarded as the minimum requirement.

Table 2B. Minimum number of primary samples to be taken from seed lots in containers holding more than 100 kg of seed, or from seed streams

Seed lot size	Number of primary samples to be taken
Up to 500 kg	At least five primary samples
501–3 000 kg	One primary sample for each 300 kg, but not less than five
3 001–20 000 kg	One primary sample for each 500 kg, but not less than 10
20 001 kg and above	One primary sample for each 700 kg, but not less than 40

When sampling a seed lot of up to 15 containers, regardless of their size, the same number of primary samples must be taken from each container.

Sampling intensity for coated seeds is as described in Tables 2A and 2B.

2.5.1.3 Taking primary samples

When defining the number and/or the size of primary samples, the seed sampler needs to ensure (besides meeting the minimum sampling intensity) that the minimum amount of seed required for the requested test(s) is sent to the testing laboratory and enough seed remains available for obtaining duplicate samples if requested.

Primary samples of approximately equal size must be taken from a seed lot, irrespective of where in the lot or container the primary sample is taken.

When the seed lot is in containers, the containers to be sampled must be selected at random or according to a systematic plan throughout the seed lot. Primary samples must be drawn from the top, middle and bottom of containers, but not necessarily from more than one position in any container, unless so specified in Tables 2A and 2B.

When the seed is in bulk or in large containers, the primary samples must be drawn from random positions.

Containers must be opened or pierced for abstraction of primary samples. The sampled containers must then be closed or the contents transferred to new containers.

When seed is to be packed in special types of containers (e.g. small, not penetrable, or moisture-proof containers), it should be sampled, if possible, either before or during the filling of the containers.

Sampling seed lots of seed tapes and seed mats should be done by taking packets or pieces of tape or mat.

The instruments being used must neither damage the seed nor select according to seed size, shape, density, chaffiness or any other quality trait. All sampling apparatus must be clean before use to prevent cross contaminations. Triers must be long enough so that the opening at the tip reaches at least half of the diameter of the container. When the container is not accessible from opposite sides, the trier must be long enough to reach the opposite side.

Sampling seed lots may be done by one of the methods listed below.

a. Automatic sampling from a seed stream. Seed may be sampled by automatic sampling devices, provided that the instrument uniformly samples the cross section of the seed stream and the material entering the instrument does not bounce out again. It may be operated either under manual or automatic control. The intervals between taking primary samples should be constant.
b. Manual sampling from a seed stream. Seed streams may also be sampled by using manual instruments when fulfilling the requirements listed under 'a'.
c. Sampling stick. The sampling stick (e.g. stick trier, sleeve type trier, spiral trier) consists of two parts, one of which fits loosely inside the other, but tightly enough so that seed or impurities do not slip between them. The outer part has a solid pointed end. Both parts have slots in their walls so that the cavity of the inner part can be opened and closed by moving the two parts against each other by either a twisting or a push-pull motion.
   The sampling stick may be used horizontally, diagonally or vertically. The spiral trier has slots in a spiral arrangement for their subsequent opening from the tip to the handle and may only be used for seeds of a size smaller than *Triticum aestivum* L. subsp. *aestivum*.
   However, when used vertically or diagonally downwards, the sampling stick must either have partitions dividing the instrument into a number of compartments or have slots in a spiral arrangement. The minimum inside diameter should be wide enough to allow the smooth and free flow of seed and contaminants into the sampling stick.
   When using the sampling stick, insert it in the closed position into the container, gently push it so that the point reaches the required position, open the sampling stick, agitate it slightly to allow it to fill completely, gently close and withdraw it and empty the primary sample into a container. Care should be exercised in closing the sampling stick so that seeds are not damaged.
d. Nobbe trier. The Nobbe trier (dynamic spear) is a pointed tube with an opening near the pointed end. Seed passes through the tube and is collected in a container. The minimum internal diameter of the Nobbe trier should be wide enough to allow the smooth and free flow of seed and contaminants through the trier.
   When using the Nobbe trier, insert it at an angle of about 30° to the horizontal plane with the opening facing down, push the trier until it reaches the required position and revolve it through 180°. Withdraw it with decreasing speed from the container, gently agitating the trier to help maintain an even flow of seed, and collect the seed sample coming from the trier in a suitable container.
e. Cargo sampler. The cargo sampler (bulk sampler) consists of a special type of chamber that is fixed to a shaft. The lower part of the chamber is cone-shaped with a pointed end. To reach a greater depth, the shaft may be lengthened by screwing on successive extensions. There is a closing system in the chamber that may be a collar on the outside of the instrument, a wing connected to a door or a valve with a spring. Some cargo samplers can be closed before they are drawn back from the sampling position; others cannot be closed, so that the filled chamber is open during withdrawal. For all species, the minimum inside diameter can be about 35 mm and the depth 75 mm. When using the cargo sampler, insert it in the closed position into the container, gently push it vertically into the seed so that the point reaches the required position, pull the cargo sampler back about 10 cm or turn it (depending on the closing system), agitate it slightly to allow it to fill completely, gently close if possible and withdraw it and empty the primary sample into a container. Care should be exercised in closing the cargo sampler, so that the seeds are not damaged.
f. Sampling by hand. This method can be used for all species and may be the most suitable method for seed that may be damaged by the use of triers, seeds with wings, seeds with low moisture content, seed tapes and seed mats.
   For hand sampling seed in containers, all positions inside the containers must be accessible. Containers with layers which are not accessible from the regular opening may have to be cut open, sampled and repackaged. Containers may also be partially or completely emptied during the sampling process to gain access to all positions in the containers. For sampling by hand, clean the hand and roll the sleeve up if necessary, insert the open hand into the container to the required position, close and withdraw the hand, taking great care that the fingers remain tightly closed about the seeds so none may escape, and empty the hand into a receiving pan.

2.5.1.4 Obtaining the composite sample

Where possible, the primary samples are compared with each other during sampling. The primary samples can only be combined to form the composite sample if they appear to be uniform. If not, the sampling procedure must be stopped. When primary samples are collected directly into one container, the content of this container may be regarded as the composite sample only if it appears uniform. If not, it must not be used for obtaining a submitted sample.

2.5.1.5 Obtaining the submitted sample

The composite sample can be submitted to the seed testing laboratory if it is of appropriate size for the tests to be conducted, or if it is difficult to mix and reduce the composite sample properly under warehouse conditions.

2.5.1.5.1 Obtaining the submitted sample for all tests

If the composite sample is too big, the submitted sample must be obtained by reducing the composite sample to an appropriate size by one of the methods referred to in 2.5.2.2. In the case of very large composite samples, a method according to 2.5.1.3 may also be used.

2.5.1.5.2 Obtaining the submitted sample for determination of moisture content

Obtaining submitted samples of the required size for moisture testing must be carried out in such a way that changes in moisture content are minimal.

Samples must be taken in the following way from the composite sample: first, mix the composite sample by either stirring it or by passing it through a mechanical divider and combining preferably once but not more than three times. Then, take a minimum of three subsamples from different positions and combine them to create the submitted sample for moisture testing.

2.5.1.5.3 Obtaining duplicate samples

Duplicate samples, which were requested no later than at the time of sampling, must be prepared in the same way as the submitted sample.

2.5.1.6 Packing and dispatch of the submitted sample

The submitted sample must be marked with the same identification as the seed lot. For an Orange International Seed Lot Certificate, the sample must be sealed, if it is not delivered personally by the sampler to the laboratory on the same premises (see 2.5.4.3). The additional information required according to 1.4.2 as well as the name of any chemical treatment applied must be provided.

Submitted samples must be packed so as to prevent damage during transit. Submitted samples should be packed in breathable containers.

Submitted samples for moisture testing, and samples from seed lots which have been dried to low moisture content, must be packed in moisture-proof containers which contain as little air as possible. Submitted samples for germination tests, viability tests and health tests may only be packed in moisture-proof containers if suitable storage conditions can be assured.

Submitted samples must be dispatched to the seed testing laboratory without delay.

2.5.1.7 Storage of submitted samples before testing

Every effort must be made to start testing a submitted sample on the day of receipt. Storage of orthodox seeds, when necessary, should be in a cool, well-ventilated room.

Non-orthodox (i.e. recalcitrant or intermediate) seeds should be tested as soon as possible after obtaining the submitted sample from the composite sample without any storage. Handling of the submitted sample and, if necessary, storage should be done under species specific optimum conditions.

2.5.2 Procedures for obtaining the submitted and working sample

2.5.2.1 Minimum size of working sample

Minimum sizes of working samples are prescribed in the appropriate chapter for each test. The working sample weights for purity analyses given in Table 2C are calculated to contain at least 2500 seeds. These weights are recommended for normal use in purity tests, see 3.5.1.

The sample weights in column 5 of Table 2C Part 1, for other seed determination (OSD) are 10 times the weights in column 4, subject to a maximum of 1000 g. These weights are recommended for normal use in OSD, see 4.5.1.

Where the seed weight obviously deviates from the purity working sample weight listed in column 4 or the OSD working sample weight listed in column 5 for the taxon concerned, conduct and analyse an experiment for assessing multiple sources of variation of 100-seed unit weights. Guidelines for the experimental design and data analysis for deriving the minimum 2500 or 25 000 seed weight are provided in the 'Calculator for adding working weights to Table 2C', available from the ISTA website.

Working samples of all coated seeds except those defined as treated seed in 2.2.12 must contain at least the number of pellets, seeds or granules indicated in column 3 of Table 2D, Part 1 and Part 2. If a smaller sample is used, the actual number of pellets, seeds or granules in the sample must be reported.

2.5.2.2 Sample reduction methods

If the seed sample needs to be reduced to a size equal to or greater than the size prescribed, the seed sample must first be thoroughly mixed for all dividers and methods excluding the Variable sample divider and Rotary divider, where mixing takes place during the dividing process. The submitted/working sample must then be obtained either by repeated halving or by abstracting and subsequently combining small random portions. The apparatus and methods for sample reduction are described in 2.5.2.2.1 to 2.5.2.2.4. One, two or more of these methods may be used in one sample reduction procedure. When using one of the dividers described for seed pellets the distance of fall must not exceed 250 mm.

After obtaining a working sample the remainder must be re-mixed before a second working sample is obtained.

Except in the case of seed health, the method of hand halving must be restricted to certain genera listed in 2.5.2.2.4. Only the spoon method and the hand halving method may be used in the laboratory to obtain working samples for seed health testing where other samples or equipment may be contaminated by spores or other propagating material.

For seed tapes and mats take pieces of tape or mat at random, to provide sufficient seeds for the test.

2.5.2.2.1 Mechanical divider method

This method is suitable for all kinds of seeds except some very chaffy seeds. The apparatus divides a sample passed through it into two or more approximately equal parts. The submitted sample can be mixed by passing it through the divider, recombining the parts and passing the whole sample through a second time, and similarly, a third time if necessary. The sample is reduced by passing the seed through repeatedly and removing parts on each occasion. This process of reduction is continued until a working sample of approximately, but not less than, the required size is obtained.

a. Conical divider. The conical divider (Boerner type) consists of a hopper, cone and a series of baffles directing the seed into two spouts. The baffles form alternate channels and spaces of equal width. They are arranged in a circle and are directed inward and downward, the channels leading to one spout and the spaces to an opposite spout. A valve or gate at the base of the hopper retains the seed. When the valve is opened the seed falls by gravity over the cone where it is evenly distributed to the channels and spaces, then passes through the spouts into the seed pans.
   Channels and spaces must be wide enough to allow the smooth free flow of seed and contaminants. The more channels and spaces, the better the accuracy. Typical commercial conical dividers have about 15 channels and 15 spaces.
b. Soil divider. The soil divider (riffle divider) consists of a hopper with attached channels or ducts alternately leading to opposite sides. Channels must be wide enough to allow the smooth free flow of seed and contaminants. The more channels, the better the accuracy. A minimum of 10 channels is required.
   In using the divider the seed is placed evenly into a pouring pan and then poured in the hopper at approximately equal rates along the entire length. The seed passes through the channels and is collected in two receiving pans.
c. Centrifugal divider. In the centrifugal divider (Gamet type) the seed flows downward through a hopper onto a shallow cup or spinner. Upon rotation of the spinner by an electric motor the seeds are thrown out by centrifugal force and fall downward. The circle or area where the seeds fall is equally divided into two parts by a stationary baffle so that approximately half the seeds fall in one spout and half in the other spout.

The centrifugal divider tends to give variable results unless the spinner is operated after having poured the seed centrally into the hopper.

d. Rotary divider. The rotary divider comprises a rotating crown or base unit usually with 6 to 32 attached subsample containers, a vibration chute and a hopper. In using the divider the seed is poured into the hopper and the rotary divider is switched on so that the crown or base unit with the containers rotates with high speed and the vibration chute starts to feed the seed into the inlet cylinder of the rotating crown/base unit. The longer the duration of the dividing operation, the better the accuracy.
   The feeding rate and therefore the duration of the dividing operation can be adjusted by the distance between the funnel of the hopper and chute, and the vibration intensity of the chute.
   There are two principles: (i) the inlet cylinder feeds the seed centrally onto a distributor within the rotating crown or base unit, distributing the seed to all containers simultaneously; and (ii) the inlet cylinder feeds the seed de-centrally into the inlets of the containers rotating underneath the inlet cylinder so that the seed stream is subdivided into a lot of subsamples.
   For this type of divider, mixing and dividing takes place in one operation.
e. Variable sample divider. The variable sample divider consists of a pouring hopper and a rotating tube underneath. The tube distributes the seed stream from the pouring hopper onto the inner surface of a further hopper, which is well fitted into a third hopper, all being concentric. In the second and the third hopper there are slots that can be twisted against each other resulting in wider or narrower slots. The effect is that variable proportions will pass through the slots. The position of the hoppers in relation to each other can be adjusted accurately, resulting in predetermined sample sizes.
   Depending on the design, the sample poured into the hopper can be divided into one or up to eight subsamples. The operation of these types of dividers can be controlled with computer software, which enables it to provide two or more subsamples with different predetermined sizes, in one operation.
   For this type of divider, mixing and dividing takes place in one operation.

2.5.2.2.2 Modified halving method

The apparatus comprises a tray into which fits a grid of equal-sized cubical cells, open at the top and every alternate one having no bottom. After preliminary mixing, the seed is poured evenly over the grid. When the grid is lifted, approximately half the sample remains on the tray. The submitted sample is successively halved in this way until a working sample, of approximately but not less than the required size, is obtained.

2.5.2.2.3 Spoon method

The spoon method is restricted to species with seeds smaller than *Triticum aestivum* L. subsp. *aestivum*, to the genera *Arachis*, *Glycine* and *Phaseolus*, and to tree genera *Abies*, *Cedrus* and *Pseudotsuga*. For all other species it can only be used to obtain working samples in the laboratory for seed health tests (7.4.1).

A tray, a spatula and a spoon with a straight edge are required. After preliminary mixing, pour the seed evenly over the tray; do not shake the tray thereafter. With the spoon in one hand, the spatula in the other, and using both, remove small portions of seed from not less than five random places. Sufficient portions of seed are taken to constitute a subsample of the required size.

2.5.2.2.4 The hand halving method

This method is restricted to the following genera of chaffy seeds:

Agrimonia, Andropogon, Anthoxanthum, Arrhenatherum, Astrebla, Beckmannia, Bouteloua, Briza, Cenchrus, Chloris, Dichanthium, Digitaria, Echinochloa, Ehrharta, Elymus, Eragrostis, Gomphrena, Gossypium (linted seed only), *Melinis, Oryza, Pennisetum* (non *glaucum*), *Psathyrostachys, Scabiosa, Sorghastrum, Stylosanthes* (non *guianensis*), *Trisetum*, *Urochloa*;

to the following genera of easily damaged fragile seeds:

Arachis, Glycine and *Phaseolus*;

and to the following genera and species of tree and shrub seeds:

Acer, Aesculus, Ailanthus, Castanea, Cedrela, Corylus, Fagus, Fraxinus, Juglans, Liriodendron, Pinus cembra, Pinus pinea, Platanus, Populus, Quercus, Salix, Tectona, Ulmus.

The hand halving method can also be used with the species where all other dividing methods are extremely difficult or impossible to use.

For all other species it can be used only to obtain working samples in the laboratory for seed health tests (7.4.1).

For applying the hand halving method, pour the sample evenly onto a smooth clean surface, thoroughly mix the seed into a mound with a flat-edged spatula, divide the mound into half and halve each half again – giving four portions – and halve each portion again – giving eight portions, arrange the portions in two rows of four, combine and retain alternate portions: e.g. combine the first and third portions in the first row with the second and fourth in the second row, remove the remaining four portions. Repeat the procedure using the retained portions until obtaining the required sample size.

2.5.3 Storage of samples after testing

The primary aim of storage of samples after testing is to be able to repeat the original tests carried out on the submitted sample. Therefore, storage conditions should be such that changes in the seed quality traits tested are minimal. For example, in the case of the purity test or other seed count, the sample should be stored in such a way that the physical identity is kept (see 3.5.2 and 4.5.2). In the case of germination, viability or health test of orthodox seeds the sample should be stored under cool and dry conditions. For such tests in recalcitrant and intermediate seeds of tropical and subtropical species, long term storage is not possible. For such seed of temperate species storability depends on the fungal status and to some extent whether the seed is dormant or not. All factors pertaining to storage need to be determined on a species basis. Protection against insects and rodents may be necessary.

To provide for re-testing by the original or by another seed testing laboratory, samples on which ISTA Certificates have been issued must be stored at least for one year from the receipt of the sample. Submitted samples in moisture proof containers, and samples of recalcitrant or intermediate species, must be stored under appropriate conditions for as long as it can be expected that the results of a re-test are not affected by the storage.

When a re-test in a different testing laboratory is required, a portion must be drawn from the stored sample in accordance with 2.5.2.2, and submitted to the designated testing laboratory. The remainder must be retained in store.

2.5.4 Conditions for issuing Orange International Seed Lot Certificates

The sampling methods laid down in the ISTA Rules must be followed when seed samples are drawn for the issue of Orange International Seed Lot Certificates. Further conditions have to be fulfilled as listed below.

2.5.4.1 Seed lot size

The seed lot must not exceed the quantity indicated in column 2 of Table 2C, subject to a tolerance of 5 % with the exception of:

a. seed being transported loose in bulk containers. The conditions under which this exception may be permitted are laid down in Chapter 17.
b. seed pellets, seed granules, seed tapes or seed mats. The maximum number of seeds that a seed lot of seed pellets, seed granules, seed tapes or seed mats may contain is 1 000 000 000 (10 000 units of 100 000) except that the weight of the seed lot, including the coating material may not exceed 40 000 kg subject to a tolerance of 5 % (42 000 kg).
c. seed lots of species of Poaceae produced in a seed company that has been approved to make larger seed lots. The conditions under which this may be permitted are laid down in 2.5.4.2.
d. seed lots of species of Poaceae produced in a seed company that has applied for approval to make larger seed lots according to 2.5.4.2. The heterogeneity of the seed lot must be tested according to 2.9 and the seed lot must not show significant heterogeneity.

Maximum lot size for treated and encrusted seeds is defined by applying the quantities indicated in Table 2C to the seeds without coating material.

A seed lot in excess of the prescribed quantity must be subdivided into seed lots not larger than the prescribed quantity, each of which must be labelled or marked with a separate seed lot identification.

2.5.4.2 Large seed lots of Poaceae

2.5.4.2.1 Definitions

Large seed lots of Poaceae species may have a maximum size of 25 000 kg (with a 5 % tolerance), if produced by an approved production plant.

For the purposes of large seed lots of Poaceae species, the following species with similar characteristics are regarded as two species groups:

Species group 1:

Lolium perenne, Lolium multiflorum, Lolium ×hybridum (previously *Lolium ×boucheanum*), ×*Festulolium, Festuca pratensis, Festuca arundinacea* and *Phleum pratense*.

Species group 2:

Festuca rubra, Festuca ovina, Festuca filiformis, Festuca heterophylla, Festuca trachyphylla, Dactylis glomerata, Poa pratensis and *Poa trivialis*.

Approval which was granted following heterogeneity testing of any species of a group is also valid for all other species of the same group.

For all other species of Poaceae, approval must be requested and granted separately for each individual species.

2.5.4.2.2 Approval

Approval is granted after heterogeneity testing of six large seed lots of the species group or individual species for which the approval is requested. Heterogeneity testing must be carried out according to 2.9, and must as a minimum be based on purity and other seed count. At least five of the six tested seed lots must have a non-significant level of heterogeneity.

2.5.4.2.3 Check sampling and testing

After approval, the large seed lots of a production plant must be monitored by check sampling and further heterogeneity testing, according to 2.9, and as a minimum based on purity and other seed count.

Of the first 100 large seed lots per species group, 4 are randomly selected (4 % check sampling) and tested for heterogeneity. If none of these are heterogeneous, the check-sampling rate is reduced to 3 % for the following 100 lots, and to 2 % for subsequent lots.

However, if a check sample is found to show significant heterogeneity, the check-sampling rate must remain at 4 %, or again be increased from 3 to 4 % or from 2 to 3 %, as applicable (Fig. 2.1).

In six consecutive check samples tested, a maximum of one sample may show significant heterogeneity.

Hence, a heterogeneous sample must be followed by at least five non-heterogeneous samples in order for approval to be retained (Fig. 2.1).

2.5.4.2.4 Withdrawal of approval

If more than one of the last six consecutive check samples tested shows significant heterogeneity, approval must be withdrawn for the species or species group and production plant concerned, and the company must re-apply for approval (Fig. 2.1).

2.5.4.2.5 Responsibility

The Certifying or Designated Authority in a country is responsible for:

- the decision of approval of the seed company (production plant);
- ensuring that each production plant is approved separately, if a seed company has more than one production plant;
- ensuring that the testing is done by an ISTA-accredited laboratory;
- the check-sampling programme.

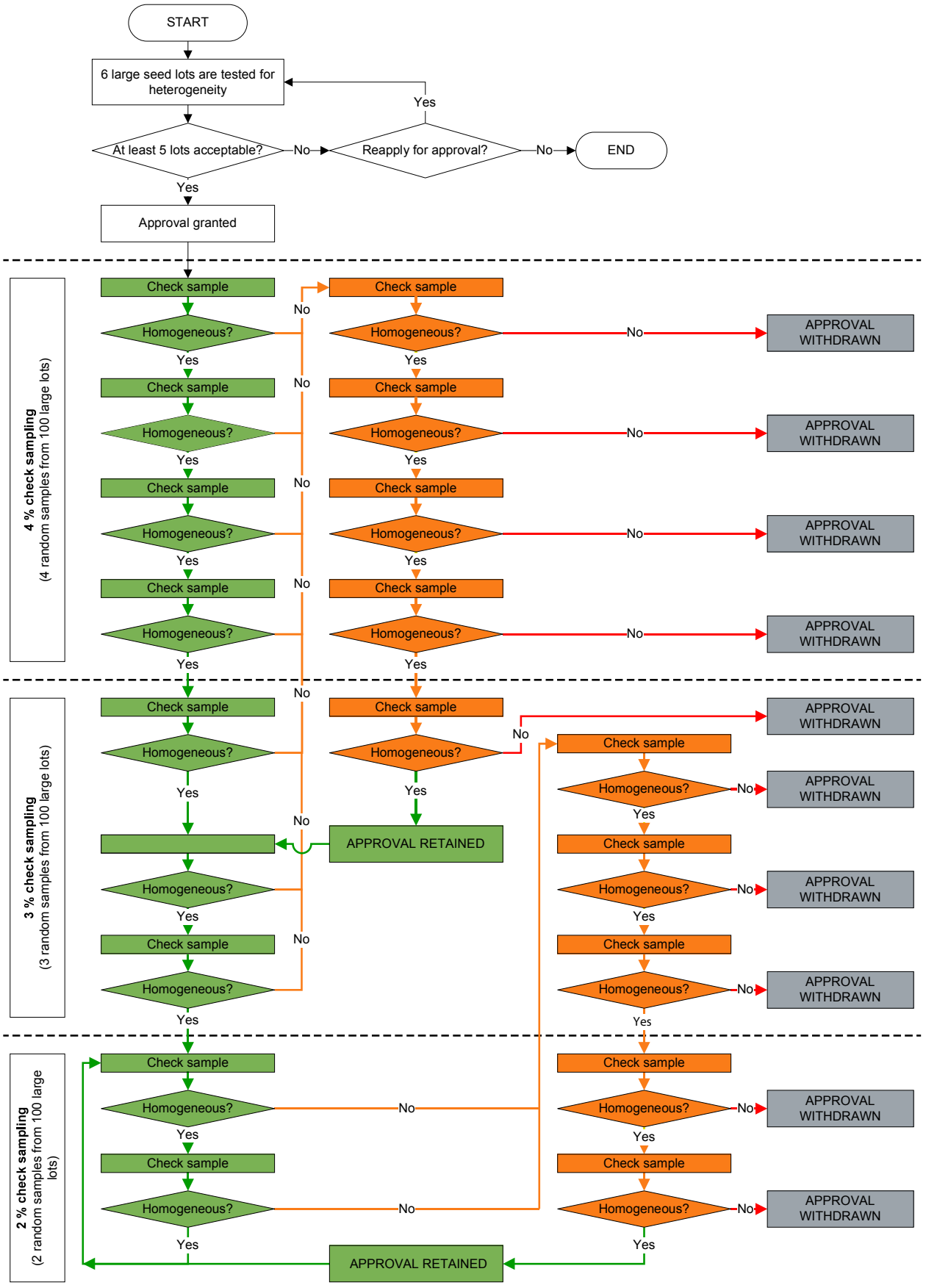

Figure 2.1. Flow chart describing the approval procedure and check-sampling programme with regard to large seed lots of Poaceae species (2.5.4.2.2–4).

2.5.4.3 Marking/labelling and sealing of containers

The seed lot must be in marked/labelled containers which are self-sealing, sealed (or capable of being sealed) or under the control of the seed sampler.

Where the seed lot is already marked/labelled and sealed before sampling, the seed sampler must verify the marking/labelling and sealing on the containers. Otherwise the sampler has to mark/label the containers and must seal every container before the seed lot leaves their control.

The samplers are personally responsible for the seals, labels and bags supplied to them and it is their duty to ensure that primary, composite or submitted samples must never be left in the hands of persons not authorised by the seed testing laboratory unless they are sealed in such a way that they cannot be tampered with.

2.5.4.4 Sampling from the seed lot

For sampling from the seed lot methods listed under 2.5.1 must be used. Automatic seed samplers must be approved by the ISTA seed testing laboratory according to the 'Protocol for the approval of automatic seed samplers' as approved by the ISTA membership and published on the ISTA website.

An Orange International Seed Lot Certificate issued on a seed lot (see 2.2.1) is still valid after re-packaging the seed lot in new containers provided that:

a. The identity of the seed in the initial seed lot is preserved.
b. The seed lot designation (see 2.2.11) is not changed.
c. The moving of the seed into the new containers is done under the control of an ISTA seed sampler.
d. There is no processing of the seed during filling of the new containers.

2.5.4.5 Submitted sample

The minimum sizes of submitted samples are as follows:

- If a determination of other seeds by number is required: the weight prescribed in Table 2C, column 3;

or

- If a determination of other seeds by number is not required: the weight prescribed for the working sample for purity analysis in Table 2C, column 4, or in 3.5.1.

If the sample is smaller than prescribed above, the sampler must be notified accordingly and analysis withheld until sufficient seed is received in a single submitted sample. This also applies to the weights of the exceptions listed below. For certain tests or under certain conditions, the following exceptions apply:

a. For coated seeds, if a determination of other seeds by number or size grading is required: the number of seeds indicated in Table 2D, Parts 1 and 2, column 2.
b. For coated seeds, if a determination of other seeds by number or size grading is not required: the number of seeds indicated for the working sample for purity analysis in Table 2D, Parts 1 and 2, column 3.
c. For moisture determination of species that must be ground (see Table 9A): 100 g. For all other species: 50 g.
   When moisture meters are to be used for testing, a larger sample size may be necessary. Contact the accredited ISTA laboratory for specific instructions.
d. For verification of species and variety: as prescribed in Chapter 8.
e. For germination or viability tests of small seed lots (2.2.14): the number of seeds required to complete one of these tests plus 25 seeds for identity assurance.
f. For determination of other seeds of small seed lots (2.2.14): the amount necessary to complete this test according to Chapter 4.

The submitted sample must be sealed and labelled or marked.

2.5.4.6 Sample reduction

For sample reduction, methods listed under 2.5.2.2 must be used.

2.5.4.7 Storage of submitted samples after testing

Submitted samples on which ISTA Certificates have been issued must be stored. In the case of small seed lots (see 2.2.14), the remainder of the submitted sample, minus 25 seeds for assurance of identity, may be sent back to the applicant. The seed testing laboratory cannot be held responsible for any deterioration of the sample during storage.

2.6 Calculation and expression of results

No specific calculation or expression of results required except under 2.9 for heterogeneity tests.

2.7 Reporting of results

No specific calculation or expression of results required except under 2.9 for heterogeneity tests.

2.8 Tables for lot size and sample sizes

Table 2C is referred to in various chapters of the ISTA Rules and indicates weights of lots and samples for different species, and the specific names to be used in reporting test results. Each sample size is derived from a nominal thousand-seed weight (TSW) for each species which, on the available evidence, is expected to be adequate for the majority of samples tested.

Where a weight is not given in the table and a count of other species is requested, the submitted sample must contain a minimum of 25 000 seeds.

Note 1: Names with an asterisk are not included in the *ISTA List of Stabilised Plant Names*. Names without an asterisk are included in the *ISTA List of Stabilised Plant Names* (but not the synonym which follows some of these names), or, in the case of generic names (e.g. *Pyrus* spp.) conserved by the International Botanical Congress and listed in the *International Code of Nomenclature*. Changes in the Stabilised List agreed at the 2019 ISTA Congress are included in this version of Table 2C. Where plant names have been changed, the old name is included with a cross reference to the new name. This applies only to 2019 Congress changes; previous cross references have been removed.

Note 2: For all species the maximum seed lot size stated can be exceeded by no more than 5 %, except for:

a. seed being transported loose in bulk containers. The conditions under which this exception may be permitted are stated in Chapter 17;
b. seed pellets, seed granules, seed tapes or seed mats (see 2.5.4.1);
c. species of Poaceae listed in Table 2C Part 1 (see 2.5.4.2).

For production plants approved under 2.5.4.2, the maximum seed lot weight for Poaceae species listed in Table 2C Part 1 is 25 000 kg (with a 5 % tolerance).

Table 2C Part 1. Lot sizes and sample sizes: agricultural and vegetable seeds

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working samples (g)	
			Purity analysis (3.5.1)	Other seeds by number (4.5.1)
1	2	3	4	5
Abelmoschus esculentus (L.) Moench	20 000	1 000	140	1 000
Achillea millefolium L.	10 000	5	0.5	5
Aeschynomene americana L.	10 000	120	12	120
Agropyron cristatum (L.) Gaertn.	10 000	40	4	40
Agropyron desertorum (Fisch. ex Link) Schult.	10 000	60	6	60
Agrostis canina L.	10 000	5	0.25	2.5
Agrostis capillaris L.	10 000	5	0.25	2.5
Agrostis gigantea Roth	10 000	5	0.25	2.5
Agrostis stolonifera L. (includes *A. palustris* Hudson)	10 000	5	0.25	2.5
Allium cepa L.	10 000	80	8	80
Allium fistulosum L.	10 000	50	5	50
Allium porrum L.	10 000	70	7	70
Allium schoenoprasum L.	10 000	30	3	30
Allium tuberosum Rottler ex Spreng.	10 000	100	10	100
Alopecurus pratensis L.	10 000	30	3	30
Alysicarpus vaginalis (L.) DC.	10 000	40	4	40
Andropogon gayanus Kunth	10 000	80	8	80
Andropogon gerardi Vitman	10 000	70	7	70
Andropogon hallii Hack.	10 000	100	10	100
Anethum graveolens L.	10 000	40	4	40
Anthoxanthum odoratum L.	10 000	20	2	20
Anthriscus cerefolium (L.) Hoffm.	10 000	60	6	60
Anthyllis vulneraria L.	10 000	60	6	60
Apium graveolens L.	10 000	10	1	10
Arachis hypogaea L.	30 000	1 000	1 000	1 000
Arctium lappa L.	10 000	50	5	50
Arrhenatherum elatius (L.) P.Beauv. ex J.Presl & C.Presl	10 000	80	8	80
Asparagus officinalis L.	20 000	1 000	100	1 000
Astragalus cicer L.	10 000	90	9	90
Astrebla lappacea (Lindl.) Domin	10 000	200	20	200
Atriplex hortensis L.	5 000	10	2.5	–
Atropa belladonna L.	10 000	30	3	30
Avena nuda L.	30 000	1 000	120	1 000
Avena sativa L.	30 000	1 000	120	1 000
Avena strigosa Schreb.	30 000	500	50	500
Avenella flexuosa (L.) Parl. (previously *Deschampsia flexuosa* (L.) Trin.)	10 000	10	1	10
Axonopus compressus (Sw.) P.Beauv.	10 000	10	1	10
Axonopus fissifolius (Raddi) Kuhlm.	10 000	10	1	10
Beckmannia eruciformis (L.) Host	10 000	20	2	20
Beta vulgaris L. (multi-germ varieties)	20 000	500	50	500
Beta vulgaris L. (mono-germ varieties)	20 000	500	30	300
Borago officinalis L.	10 000	450	45	450
Bothriochloa insculpta (Hochst. ex A.Rich.) A.Camus	10 000	20	2	20
Bothriochloa pertusa (L.) A.Camus	10 000	10	1	10
Bouteloua gracilis (Kunth) Lag. ex Griffiths	10 000	60	6	60
(*Brachiaria brizantha* (Hochst. ex A.Rich) Stapf see *Urochloa brizantha* (Hochst. ex A.Rich.) R.D.Webster)				
(*Brachiaria decumbens* Stapf see *Urochloa decumbens* (Stapf) R.D.Webster)				
(*Brachiaria humidicola* (Rendle) Schweick. see *Urochloa humidicola* (Rendle) Morrone & Zuloaga)				

Table 2C Part 1. Lot sizes and sample sizes: agricultural and vegetable seeds (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working samples (g)	
			Purity analysis (3.5.1)	Other seeds by number (4.5.1)
1	2	3	4	5
(*Brachiaria mutica* (Forssk.) Stapf see *Urochloa mutica* (Forssk.) T.Q.Nguyen)				
(*Brachiaria ramosa* (L.) Stapf see *Urochloa ramosa* (L.) T.Q.Nguyen)				
(*Brachiaria ruziziensis* R.Germ. & C.M.Evrard see *Urochloa ruziziensis* (R.Germ. & C.M.Evrard) Crins)				
Brassica carinata A.Braun	10 000	100	10	100
Brassica juncea (L.) Czern.	10 000	40	4	40
Brassica napus L.	10 000	100	10	100
Brassica napus L. var. *napobrassica* (L.) Rchb.*	10 000	100	10	100
Brassica nigra (L.) W.D.J.Koch	10 000	40	4	40
Brassica oleracea L. (all varieties)	10 000	100	10	100
Brassica rapa L. (includes *B. campestris* L.)	10 000	70	7	70
Bromus arvensis L.	10 000	60	6	60
(*Bromus carinatus* Hook. & Arn. see *Bromus carinatus* Hook. & Arn. var. *carinatus*)				
Bromus carinatus Hook. & Arn. var. *carinatus* (previously *Bromus carinatus* Hook. & Arn.)	10 000	200	20	200
Bromus carinatus Hook. & Arn. var. *marginatus* (Steud.) Barkworth & Anderton (previously *Bromus marginatus* Steud.)	10 000	200	20	200
Bromus catharticus Vahl	10 000	200	20	200
Bromus erectus Huds.	10 000	100	10	100
Bromus hordeaceus L.	10 000	50	5	50
Bromus inermis Leyss.	10 000	90	9	90
(*Bromus marginatus* Steud. see *Bromus carinatus* Hook. & Arn. var. *marginatus* (Steud.) Barkworth & Anderton)				
Bromus riparius Rehmann	10 000	90	9	90
Bromus sitchensis Trin.	10 000	200	20	200
Cajanus cajan (L.) Huth	20 000	1 000	300	1 000
Calopogonium mucunoides Desv.	20 000	400	40	400
Camelina sativa (L.) Crantz	10 000	40	4	40
Cannabis sativa L.	10 000	600	60	600
Capsicum spp.	10 000	150	15	150
Carthamus tinctorius L.	25 000	900	90	900
Carum carvi L.	10 000	80	8	80
Cenchrus ciliaris L. (fascicles)	10 000	60	6	60
(*Cenchrus setiger* Vahl see *Cenchrus setigerus* Vahl)				
Cenchrus setigerus Vahl (previously *Cenchrus setiger* Vahl)	20 000	150	15	150
Centrosema molle Mart. ex Benth.	20 000	600	60	600
Centrosema pascuorum Mart. ex Benth.	20 000	550	55	550
Chamaecrista rotundifolia (Pers.) Greene	10 000	100	10	100
Chenopodium quinoa Willd.	10 000	100	10	100
Chloris gayana Kunth	10 000	10	1	10
Cicer arietinum L.	30 000	1 000	1 000	1 000
Cichorium endivia L.	10 000	40	4	40
Cichorium intybus L.	10 000	50	5	50
Citrullus lanatus (Thunb.) Matsum. & Nakai	20 000	1 000	250	1 000
Claytonia perfoliata Donn ex Willd.	10 000	20	2	20
Corchorus capsularis L.	10 000	150	15	150
Corchorus olitorius L.	10 000	150	15	150

Table 2C Part 1. Lot sizes and sample sizes: agricultural and vegetable seeds (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working samples (g)	
			Purity analysis (3.5.1)	Other seeds by number (4.5.1)
1	2	3	4	5
Coriandrum sativum L.	10 000	400	40	400
(*Crambe abyssinica* Hochst. ex R.E.Fr. see *Crambe hispanica* L. subsp. *abyssinica* (Hochst. ex R.E.Fr.) Prina)				
Crambe hispanica L. subsp. *abyssinica* (Hochst. ex R.E.Fr.) Prina (previously *Crambe abyssinica* Hochst. ex R.E.Fr.)	10 000	200	20	200
Crotalaria brevidens Benth. (includes *Crotalaria intermedia* Kotschy)	10 000	150	15	150
Crotalaria juncea L.	10 000	700	70	700
Crotalaria lanceolata E.Mey.	10 000	70	7	70
Crotalaria pallida Aiton	10 000	150	15	150
Crotalaria spectabilis Roth	10 000	350	35	350
Cucumis melo L.	10 000	150	70	–
Cucumis sativus L.	10 000	150	70	–
Cucumis spp.	10 000	150	70	–
Cucurbita maxima Duchesne	20 000	1 000	700	1 000
Cucurbita moschata Duchesne	10 000	350	180	–
Cucurbita pepo L.	20 000	1 000	700	1 000
Cucurbita spp.	10 000	350	180	–
Cucurbita hybrids	10 000	350	180	–
Cuminum cyminum L.	10 000	60	6	60
Cyamopsis tetragonoloba (L.) Taub.	20 000	1 000	100	1 000
Cynara cardunculus L.	10 000	900	90	900
Cynodon dactylon (L.) Pers.	10 000	10	1	10
Cynosurus cristatus L.	10 000	20	2	20
Dactylis glomerata L.	10 000	30	3	30
Daucus carota L.	10 000	30	3	30
Deschampsia cespitosa (L.) P.Beauv.	10 000	10	1	10
(*Deschampsia flexuosa* (L.) Trin. see *Avenella flexuosa* (L.) Parl.)				
Desmodium intortum (Mill.) Urb.	10 000	40	4	40
Desmodium uncinatum (Jacq.) DC.	20 000	120	12	120
Dichanthium aristatum (Poir.) C.E.Hubb.	10 000	30	3	30
Dichondra micrantha Urb.	10 000	50	5	50
Digitaria eriantha Steud. (includes *Digitaria decumbens* Stent)	10 000	12	1.2	12
Echinochloa crus-galli (L.) P.Beauv.	10 000	80	8	80
Ehrharta calycina Sm.	10 000	40	4	40
Eleusine coracana (L.) Gaertn.	10 000	60	6	60
Elymus lanceolatus (Scribn. & J.G.Sm.) Gould	10 000	80	8	80
Elymus repens (L.) Gould (previously *Elytrigia repens* (L.) Desv. ex Nevski)	10 000	100	10	100
Elymus trachycaulus (Link) Gould ex Shinners	10 000	80	8	80
(*Elytrigia elongata* (Host) Nevski see *Thinopyrum elongatum* (Host) D.R.Dewey)				
(*Elytrigia intermedia* (Host) Nevski see *Thinopyrum intermedium* (Host) Barkworth & D.R.Dewey)				
(*Elytrigia repens* (L.) Desv. ex Nevski see *Elymus repens* (L.) Gould)				
Eragrostis curvula (Schrad.) Nees	10 000	10	1	10
Eragrostis tef (Zuccagni) Trotter	10 000	10	1	10
(*Eruca sativa* Mill. see *Eruca vesicaria* (L.) Cav. subsp. *sativa* (Mill.) Thell.)				

Table 2C Part 1. Lot sizes and sample sizes: agricultural and vegetable seeds (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working samples (g)	
			Purity analysis (3.5.1)	Other seeds by number (4.5.1)
1	2	3	4	5
Eruca vesicaria (L.) Cav. subsp. *sativa* (Mill.) Thell. (previously *Eruca sativa* Mill.)	10 000	40	4	40
Fagopyrum esculentum Moench	10 000	600	60	600
Festuca arundinacea Schreb.	10 000	50	5	50
Festuca filiformis Pourr.	10 000	25	2.5	25
Festuca heterophylla Lam.	10 000	60	6	60
Festuca ovina L. (all varieties)	10 000	25	2.5	25
Festuca pratensis Huds.	10 000	50	5	50
Festuca rubra L. s.l. (all varieties)	10 000	30	3	30
Festuca trachyphylla (Hack.) Hack. (synonym *Festuca brevipila* R.Tracey)	10 000	25	2.5	25
×*Festulolium* Asch. & Graebn.	10 000	60	6	60
Foeniculum vulgare Mill.	10 000	180	18	180
Fragaria spp.	10 000	10	1	10
Galega orientalis Lam.	10 000	200	20	200
Glycine max (L.) Merr.	30 000	1 000	500	1 000
Gossypium spp.	25 000	1 000	350	1 000
Hedysarum coronarium L. (fruit)	10 000	300	30	300
Hedysarum coronarium L. (seed)	10 000	120	12	120
Helianthus annuus L.	25 000	1 000	200	1 000
Hibiscus cannabinus L.	10 000	700	70	700
Holcus lanatus L.	10 000	10	1	10
Hordeum vulgare L. subsp. *vulgare* (previously *Hordeum vulgare* L.)	30 000	1 000	120	1 000
Ipomoea aquatica Forssk.	20 000	1 000	100	1 000
Koeleria macrantha (Ledeb.) Schult.	10 000	10	1	10
Kummerowia stipulacea (Maxim.) Makino	10 000	50	5	50
Kummerowia striata (Thunb.) Schindl.	10 000	40	4	40
Lablab purpureus (L.) Sweet	20 000	1 000	600	1 000
Lactuca sativa L.	10 000	30	3	30
Lagenaria siceraria (Molina) Standl.	20 000	1 000	500	1 000
Lathyrus cicera L.	20 000	1 000	140	1 000
Lathyrus hirsutus L.	10 000	700	70	700
Lathyrus sativus L.	20 000	1 000	450	1 000
Lens culinaris Medik.	30 000	600	60	600
Lepidium sativum L.	10 000	60	6	60
Lespedeza juncea (L. f.) Pers.	10 000	30	3	30
Leucaena leucocephala (Lam.) de Wit	20 000	1 000	100	1 000
Linum usitatissimum L.	10 000	150	15	150
Listia bainesii (Baker) B.-E.vanWyk & Boatwr.	10 000	10	1	10
Lolium ×*hybridum* Hausskn.	10 000	60	6	60
Lolium multiflorum Lam.	10 000	60	6	60
Lolium perenne L.	10 000	60	6	60
Lolium rigidum Gaudin	10 000	60	6	60
Lotus corniculatus L.	10 000	30	3	30
Lotus tenuis Waldst. & Kit. ex Willd.	10 000	30	3	30
Lotus uliginosus Schkuhr	10 000	20	2	20
Luffa acutangula (L.) Roxb.	20 000	1 000	400	1 000
Luffa aegyptiaca Mill.	20 000	1 000	250	1 000
Lupinus albus L.	30 000	1 000	450	1 000
Lupinus angustifolius L.	30 000	1 000	450	1 000

Table 2C Part 1. Lot sizes and sample sizes: agricultural and vegetable seeds (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working samples (g)	
			Purity analysis (3.5.1)	Other seeds by number (4.5.1)
1	2	3	4	5
Lupinus luteus L.	30 000	1 000	450	1 000
Macroptilium atropurpureum (DC.) Urb.	20 000	350	35	350
Macroptilium lathyroides (L.) Urb.	20 000	200	20	200
Macrotyloma axillare (E.Mey.) Verdc.	20 000	250	25	250
Macrotyloma uniflorum (Lam.) Verdc.	20 000	800	80	800
Medicago arabica (L.) Huds. (in burr)	10 000	600	60	600
Medicago arabica (L.) Huds. (out of burr)	10 000	50	5	50
Medicago italica (Mill.) Fiori (includes *Medicago tornata* (L.) Mill.)	10 000	100	10	100
Medicago littoralis Rohde ex Loisel.	10 000	70	7	70
Medicago lupulina L.	10 000	50	5	50
Medicago orbicularis (L.) Bartal.	10 000	80	8	80
Medicago polymorpha L.	10 000	70	7	70
Medicago rugosa Desr.	10 000	180	18	180
Medicago sativa L.	10 000	50	5	50
Medicago scutellata (L.) Mill.	10 000	400	40	400
Medicago truncatula Gaertn.	10 000	100	10	100
Megathyrsus maximus (Jacq.) B.K.Simon & S.W.L.Jacobs (previously *Panicum maximum* Jacq.)	10 000	20	2	20
Melilotus albus Medik.	10 000	50	5	50
Melilotus indicus (L.) All.	10 000	50	5	50
Melilotus officinalis (L.) Lam.	10 000	50	5	50
Melinis minutiflora P.Beauv.	10 000	5	0.5	5
Momordica charantia L.	20 000	1 000	450	1 000
Mucuna pruriens (L.) DC.	20 000	1 000	1 000	1 000
Nasturtium officinale W.T.Aiton	10 000	5	0.5	5
Neonotonia wightii (Wight & Arn.) J.A.Lackey	10 000	150	15	150
Neustanthus phaseoloides (Roxb.) Benth. (previously *Pueraria phaseoloides* (Roxb.) Benth.)	20 000	300	30	300
Nicotiana tabacum L.	10 000	5	0.5	5
Ocimum basilicum L.	10 000	40	4	40
Oenothera biennis L.	10 000	10	1	10
Oloptum miliaceum (L.) Röser & Hamasha (previously *Piptatherum miliaceum* (L.) Coss.)	10 000	20	2	20
Onobrychis viciifolia Scop. (fruit)	10 000	600	60	600
Onobrychis viciifolia Scop. (seed)	10 000	400	40	400
Origanum majorana L.	10 000	5	0.5	5
Origanum vulgare L.	10 000	5	0.5	5
Ornithopus compressus L.	10 000	120	12	120
Ornithopus sativus Brot.	10 000	90	9	90
Oryza sativa L.	30 000	700	70	700
Panicum antidotale Retz.	10 000	20	2	20
Panicum coloratum L.	10 000	20	2	20
(*Panicum maximum* Jacq. see *Megathyrsus maximus* (Jacq.) B.K.Simon & S.W.L.Jacobs)				
Panicum miliaceum L.	10 000	150	15	150
Panicum virgatum L.	10 000	30	3	30
Papaver somniferum L.	10 000	10	1	10
Pascopyrum smithii (Rydb.) Barkworth & D.R.Dewey	10 000	150	15	150
Paspalum dilatatum Poir.	10 000	50	5	50
Paspalum notatum Flüggé	10 000	70	7	70
Paspalum plicatulum Michx.	10 000	40	4	40

Table 2C Part 1. Lot sizes and sample sizes: agricultural and vegetable seeds (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working samples (g)	
			Purity analysis (3.5.1)	Other seeds by number (4.5.1)
1	2	3	4	5
Paspalum scrobiculatum L.	10 000	80	8	80
Paspalum urvillei Steud.	10 000	30	3	30
Paspalum virgatum L.	10 000	30	3	30
Pastinaca sativa L.	10 000	100	10	100
Pennisetum clandestinum Hochst. ex Chiov.	10 000	70	7	70
Pennisetum glaucum (L.) R.Br.	10 000	150	15	150
Petroselinum crispum (Mill.) Fuss	10 000	40	4	40
Phacelia tanacetifolia Benth.	10 000	50	5	50
Phalaris aquatica L.	10 000	40	4	40
Phalaris arundinacea L.	10 000	30	3	30
Phalaris canariensis L.	10 000	200	20	200
Phaseolus coccineus L.	30 000	1 000	1 000	1 000
Phaseolus lunatus L.	30 000	1 000	1 000	1 000
Phaseolus vulgaris L.	30 000	1 000	700	1 000
Phleum nodosum L.	10 000	10	1	10
Phleum pratense L.	10 000	10	1	10
Physalis pubescens L.	10 000	20	2	20
Pimpinella anisum L.	10 000	70	7	70
(*Piptatherum miliaceum* (L.) Coss. see *Oloptum miliaceum* (L.) Röser & Hamasha)				
Pisum sativum L. s.l.	30 000	1 000	900	1 000
Plantago lanceolata L.	10 000	60	6	60
Poa annua L.	10 000	10	1	10
Poa bulbosa L.	10 000	30	3	30
Poa compressa L.	10 000	5	0.5	5
Poa nemoralis L.	10 000	5	0.5	5
Poa palustris L.	10 000	5	0.5	5
Poa pratensis L.	10 000	5	1	5
Poa secunda J.Presl (includes *Poa ampla* Merr.)	10 000	15	1.5	15
Poa trivialis L.	10 000	5	1	5
Portulaca oleracea L.	10 000	5	0.5	5
Psathyrostachys juncea (Fisch.) Nevski	10 000	60	6	60
Pseudoroegneria spicata (Pursh) Á.Löve	10 000	80	8	80
Psophocarpus tetragonolobus (L.) DC.	20 000	1 000	1 000	1 000
(*Pueraria lobata* (Willd.) Ohwi see *Pueraria montana* (Lour.) Merr. var. *lobata* (Willd.) Maesen & S.M.Almeida ex Sanjappa & Predeep)				
Pueraria montana (Lour.) Merr. var. *lobata* (Willd.) Maesen & S.M.Almeida ex Sanjappa & Predeep (previously *Pueraria lobata* (Willd.) Ohwi)	10 000	350	35	350
(*Pueraria phaseoloides* (Roxb.) Benth. see *Neustanthus phaseoloides* (Roxb.) Benth.)				
Raphanus sativus L.	10 000	300	30	300
Rheum ×rhabarbarum auct., non L. (previously *Rheum rhaponticum* L.)	10 000	450	45	450
(*Rheum rhaponticum* L. see *Rheum ×rhabarbarum* auct., non L.)				
Ricinus communis L.	20 000	1 000	500	1 000
Rosmarinus officinalis L.	10 000	30	3	30
Rumex acetosa L.	10 000	30	3	30
Salvia hispanica L.	10 000	35	3.5	35
Sanguisorba minor Scop.	10 000	250	25	250

Table 2C Part 1. Lot sizes and sample sizes: agricultural and vegetable seeds (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working samples (g)	
			Purity analysis (3.5.1)	Other seeds by number (4.5.1)
1	2	3	4	5
Satureja hortensis L.	10 000	20	2	20
Schizachyrium scoparium (Michx.) Nash	10 000	50	5	50
Scorzonera hispanica L.	10 000	300	30	300
Secale cereale L.	30 000	1 000	120	1 000
Securigera varia (L.) Lassen	10 000	100	10	100
Sesamum indicum L.	10 000	70	7	70
Setaria italica (L.) P.Beauv.	10 000	90	9	90
Setaria sphacelata (Schumach.) Stapf & C.E.Hubb.	10 000	30	3	30
Sinapis alba L.	10 000	200	20	200
Solanum (sect. *Lycopersicon*) spp.	200	15	7	–
Solanum (sect. *Lycopersicon*) hybrids	200	15	7	–
Solanum lycopersicum L.	200	15	7	–
Solanum melongena L.	10 000	150	15	150
Solanum nigrum L.	10 000	25	2.5	25
Solanum tuberosum L.	10 000	25	10	–
Sorghastrum nutans (L.) Nash	10 000	70	7	70
Sorghum ×*almum* Parodi	30 000	200	20	200
(*Sorghum bicolor* (L.) Moench see *Sorghum bicolor* (L.) Moench subsp. *bicolor*)				
Sorghum bicolor (L.) Moench subsp. *bicolor* (previously *Sorghum bicolor* (L.) Moench)	30 000	900	90	900
Sorghum bicolor (L.) Moench subsp. *drummondii* (Steud.) de Wet ex Davidse (previously *Sorghum sudanense* (Piper) Stapf)	10 000	250	25	250
Sorghum bicolor (L.) Moench × *S. sudanense* (Piper) Stapf	30 000	300	30	300
Sorghum halepense (L.) Pers.	10 000	90	9	90
(*Sorghum sudanense* (Piper) Stapf see *Sorghum bicolor* (L.) Moench subsp. *drummondii* (Steud.) de Wet ex Davidse)				
Spergula arvensis L.	10 000	40	4	40
Spinacia oleracea L.	10 000	250	25	250
Stylosanthes guianensis (Aubl.) Sw.	10 000	70	7	70
Stylosanthes hamata (L.) Taub.	10 000	70	7	70
Stylosanthes humilis Kunth	10 000	70	7	70
Stylosanthes scabra Vogel	10 000	80	8	80
Taraxacum officinale F.H.Wigg., s.l.	10 000	30	3	30
Tetragonia tetragonoides (Pall.) Kuntze	20 000	1 000	200	1 000
Thinopyrum elongatum (Host) D.R.Dewey (previously *Elytrigia elongata* (Host) Nevs)	10 000	200	20	200
Thinopyrum intermedium (Host) Barkworth & D.R.Dewey (previously *Elytrigia intermedia* (Host) Nevski)	10 000	150	15	150
Thymus vulgaris L.	10 000	5	0.5	5
Tragopogon porrifolius L.	10 000	400	40	400
Trifolium alexandrinum L.	10 000	60	6	60
Trifolium campestre Schreb.	10 000	5	0.5	5
Trifolium dubium Sibth.	10 000	20	2	20
Trifolium fragiferum L.	10 000	40	4	40
Trifolium glomeratum L.	10 000	10	1	10
Trifolium hirtum All.	10 000	70	7	70
Trifolium hybridum L.	10 000	20	2	20
Trifolium incarnatum L.	10 000	80	8	80
Trifolium lappaceum L.	10 000	20	2	20

Table 2C Part 1. Lot sizes and sample sizes: agricultural and vegetable seeds (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working samples (g)	
			Purity analysis (3.5.1)	Other seeds by number (4.5.1)
1	2	3	4	5
Trifolium michelianum Savi (includes *Trifolium balansae* Boiss.)	10 000	20	2	20
Trifolium pratense L.	10 000	50	5	50
Trifolium repens L.	10 000	20	2	20
Trifolium resupinatum L.	10 000	20	2	20
Trifolium semipilosum Fresen.	10 000	20	2	20
Trifolium squarrosum L.	10 000	150	15	150
Trifolium subterraneum L.	10 000	250	25	250
Trifolium vesiculosum Savi	10 000	30	3	30
Trigonella foenum-graecum L.	10 000	450	45	450
Trisetum flavescens (L.) P.Beauv.	10 000	5	0.5	5
×*Triticosecale Wittm.* ex A.Camus	30 000	1 000	120	1 000
(*Triticum aestivum* L. see *Triticum aestivum* L. subsp. *aestivum*)				
Triticum aestivum L. subsp. *aestivum* (previously *Triticum aestivum* L.)	30 000	1 000	120	1 000
Triticum aestivum L. subsp. *spelta* (L.) Thell. (previously *Triticum spelta* L.)	30 000	1 000	270	1 000
(*Triticum dicoccon* Schrank see *Triticum turgidum* L. subsp. *dicoccon* (Schrank) Thell.)				
(*Triticum durum* Desf. see *Triticum turgidum* L. subsp. *durum* (Desf.) van Slageren)				
(*Triticum spelta* L. see *Triticum aestivum* L. subsp. *spelta* (L.) Thell.)				
Triticum turgidum L. subsp. *dicoccon* (Schrank) Thell. (previously *Triticum dicoccon* Schrank)	30 000	1 000	270	1 000
Triticum turgidum L. subsp. *durum* (Desf.) van Slageren (previously *Triticum durum* Desf.)	30 000	1 000	120	1 000
Urochloa brizantha (Hochst. ex A.Rich.) R.D.Webster (previously *Brachiaria brizantha* (Hochst. ex A.Rich.) Stapf)	10 000	100	10	100
Urochloa decumbens (Stapf) R.D.Webster (previously *Brachiaria decumbens* Stapf)	10 000	100	10	100
Urochloa humidicola (Rendle) Morrone & Zuloaga (previously *Brachiaria humidicola* (Rendle) Schweick.)	10 000	100	10	100
Urochloa mosambicensis (Hack.) Dandy	10 000	30	3	30
Urochloa mutica (Forssk.) T.Q.Nguyen (previously *Brachiaria mutica* (Forssk.) Stapf)	10 000	30	3	30
Urochloa ramosa (L.) T.Q.Nguyen (previously *Brachiaria ramosa* (L.) Stapf)	10 000	90	9	90
Urochloa ruziziensis (R.Germ. & C.M.Evrard) Crins (previously *Brachiaria ruziziensis* R.Germ. & C.M.Evrard)	20 000	150	15	150
Valerianella locusta (L.) Laterr.	10 000	70	7	70
Vicia benghalensis L.	30 000	1 000	120	1 000
Vicia ervilia (L.) Willd.	30 000	1 000	120	1 000
Vicia faba L.	30 000	1 000	1 000	1 000
Vicia narbonensis L.	30 000	1 000	600	1 000
Vicia pannonica Crantz	30 000	1 000	120	1 000
Vicia sativa L. (includes *V. angustifolia* L.)	30 000	1 000	140	1 000
Vicia villosa Roth (includes *V. dasycarpa* Ten.)	30 000	1 000	100	1 000
Vigna angularis (Willd.) Ohwi & H.Ohashi	30 000	1 000	250	1 000
Vigna marina (Burm.) Merr.	30 000	800	80	800

Table 2C Part 1. Lot sizes and sample sizes: agricultural and vegetable seeds (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working samples (g)	
			Purity analysis (3.5.1)	Other seeds by number (4.5.1)
1	2	3	4	5
Vigna mungo (L.) Hepper	30 000	1 000	700	1 000
Vigna radiata (L.) R.Wilczek	30 000	1 000	120	1 000
Vigna subterranea (L.) Verdc.	30 000	1 000	500	1 000
Vigna unguiculata (L.) Walp.	30 000	1 000	400	1 000
Zea mays L.	40 000	1 000	900	1 000
Zoysia japonica Steud.	10 000	10	1	10

Table 2C Part 2. Lot sizes and sample sizes: tree and shrub seeds

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working sample for purity analysis (3.5.1) (g)
1	2	3	4
Abies alba Mill.	1 000	240	120
Abies amabilis Douglas ex J.Forbes	1 000	200	100
Abies balsamea (L.) Mill.	1 000	40	20
Abies cephalonica Loudon	1 000	360	180
Abies cilicica (Antoine & Kotschy) Carrière	1 000	1 000	500
Abies concolor (Gordon & Glend.) Lindl. ex Hildebr.	1 000	160	80
Abies firma Siebold & Zucc.	1 000	200	100
Abies fraseri (Pursh) Poir.	1 000	40	20
Abies grandis (Douglas ex D.Don) Lindl.	1 000	100	50
Abies homolepis Siebold & Zucc.	1 000	80	40
Abies lasiocarpa (Hook.) Nutt.	1 000	50	25
Abies magnifica A.Murray bis	1 000	400	200
Abies nordmanniana (Steven) Spach	1 000	360	180
Abies numidica de Lannoy ex Carrière	1 000	500	250
Abies pinsapo Boiss.	1 000	320	160
Abies procera Rehder	1 000	160	80
Abies sachalinensis (F.Schmidt) Mast.	1 000	60	30
Abies veitchii Lindl.	1 000	40	20
Acacia spp.	1 000	70	35
Acer campestre L.	1 000	400	200
Acer negundo L.	500	200	100
Acer palmatum Thunb.	500	100	50
Acer platanoides L.	500	700	350
Acer pseudoplatanus L.	500	600	300
Acer rubrum L.	500	100	50
Acer saccharinum L.	500	1 000	500
Acer saccharum Marshall	500	360	180
Aesculus hippocastanum L.	5 000	500 seeds	500 seeds
Ailanthus altissima (Mill.) Swingle	1 000	160	80
Alnus cordata (Loisel.) Duby	1 000	12	6
Alnus glutinosa (L.) Gaertn.	1 000	8	4
Alnus incana (L.) Moench	1 000	4	2
Alnus rubra Bong.	1 000	4	2
Amorpha fruticosa L.	1 000	1 000	150
Berberis aquifolium Pursh	1 000	60	30

Table 2C Part 2. Lot sizes and sample sizes: tree and shrub seeds (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working sample for purity analysis (3.5.1) (g)
1	2	3	4
Betula papyrifera Marshall	300	10	3
Betula pendula Roth	300	10	1
Betula pubescens Ehrh.	300	10	1
Calocedrus decurrens (Torr.) Florin	300	160	80
Caragana arborescens Lam.	1 000	160	80
Carica papaya L.	1 000	100	50
Carpinus betulus L.	1 000	500	250
Castanea sativa Mill.	5 000	500 seeds	500 seeds
Catalpa spp.*	1 000	120	60
Cedrela spp.	1 000	80	40
Cedrus atlantica (Endl.) G.Manetti ex Carrière	1 000	400	200
Cedrus deodara (Roxb. ex D.Don) G.Don	1 000	600	300
Cedrus libani A.Rich.	1 000	400	200
Chamaecyparis lawsoniana A.Murray bis) Parl.	1 000	20	6
(*Chamaecyparis nootkatensis* (D.Don) Spach see *Cupressus nootkatensis* D.Don)			
Chamaecyparis obtusa (Siebold & Zucc.) Endl.	1 000	12	6
Chamaecyparis pisifera (Siebold & Zucc.) Endl.	1 000	10	3
Chamaecyparis thyoides (L.) Britton *et al.*	1 000	10	3
Cornus mas L.	1 000	1 000	600
Cornus sanguinea L.	1 000	300	150
Corylus avellana L.	5 000	500 fruits	500 fruits
Corymbia citriodora (Hook.) K.D.Hill & L.A.S.Johnson	1 000	40	15
Corymbia ficifolia (F.Muell.) K.D.Hill & L.A.S.Johnson	1 000	40	15
Corymbia maculata (Hook.) K.D.Hill & L.A.S.Johnson	1 000	40	15
Cotoneaster spp.*	1 000	40	20
Crataegus monogyna Jacq.	1 000	400	200
Cryptomeria japonica (L. f.) D.Don	1 000	20	10
Cupressus arizonica Greene	1 000	60	30
Cupressus macrocarpa Hartw.	1 000	40	20
Cupressus nootkatensis D.Don (previously *Chamaecyparis nootkatensis* (D.Don) Spach)	1 000	20	10
Cupressus sempervirens L.	1 000	40	20
Cydonia oblonga Mill.	1 000	50	25
Cytisus scoparius (L.) Link	1 000	40	20
Elaeagnus angustifolia L.	1 000	800	400
Eucalyptus astringens (Maiden) Maiden	1 000	40	15
Eucalyptus botryoides Sm.	1 000	15	5
Eucalyptus bridgesiana R.T.Baker	1 000	30	10
Eucalyptus camaldulensis Dehnh.	1 000	15	5
Eucalyptus cinerea F.Muell. ex Benth.	1 000	30	10
Eucalyptus cladocalyx F.Muell.	1 000	40	15
Eucalyptus cloeziana F.Muell.	1 000	40	15
Eucalyptus cypellocarpa L.A.S.Johnson	1 000	30	10
Eucalyptus dalrympleana Maiden	1 000	30	10
Eucalyptus deanei Maiden	1 000	15	5
Eucalyptus deglupta Blume	1 000	10	2
Eucalyptus delegatensis R.T.Baker	1 000	40	15
Eucalyptus elata Dehnh.	1 000	40	15
Eucalyptus fastigata H.Deane & Maiden	1 000	40	15
Eucalyptus glaucescens Maiden & Blakely	1 000	40	15
Eucalyptus globulus Labill. (includes *E. maidenii* F.Muell. and *E. saint-johnii* (R.T.Baker) R.T.Baker)	1 000	60	20
Eucalyptus grandis W.Hill ex Maiden	1 000	15	5

Table 2C Part 2. Lot sizes and sample sizes: tree and shrub seeds (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working sample for purity analysis (3.5.1) (g)
1	2	3	4
Eucalyptus gunnii Hook. f.	1 000	15	5
Eucalyptus largiflorens F.Muell.	1 000	15	5
Eucalyptus leucoxylon F.Muell.	1 000	30	10
Eucalyptus macrorhyncha F.Muell. ex Benth.	1 000	40	15
Eucalyptus mannifera Mudie	1 000	15	5
Eucalyptus melliodora A.Cunn. ex Schauer	1 000	30	10
Eucalyptus microtheca F.Muell.	1 000	15	5
Eucalyptus moluccana Roxb.	1 000	30	10
Eucalyptus muelleriana A.W.Howitt	1 000	60	20
Eucalyptus nitens (H.Deane & Maiden) Maiden	1 000	30	10
Eucalyptus pauciflora Sieber ex Spreng. (includes *E. niphophila* Maiden & Blakely)	1 000	60	20
Eucalyptus pilularis Sm.	1 000	60	20
Eucalyptus polybractea R.T.Baker	1 000	60	20
Eucalyptus radiata Sieber ex DC.	1 000	40	15
Eucalyptus regnans F.Muell.	1 000	30	10
Eucalyptus resinifera Sm.	1 000	30	10
Eucalyptus robusta Sm.	1 000	15	5
Eucalyptus rudis Endl.	1 000	15	5
Eucalyptus saligna Sm.	1 000	15	5
Eucalyptus sideroxylon A.Cunn. ex Woolls	1 000	30	10
Eucalyptus sieberi L.A.S.Johnson	1 000	40	15
Eucalyptus smithii R.T.Baker	1 000	30	10
Eucalyptus tereticornis Sm.	1 000	15	5
Eucalyptus viminalis Labill.	1 000	30	10
Euonymus europaeus L.	1 000	200	100
Fagus sylvatica L.	5 000	1 000	600
Fraxinus spp.	1 000	400	200
Ginkgo biloba L.	5 000	500 seeds	500 seeds
Gleditsia triacanthos L.	1 000	800	400
Ilex aquifolium L.	1 000	200	90
Juniperus communis L. (berries)	1 000	300	150
Juniperus communis L. (seeds)	1 000	40	20
Juniperus scopulorum Sarg.	1 000	70	35
Juniperus virginiana L.	1 000	100	50
Koelreuteria paniculata Laxm.	1 000	800	400
Laburnum alpinum (Mill.) J.Presl	1 000	140	70
Laburnum anagyroides Medik.	1 000	140	70
Larix decidua Mill.	1 000	35	17
(*Larix* ×*eurolepis* A.Henry see *Larix* ×*marschlinsii* Coaz)			
Larix gmelinii (Rupr.) Rupr.	1 000	25	10
Larix kaempferi (Lamb.) Carrière	1 000	24	10
Larix laricina (D.Roi) K.Koch	1 000	25	10
Larix ×*marschlinsii* Coaz (previously *Larix* ×*eurolepis* A.Henry)	1 000	35	16
Larix occidentalis Nutt.	1 000	25	10
Larix sibirica Ledeb.	1 000	25	10
Ligustrum vulgare L.	1 000	100	50
Liquidambar styraciflua L.	300	30	15
Liriodendron tulipifera L.	1 000	180	90
Malus spp. (except *M. sargentii, M. sylvestris*)	1 000	50	25
Malus sargentii Rehder	1 000	24	12
Malus sylvestris (L.) Mill.	1 000	160	80
Morus spp.	1 000	20	5

Table 2C Part 2. Lot sizes and sample sizes: tree and shrub seeds (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working sample for purity analysis (3.5.1) (g)
1	2	3	4
Nothofagus alpina (Poepp. & Endl.) Oerst.	1 000	50	25
Nothofagus obliqua (Mirb.) Blume	1 000	60	30
Picea abies (L.) H.Karst.	1 000	40	20
Picea engelmannii Engelm.	1 000	16	8
Picea glauca (Moench) Voss	1 000	10	5
Picea glehnii (F.Schmidt) Mast.	1 000	25	9
Picea jezoensis (Siebold & Zucc.) Carrière	1 000	25	7
Picea koyamae Shiras.	1 000	25	9
Picea mariana (Mill.) Britton *et al.*	1 000	6	3
Picea omorika (Pančić) Purk.	1 000	25	8
Picea orientalis (L.) Link	1 000	30	15
Picea polita (Siebold & Zucc.) Carrière	1 000	80	40
Picea pungens Engelm.	1 000	30	15
Picea rubens Sarg.	1 000	25	9
Picea sitchensis (Bong.) Carrière	1 000	12	6
Pinus albicaulis Engelm.	1 000	700	350
Pinus aristata Engelm.	1 000	100	50
Pinus banksiana Lamb.	1 000	25	9
Pinus brutia Ten.	1 000	100	50
Pinus canariensis C.Sm.	1 000	60	30
Pinus caribaea Morelet	1 000	100	50
Pinus cembra L.	1 000	1 000	700
Pinus cembroides Zucc.	1 000	1 000	700
Pinus clausa (Chapm. ex Engelm.) Vasey ex Sarg.	1 000	40	20
Pinus contorta Douglas ex Loudon	1 000	25	9
Pinus coulteri D.Don	1 000	1 000	900
Pinus densiflora Siebold & Zucc.	1 000	60	30
Pinus echinata Mill.	1 000	50	25
Pinus edulis Engelm.	1 000	1 000	700
Pinus elliottii Engelm.	1 000	160	80
Pinus flexilis E.James	1 000	500	250
Pinus glabra Walter	1 000	80	40
Pinus halepensis Mill.	1 000	100	50
Pinus heldreichii Christ	1 000	120	60
Pinus jeffreyi A.Murray bis *et al.*	1 000	600	300
Pinus kesiya Royle ex Gordon ('*khasya*')	1 000	80	40
Pinus koraiensis Siebold & Zucc.	1 000	2 000	1 000
Pinus lambertiana Douglas	1 000	1 000	500
Pinus merkusii Jungh. & de Vriese	1 000	120	60
Pinus monticola Douglas ex D.Don	1 000	90	45
Pinus mugo Turra	1 000	40	20
Pinus muricata D.Don	1 000	50	25
Pinus nigra J.F.Arnold	1 000	100	50
Pinus oocarpa Schiede ex Schltdl.	1 000	70	35
Pinus palustris Mill.	1 000	500	250
Pinus parviflora Siebold & Zucc.	1 000	500	250
Pinus patula Schltdl. & Cham.	1 000	40	20
Pinus peuce Griseb.	1 000	240	120
Pinus pinaster Aiton	1 000	240	120
Pinus pinea L.	1 000	1 000	1 000
Pinus ponderosa P.Lawson & C.Lawson	1 000	200	100
Pinus pumila (Pall.) Regel	1 000	40	20
Pinus radiata D.Don	1 000	160	80
Pinus resinosa Aiton	1 000	50	25
Pinus rigida Mill.	1 000	40	20
Pinus strobus L.	1 000	90	45

Table 2C Part 2. Lot sizes and sample sizes: tree and shrub seeds (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working sample for purity analysis (3.5.1) (g)
1	2	3	4
Pinus sylvestris L.	1 000	40	20
Pinus tabuliformis Carrière	1 000	100	50
Pinus taeda L.	1 000	140	70
Pinus taiwanensis Hayata	1 000	100	50
Pinus thunbergii Parl.	1 000	70	35
Pinus virginiana Mill.	1 000	50	25
Pinus wallichiana A.B.Jacks.	1 000	250	125
Platanus spp.	1 000	25	6
Platycladus orientalis (L.) Franco	1 000	120	60
Populus spp.	50	5	2
Prunus avium (L.) L.	1 000	900	450
Prunus padus L.	1 000	360	180
Prunus persica (L.) Batsch	5 000	500 seeds	500 seeds
Prunus serotina Ehrh.	1 000	500	250
Prunus spp. (TSW ≤ 200 g)	1 000	1 000	500
Prunus spp. (TSW > 200 g)	1 000	500 seeds	500 seeds
Pseudotsuga menziesii (Mirb.) Franco	1 000	60	30
Pyrus spp.	1 000	180	90
Quercus spp.	5 000	500 seeds	500 seeds
Robinia pseudoacacia L.	1 000	100	50
Rosa spp.	1 000	50	25
Salix spp.	50	5	2
Senegalia spp.	1 000	70	35
Sequoia sempervirens (D.Don) Endl.	1 000	25	12
Sequoiadendron giganteum (Lindl.) J.Buchholz	1 000	25	12
Sorbus spp.	1 000	25	10
Spartium junceum L.	1 000	40	20
Styphnolobium japonicum (L.) Schott	1 000	100	50
Syringa spp.	1 000	30	15
Taxodium distichum (L.) Rich.	300	500	250
Taxus spp.	1 000	320	160
Tectona grandis L. f.	1 000	2 000	1 000
Thuja occidentalis L.	1 000	25	4
Thuja plicata Donn ex D.Don	1 000	10	3
Tilia cordata Mill.	1 000	180	90
Tilia platyphyllos Scop.	1 000	500	250
Tsuga canadensis (L.) Carrière	1 000	25	7
Tsuga heterophylla (Raf.) Sarg.	1 000	10	4
Ulmus americana L.	1 000	30	15
Ulmus parvifolia Jacq.	1 000	20	8
Ulmus pumila L.	1 000	30	15
Vachellia spp.	1 000	70	35
Viburnum opulus L.	1 000	160	80
Zelkova serrata (Thunb.) Makino	1 000	60	30

Table 2C Part 3. Lot sizes and sample sizes: flower, spice, herb and medicinal species

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working sample for purity analysis (3.5.1) (g)
1	2	3	4
Abutilon ×*hybridum* hort. ex Voss	5 000	40	10
Achillea clavennae L.	5 000	5	0.5
Achillea filipendulina Lam.	5 000	5	0.5
Achillea ptarmica L.	5 000	5	0.5
Achillea umbellata Sm.	5 000	5	0.5
Adonis vernalis L.	5 000	20	5
Ageratum houstonianum Mill.	5 000	5	0.5
Agrimonia eupatoria L.	5 000	200	50
Alcea rosea L.	5 000	80	20
Althaea hybrids	5 000	80	20
Althaea officinalis L.	5 000	80	20
Alyssum argenteum All.	5 000	10	3
Alyssum montanum L.	5 000	10	3
Amaranthus caudatus L.	5 000	10	2
Amaranthus cruentus L.	5 000	10	2
Amaranthus hybridus L.	5 000	10	2
Amaranthus tricolor L.	5 000	10	2
Amberboa moschata (L.) DC.	5 000	40	10
Ammobium alatum R.Br.	5 000	5	1
(*Anagallis arvensis* L. see *Lysimachia arvensis* (L.) U.Manns & Anderb.)			
Anchusa azurea Mill.	5 000	100	25
Anchusa capensis Thunb.	5 000	40	10
Anemone coronaria L.	5 000	10	3
Anemone pulsatilla L.	5 000	10	3
Anemone sylvestris L.	5 000	10	3
Angelica archangelica L.	5 000	40	10
Antirrhinum majus L.	5 000	5	0.5
Aquilegia alpina L.	5 000	20	4
Aquilegia canadensis L.	5 000	20	4
Aquilegia chrysantha A.Gray	5 000	20	4
Aquilegia ×*cultorum* Bergmans	5 000	20	4
Aquilegia vulgaris L.	5 000	20	4
(*Arabis alpina* L. see *Arabis alpina* L. subsp. *alpina*)			
Arabis alpina L. subsp. *alpina* (previously *Arabis alpina* L.)	5 000	10	2
Arabis alpina L. subsp. *caucasica* (Willd.) Briq. (previously *Arabis caucasica* Willd.)	5 000	10	2
Arabis ×*arendsii* H.R.Wehrh.	5 000	10	2
Arabis blepharophylla Hook. & Arn.	5 000	10	2
(*Arabis caucasica* Willd. see *Arabis alpina* L. subsp. *caucasica* (Willd.) Briq.)			
Arabis procurrens Waldst. & Kit.	5 000	10	2
Arabis scopoliana Boiss.	5 000	10	2
(*Arctotis stoechadifolia* P.J.Bergius see *Arctotis venusta* Norl.)			
Arctotis venusta Norl. (previously *Arctotis stoechadifolia* P.J.Bergius)	5 000	20	4
Armeria maritima (Mill.) Willd.	5 000	20	5
Artemisia absinthium L.	5 000	5	0.5
Artemisia dracunculus L.	5 000	5	0.5
Artemisia maritima L.	5 000	5	0.5
Artemisia vulgaris L.	5 000	5	0.5
Asclepias tuberosa L.	5 000	130	13
Asparagus aethiopicus L.	10 000	200	60

Table 2C Part 3. Lot sizes and sample sizes: flower, spice, herb and medicinal species (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working sample for purity analysis (3.5.1) (g)
1	2	3	4
Asparagus plumosus L.	10 000	200	50
Aster alpinus L.	5 000	20	5
Aster amellus L.	5 000	20	5
(*Aster dumosus* L. see *Symphyotrichum dumosum* (L.) G.L.Nesom)			
Aubrieta deltoidea (L.) DC. (includes *A. graeca* Griseb.)	5 000	5	1
Aurinia saxatilis (L.) Desv.	5 000	10	3
Bassia scoparia (L.) A.J.Scott	5 000	10	3
Begonia Semperflorens-Cultorum Group	5 000	5	0.1
Begonia ×*tuberhybrida* Voss	5 000	5	0.1
Bellis perennis L.	5 000	5	0.5
Betonica macrantha K.Koch (previously *Stachys macrantha* (K.Koch) Stearn)	5 000	20	5
Brachyscome iberidifolia Benth.	5 000	5	0.3
Briza maxima L.	5 000	40	10
Browallia viscosa Kunth	5 000	5	0.5
Brunnera macrophylla (Adams) I.M.Johnst.	5 000	40	10
Calceolaria ×*herbeohybrida* Voss	5 000	5	0.1
Calceolaria polyrrhiza Cav.	5 000	5	0.1
Calendula officinalis L.	5 000	80	20
Callistephus chinensis (L.) Nees	5 000	20	6
Campanula carpatica Jacq.	5 000	5	0.2
Campanula fragilis Cirillo	5 000	5	1
Campanula garganica Ten.	5 000	5	0.5
Campanula glomerata L.	5 000	5	0.2
Campanula lactiflora M.Bieb.	5 000	5	1
Campanula medium L.	5 000	5	0.6
Campanula persicifolia L.	5 000	5	0.2
Campanula portenschlagiana Schult.	5 000	5	0.5
Campanula pyramidalis L.	5 000	5	1
Campanula rapunculus L.	5 000	5	1
Celosia argentea L.	5 000	10	2
Centaurea benedicta (L.) L.	5 000	300	75
Centaurea cyanus L.	5 000	40	10
Centaurea gymnocarpa Moris & D.Not.	5 000	40	10
Centaurea imperialis Hausskn. ex Bornm.	5 000	40	10
Centaurea macrocephala Muss. Puschk. ex Willd.	5 000	40	10
Centaurea montana L.	5 000	40	10
Centaurea ragusina L.	5 000	40	10
Cerastium tomentosum L.	5 000	10	2
Chelidonium majus L.	5 000	5	1
Chrysanthemum indicum L.	5 000	30	8
Clarkia amoena (Lehm.) A.Nelson & J.F.Macbr.	5 000	5	1
Clarkia pulchella Pursh	5 000	5	1
Clarkia unguiculata Lindl.	5 000	5	1
Cleome hassleriana Chodat	5 000	20	5
Cleretum bellidiforme (Burm. f.) G.D.Rowley (previously *Dorotheanthus bellidiformis* (Burm. f.) N.E.Br.)	5 000	5	0.5
Cobaea scandens Cav.	5 000	200	50
Coix lacryma-jobi L.	5 000	600	150
Coleostephus multicaulis (Desf.) Durieu	5 000	30	8
Consolida ajacis (L.) Schur	5 000	30	8
Consolida regalis Gray	5 000	30	8

Table 2C Part 3. Lot sizes and sample sizes: flower, spice, herb and medicinal species (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working sample for purity analysis (3.5.1) (g)
1	2	3	4
Convolvulus tricolor L.	5 000	100	25
Coreopsis basalis (A.Dietr.) S.F.Blake (includes *C. drummondii* (D.Don) Torr. & A.Gray)	5 000	20	5
Coreopsis lanceolata L.	5 000	20	5
Coreopsis maritima (Nutt.) Hook. f.	5 000	5	1
Coreopsis tinctoria Nutt.	5 000	5	1
Cosmos bipinnatus Cav.	5 000	80	20
Cosmos sulphureus Cav.	5 000	80	20
Cyclamen persicum Mill.	5 000	100	30
Cymbalaria muralis G.Gaertn. *et al.*	5 000	5	0.2
Cynoglossum amabile Stapf & J.R.Drumm.	5 000	40	10
Dahlia pinnata Cav.	5 000	80	20
Datura metel L.	5 000	100	25
Datura stramonium L.	5 000	100	25
Delphinium ×*belladonna* hort. ex Bergmans	5 000	20	4
Delphinium cardinale Hook.	5 000	20	4
Delphinium ×*cultorum* Voss	5 000	20	4
Delphinium formosum Boiss. & A.Huet	5 000	20	4
Delphinium grandiflorum L.	5 000	20	4
Dianthus barbatus L.	5 000	10	3
Dianthus caryophyllus L.	5 000	20	5
Dianthus chinensis L.	5 000	10	3
Dianthus deltoides L.	5 000	20	0.5
Dianthus plumarius L.	5 000	20	5
Digitalis lanata Ehrh.	5 000	5	1
Digitalis purpurea L.	5 000	5	0.2
Dimorphotheca ecklonis DC. (previously *Osteospermum ecklonis* (DC.) Norl.)	5 000	40	10
Dimorphotheca pluvialis (L.) Moench	5 000	40	10
Dimorphotheca tragus (Aiton) DC.	5 000	40	10
Doronicum orientale Hoffm.	5 000	10	2
(*Dorotheanthus bellidiformis* (Burm. f.) N.E.Br. see *Cleretum bellidiforme* (Burm. f.) G.D.Rowley)			
Echinacea purpurea (L.) Moench	5 000	20	5
Echinops ritro L.	5 000	80	20
Echium candicans L. f.	5 000	40	10
Echium plantagineum L.	5 000	40	10
Erigeron speciosus (Lindl.) DC.	5 000	5	0.5
Erysimum cheiri (L.) Crantz	5 000	10	3
Erysimum ×*marshallii* (Henfr.) Bois	5 000	10	3
Eschscholzia californica Cham.	5 000	20	5
Eustoma exaltatum (L.) Salisb. ex G.Don	5 000	5	0.2
Fatsia japonica (Thunb.) Decne. & Planch.	5 000	60	15
Felicia heterophylla (Cass.) Grau	5 000	20	5
Freesia refracta (Jacq.) Klatt	5 000	100	25
Gaillardia aristata Pursh	5 000	30	8
Gaillardia pulchella Foug.	5 000	20	6
Galega officinalis L.	5 000	80	20
Galeopsis segetum Neck.	5 000	20	4
Gazania rigens (L.) Gaertn.	5 000	20	5
Gentiana acaulis L.	5 000	5	0.7
Geranium hybrids	5 000	40	10

Table 2C Part 3. Lot sizes and sample sizes: flower, spice, herb and medicinal species (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working sample for purity analysis (3.5.1) (g)
1	2	3	4
Gerbera jamesonii Adlam	5 000	40	10
Geum coccineum Sm.	5 000	20	5
Geum quellyon Sweet	5 000	20	5
Gilia tricolor Benth.	5 000	5	1
Glandularia canadensis (L.) Nutt.	5 000	20	6
Glandularia ×hybrida (hort. ex Groenl. & Rümpler) G.L.Nesom & Pruski (previously *Verbena* Hybrida Group)	5 000	20	6
Glebionis carinata (Schousb.) Tzvelev	5 000	30	8
Glebionis coronaria (L.) Cass. ex Spach	5 000	30	8
Glebionis segetum (L.) Fourr.	5 000	30	8
Gomphrena globosa L.	5 000	40	10
Goniolimon tataricum (L.) Boiss.	5 000	20	5
Grevillea robusta A.Cunn. ex R.Br.	5 000	80	20
Gypsophila elegans M.Bieb.	5 000	10	2
Gypsophila paniculata L.	5 000	10	2
Gypsophila repens L.	5 000	10	2
Helenium autumnale L.	5 000	5	0.9
Helianthemum nummularium (L.) Mill.	5 000	20	5
Helianthus debilis Nutt.	10 000	150	40
Heliopsis helianthoides (L.) Sweet	5 000	40	10
Heliotropium arborescens L.	5 000	5	1
Hesperis matronalis L.	5 000	20	5
Heteranthemis viscidehirta Schott	5 000	30	8
Heuchera sanguinea Engelm.	5 000	5	0.1
Hibiscus trionum L.	5 000	40	10
Hippeastrum hybrids	5 000	80	20
Hypericum perforatum L.	5 000	5	0.3
Hyssopus officinalis L.	5 000	10	3
Iberis amara L.	5 000	20	6
Iberis gibraltarica L.	5 000	10	3
Iberis sempervirens L.	5 000	10	3
Iberis umbellata L.	5 000	10	3
Impatiens balsamina L.	5 000	100	25
Impatiens walleriana Hook. f.	5 000	10	2
Inula helenium L.	5 000	20	4
Ipomoea alba L.	10 000	400	100
Ipomoea purpurea (L.) Roth	10 000	400	100
Ipomoea quamoclit L.	10 000	200	50
Ipomoea tricolor Cav.	10 000	400	100
Jacobaea maritima (L.) Pelser & Meijden	5 000	5	0.5
Kalanchoe blossfeldiana Poelln.	5 000	5	0.1
Kalanchoe crenata (Andrews) Haw.	5 000	5	0.1
Kalanchoe globulifera H.Perrier	5 000	5	0.1
Kniphofia uvaria (L.) Oken	5 000	10	3
Lathyrus latifolius L.	10 000	400	100
Lathyrus odoratus L.	10 000	600	150
Lavandula angustifolia Mill.	5 000	10	2
Lavatera trimestris L.	5 000	40	10
Legousia speculum-veneris (L.) Chaix	5 000	5	1
Leontopodium nivale (Ten.) Hand.-Mazz.	5 000	5	0.1
Leonurus cardiaca L.	5 000	10	2
Leucanthemum maximum (Ramond) DC.	5 000	20	5

Table 2C Part 3. Lot sizes and sample sizes: flower, spice, herb and medicinal species (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working sample for purity analysis (3.5.1) (g)
1	2	3	4
Leucanthemum vulgare Lam.	5 000	20	5
Levisticum officinale W.D.J.Koch	5 000	30	8
Liatris pycnostachya Michx.	5 000	30	8
Liatris spicata (L.) Willd.	5 000	30	8
Lilium regale E.H.Wilson	5 000	40	10
Limonium bellidifolium (Gouan) Dumort.	5 000	20	5
(*Limonium bonduellei* (T.Lestib.) Kuntze see *Limonium sinuatum* (L.) Mill. subsp. *bonduellei* (T.Lestib.) Sauvage & Vindt)			
Limonium gerberi Soldano	5 000	20	5
(*Limonium sinuatum* (L.) Mill. see *Limonium sinuatum* (L.) Mill. subsp. *sinuatum*)			
Limonium sinuatum (L.) Mill. subsp. *bonduellei* (T.Lestib.) Sauvage & Vindt) (previously *Limonium bonduellei* (T.Lestib.) Kuntze)	5 000	200	50
Limonium sinuatum (L.) Mill. subsp. *sinuatum* (previously *Limonium sinuatum* (L.) Mill.) (heads)	5 000	200	50
Limonium sinuatum (L.) Mill. subsp. *sinuatum* (previously *Limonium sinuatum* (L.) Mill.) (seeds)	5 000	20	6
Linaria bipartita (Vent.) Willd.	5 000	5	0.2
Linaria maroccana Hook. f.	5 000	5	0.4
Linaria vulgaris Mill.	5 000	5	0.2
Linum flavum L.	5 000	20	5
Linum grandiflorum Desf.	5 000	40	10
Linum narbonense L.	5 000	20	5
Linum perenne L.	5 000	20	5
Lobelia cardinalis L. (includes *L. fulgens* Humb. & Bonpl. ex Willd.)	5 000	5	0.1
Lobelia erinus L.	5 000	5	0.2
Lobularia maritima (L.) Desv.	5 000	5	1
Lomelosia caucasica (M.Bieb.) Greuter & Burdet	5 000	80	20
Lonas annua (L.) Vines & Druce	5 000	5	0.6
Lunaria annua L.	5 000	80	20
(*Lupinus hartwegii* Lindl. see *Lupinus mexicanus* Cerv. ex Lag.)			
Lupinus hybrids	10 000	200	60
Lupinus mexicanus Cerv. ex Lag. (previously *Lupinus hartwegii* Lindl.)	10 000	200	60
Lupinus nanus Douglas ex Benth.	10 000	200	60
Lupinus polyphyllus Lindl.	10 000	200	60
Lysimachia arvensis (L.) U.Manns & Anderb. (previously *Anagallis arvensis* L.)	5 000	10	2
Malcolmia maritima (L.) W.T.Aiton	5 000	10	3
Malope trifida Cav.	5 000	20	5
Malva sylvestris L.	5 000	30	15
Marrubium vulgare L.	5 000	10	2
Matricaria chamomilla L.	5 000	5	0.5
Matthiola incana (L.) W.T.Aiton	5 000	20	4
Matthiola longipetala (Vent.) DC.	5 000	10	2
Melissa officinalis L.	5 000	10	2
Mentha ×*piperita* L.	5 000	5	0.5
Mimosa pudica L.	5 000	40	10
Mimulus cardinalis Douglas ex Benth.	5 000	5	0.2
Mimulus cupreus hort. ex Dombrain	5 000	5	0.2
Mimulus ×*hybridus* hort. ex Voss	5 000	5	0.2

Table 2C Part 3. Lot sizes and sample sizes: flower, spice, herb and medicinal species (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working sample for purity analysis (3.5.1) (g)
1	2	3	4
Mimulus luteus L.	5 000	5	0.2
Mirabilis jalapa L.	10 000	800	200
Moluccella laevis L.	5 000	100	25
Myosotis hybrids	5 000	10	2
Myosotis scorpioides L.	5 000	10	2
Myosotis sylvatica Hoffm.	5 000	10	2
Nemesia strumosa Benth.	5 000	5	1
Nemesia versicolor E.Mey. ex Benth.	5 000	5	1
Nemophila maculata Benth. ex Lindl.	5 000	20	5
Nemophila menziesii Hook. & Arn.	5 000	20	5
Nepeta cataria L.	5 000	10	2
Nicotiana alata Link & Otto	5 000	5	0.2
Nicotiana ×sanderae W.Watson	5 000	5	0.2
Nicotiana suaveolens Lehm.	5 000	5	0.5
Nierembergia hippomanica Miers	5 000	5	0.5
Nigella damascena L.	5 000	20	6
Nigella hispanica L.	5 000	20	6
Nigella sativa L.	5 000	40	10
Oenothera macrocarpa Nutt.	5 000	40	10
(*Osteospermum ecklonis* (DC.) Norl. see *Dimorphotheca ecklonis* DC.)			
Papaver alpinum L.	5 000	5	0.5
Papaver glaucum Boiss. & Hausskn.	5 000	5	0.5
Papaver nudicaule L.	5 000	5	0.5
Papaver orientale L.	5 000	5	1
Papaver rhoeas L.	5 000	5	0.5
Pelargonium Zonale Group	5 000	80	20
Penstemon barbatus (Cav.) Roth	5 000	10	2
Penstemon hartwegii Benth.	5 000	10	2
Penstemon hybrids	5 000	10	2
Pericallis cruenta (Masson ex L'Hér.) Bolle	5 000	5	0.5
Perilla frutescens (L.) Britton	5 000	10	3
Petunia ×atkinsiana (Sweet) D.Don ex W.H.Baxter	5 000	5	0.2
Phacelia campanularia A.Gray	5 000	10	2
Phlox drummondii Hook.	5 000	20	5
Phlox paniculata L.	5 000	20	5
Phlox subulata L.	5 000	20	5
Pholistoma auritum (Lindl.) Lilja	5 000	20	5
Physalis alkekengi L.	5 000	20	4
Pimpinella major (L.) Huds.	5 000	20	5
Pimpinella saxifraga L.	5 000	20	5
Plectocephalus americana (Nutt.) D.Don	5 000	100	35
Plectranthus scutellarioides (L.) R.Br.	5 000	10	2
Portulaca grandiflora Hook.	5 000	5	0.3
Primula auricula L.	5 000	5	1
Primula denticulata Sm.	5 000	5	0.5
Primula elatior (L.) Hill	5 000	10	2
Primula japonica A.Gray	5 000	5	1
Primula ×kewensis W.Watson	5 000	5	0.5
Primula malacoides Franch.	5 000	5	0.5
Primula obconica Hance	5 000	5	0.5
Primula praenitens Ker Gawl.	5 000	5	1

Table 2C Part 3. Lot sizes and sample sizes: flower, spice, herb and medicinal species (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working sample for purity analysis (3.5.1) (g)
1	2	3	4
Primula veris L.	5000	5	1
Primula vulgaris Huds.	5000	5	1
Psephellus dealbatus (Willd.) K.Koch	5000	40	10
Psylliostachys suworowii (Regel) Roshkova	5000	20	5
Ranunculus asiaticus L.	5000	5	1
Reseda odorata L.	5000	10	3
Rheum palmatum L.	5000	100	30
Rhodanthe humboldtiana (Gaudich.) Paul G.Wilson	5000	30	8
Rhodanthe manglesii Lindl.	5000	30	8
Rhodanthe chlorocephala (Turcz.) Paul G.Wilson (includes *Helipterum roseum* (Hook.) Benth.)	5000	30	8
Rudbeckia fulgida Aiton	5000	10	2
Rudbeckia hirta L.	5000	5	1
Ruta graveolens L.	5000	20	6
Saintpaulia ionantha H.Wendl.	5000	5	0.1
Salpiglossis sinuata Ruiz & Pav.	5000	5	1
Salvia coccinea Buc'hoz ex Etl.	5000	30	8
Salvia farinacea Benth.	5000	20	5
Salvia officinalis L.	5000	30	20
Salvia patens Cav.	5000	30	8
Salvia pratensis L.	5000	30	8
Salvia sclarea L.	5000	80	20
Salvia splendens Sellow ex Nees	5000	30	8
Salvia viridis L.	5000	20	5
Sanvitalia procumbens Lam.	5000	10	2
Saponaria calabrica Guss.	5000	20	5
Saponaria ocymoides L.	5000	20	5
Saponaria officinalis L.	5000	20	5
Scabiosa atropurpurea L.	5000	60	15
Schefflera elegantissima (hort. Veitch ex Mast.) Lowry & Frodin	5000	20	6
Schizanthus pinnatus Ruiz & Pav.	5000	10	2
Senecio elegans L.	5000	5	0.5
Silene chalcedonica (L.) E.H.L.Krause	5000	5	1
Silene coronaria (L.) Clairv.	5000	20	5
Silene pendula L.	5000	10	2
Silybum marianum (L.) Gaertn.	5000	200	50
Sinningia speciosa (Lodd. *et al.* ex Ker Gawl.) Hiern	5000	5	0.2
Solanum giganteum Jacq.	5000	20	5
Solanum laciniatum Aiton	5000	20	5
Solanum marginatum L. f.	5000	20	5
Solanum pseudocapsicum L.	5000	20	5
(*Stachys macrantha* (K.Koch) Stearn see *Betonica macrantha* K.Koch)			
Symphyotrichum dumosum (L.) G.L.Nesom (previously *Aster dumosus* L.)	5000	20	5
Tagetes erecta L.	5000	40	10
Tagetes patula L.	5000	40	10
Tagetes tenuifolia Cav.	5000	20	5
Tanacetum achilleifolium (M.Bieb.) Sch. Bip.	5000	30	8
Tanacetum cinerariifolium (Trevir.) Sch. Bip.	5000	10	3
Tanacetum coccineum (Willd.) Grierson	5000	30	8
Tanacetum parthenium (L.) Sch. Bip.	5000	20	5

Table 2C Part 3. Lot sizes and sample sizes: flower, spice, herb and medicinal species (continued)

Species	Maximum weight of lot (kg) (except see 2.8 Note 2)	Minimum submitted sample (g)	Minimum working sample for purity analysis (3.5.1) (g)
1	2	3	4
Thunbergia alata Bojer ex Sims	5 000	200	50
Thymus serpyllum L.	5 000	5	0.5
Torenia fournieri Linden ex E.Fourn.	5 000	5	0.2
Tripleurospermum inodorum (L.) Sch. Bip.	5 000	5	0.5
Tripleurospermum maritimum (L.) W.D.J.Koch	5 000	5	0.5
Tropaeolum majus L.	10 000	1 000	350
Tropaeolum peltophorum Benth.	10 000	1 000	350
Tropaeolum peregrinum L.	10 000	1 000	350
Vaccaria hispanica (Mill.) Rauschert	5 000	20	5
Valeriana officinalis L.	5 000	10	2
Verbascum densiflorum Bertol.	5 000	5	0.3
Verbascum phlomoides L.	5 000	5	0.5
Verbascum thapsus L.	5 000	5	0.5
Verbena bonariensis L.	5 000	20	6
(*Verbena* Hybrida Group see *Glandularia* ×*hybrida* (hort. ex Groenl. & Rümpler) G.L.Nesom & Pruski)			
Verbena rigida Spreng.	5 000	10	2
Vinca minor L.	5 000	20	5
Viola cornuta L.	5 000	10	3
Viola odorata L.	5 000	10	3
Viola tricolor L.	5 000	10	3
Xeranthemum annuum L.	5 000	10	3
Xerochrysum bracteatum (Vent.) Tzvelev	5 000	10	2
Zinnia elegans Jacq.	5 000	80	20
Zinnia haageana Regel	5 000	20	6

Table 2D Part 1. Sample sizes (numbers of seeds) for pelleted seeds, encrusted seed and seed granules

Determinations	Minimum submitted sample	Minimum working sample
Purity analysis (including verification of species)	2 500	2 500
Thousand-seed weight	2 500	Pure pellet fraction
Germination	2 500	400
Determination of other seeds	10 000	7 500
Determination of other seeds (encrusted seeds and seed granules)	25 000	25 000
Size grading	5 000	1 000

Table 2D Part 2. Sample sizes (number of seeds) for seed tapes and mats

Determinations	Minimum submitted sample	Minimum working sample
Verification of species	300	100
Germination	2 000	400
Purity analysis (if required)	2 500	2 500
Determination of other seeds	10 000	7 500

2.9 Heterogeneity testing for seed lots in multiple containers

The object of heterogeneity testing is to detect the presence of heterogeneity which makes the seed lot technically unacceptable for sampling according to the object as defined in 2.1.

2.9.1 The H value test

2.9.1.1 Definitions of terms and symbols

The testing of predominantly in-range heterogeneity of an attribute adopted as an indicator involves a comparison between the observed variance and the acceptable variance of that attribute. The container-samples of a seed lot are samples drawn independently of each other from different containers. The examinations of container-samples for the indicating attribute must also be mutually independent. Since there is only one source of information for each container, heterogeneity within containers is not directly involved. The acceptable variance is calculated by multiplying the theoretical variance caused by random variation with a factor *f* for additional variation, taking into account the level of heterogeneity which is achievable in good seed production practice. The theoretical variance can be calculated from the respective probability distributions, which is the binomial distribution in the case of purity and germination, and the Poisson distribution in the case of the other seed count.

No number of containers in the lot

N number of independent container-samples

n number of seeds tested from each container-sample (1000 for purity, 100 for germination and 2500 for other seed count, see 2.9.1.3)

X test result of the adopted attribute in a container-sample

$\sum$ symbol for sum of all values

f factor for multiplying the theoretical variance to obtain the acceptable variance (see Table 2E)

Mean of all *X* values determined for the lot in respect of the adopted attribute:

$$\overline{X} = \frac{\sum X}{N}$$

Acceptable variance of independent container-samples in respect of purity or germination percentages:

$$W = \frac{\overline{X} \times (100 - \overline{X})}{n} \times f$$

Acceptable variance of independent container-samples in respect of number of other seeds:

$$W = \overline{X} \times f$$

Observed variance of independent container-samples based on all *X* values in respect of the adopted attribute:

$$V = \frac{N \sum X^2 - (\sum X)^2}{N(N-1)}$$

H value:

$$H = \frac{V}{W} - f$$

Negative H values are reported as zero.

Table 2E. Factors for additional variation in seed lots to be used for calculating *W* and finally the H value

Attributes	Non-chaffy seeds	Chaffy seeds
Purity	1.1	1.2
Other seed count	1.4	2.2
Germination	1.1	1.2

Remarks:

- For purity and germination calculate to two decimal places if *N* is less than 10 and to three decimal places if *N* is 10 or more.
- For the number of other seeds, calculate to one decimal place if *N* is less than 10, and to two decimal places if *N* is 10 or more.
- For definition of non-chaffy and chaffy seeds see 3.6.6 of the ISTA Rules. The chaffiness of various genera is listed in Table 3B Part 1.

Table 2F. Sampling intensity and critical H values. Number of independent container samples to be drawn as depending on the number of containers in the lot and critical H values for seed lot heterogeneity at a significance level of 1 % probability

Number of containers in the lot	Number of independent container samples	Critical H value for purity and germination attributes		Critical H value for other seed count attributes	
		non-chaffy seeds	chaffy seeds	non-chaffy seeds	chaffy seeds
5	5	2.55	2.78	3.25	5.10
6	6	2.22	2.42	2.83	4.44
7	7	1.98	2.17	2.52	3.98
8	8	1.80	1.97	2.30	3.61
9	9	1.66	1.81	2.11	3.32
10	10	1.55	1.69	1.97	3.10
11–15	11	1.45	1.58	1.85	2.90
16–25	15	1.19	1.31	1.51	2.40
26–35	17	1.10	1.20	1.40	2.20
36–49	18	1.07	1.16	1.36	2.13
50 or more	20	0.99	1.09	1.26	2.00

2.9.1.2 Sampling the lot

The number of independent container samples must be not less than presented in Table 2F.

Sampling intensity has been chosen such that in a lot containing about 10 % deviating containers, at least one deviating container is selected with a probability of p = 90 %. Since the detection of a deviating container is conditional on selection, the power of both tests to detect heterogeneity is at best close to equal, but usually lower than the chosen selection probability. (Reference: Steiner, A. M. and Meyer, U. (1990), H value and R value heterogeneity testing of seed lots; properties, sampling intensity and precision. *Agribiological Research* **43**, 103–114.)

The containers to be sampled are chosen strictly at random. The sample taken from the container must adequately represent the whole contents, e.g. the top, middle and bottom of a bag. The weight of each container-sample must be not less than half that specified in Table 2C, column 3.

2.9.1.3 Testing procedure

The attribute adopted to indicate heterogeneity may be:

a. percentage by weight of any purity component,
b. percentage of any germination test component, or
c. the total number seeds or the number of any single species in the determination of other seeds by number.

In the laboratory, a working sample is drawn from each container-sample and tested independently of any other sample for the chosen attribute.

a. The percentage by weight of any component may be used, provided it can be separated as in the purity analysis, e.g. pure seed, other seeds, or empty seeds of grasses. The working sample should be of such weight as is estimated to contain 1000 seeds counted from each container-sample. Each working sample is separated into two fractions: the selected component and the remainder.
b. Any kind of seed or seedling determinable in a standard germination test may be used, e.g. normal seedlings, abnormal seedlings or hard seeds. From each container-sample a germination test of 100 seeds is set up simultaneously and completed in accordance with conditions specified in Table 5A.
c. The seed count may be of any component that can be counted, e.g. a specified seed species, or all other seeds together. Each working sample must be of a weight estimated to contain about 2500 seeds and a count is made in it of the number of seeds of the kind selected (i.e. other seed count).

2.9.1.4 Use of Table 2F

Table 2F shows the critical H values which would be exceeded in only 1 % of tests from seed lots with an acceptable distribution of the attribute adopted as indicator. If the calculated H value exceeds the critical H value belonging to the sample number *N*, the attribute and the chaffiness in Table 2F, then the lot is considered to show significant heterogeneity in the in-range, or possibly also the off-range sense. If, however, the calculated H value is less than or equal to the tabulated critical H value, then the lot is considered to show no heterogeneity in the in-range, or possibly off-range sense with respect to the attribute being tested.

2.9.1.5 Reporting results

The result of the H value heterogeneity test for seed lots in multiple containers must be reported under 'Other determinations', as follows:

- $\overline{X}$: mean of all *X* values determined for the lot in respect of the adopted attribute;
- *N*: number of independent container samples;
- *No*: number of containers in the lot;
- the calculated H value;
- the statement: 'This H value does/does not indicate significant heterogeneity.'

Note: the H value must not be calculated or reported if $\overline{X}$ is outside the following limits:

- purity components: above 99.8 % or below 0.2 %;
- germination: above 99.0 % or below 1.0 %;
- number of specified seeds: below two per sample.

2.9.2 The R value test

The object of this test is to detect off-range heterogeneity of the seed lot using the attribute adopted as an indicator. The test for off-range heterogeneity involves comparing the maximum difference found between samples of similar size drawn from the lot with a tolerated range. This tolerated range is based on the acceptable standard deviation, which is achievable in good seed production practice.

Each independent container-sample is taken from a different container, so that heterogeneity within containers is not directly involved. Information about heterogeneity within containers is contained, however, in the acceptable standard deviation which is in fact incorporated into the tabulation of tolerated ranges. The acceptable standard deviation was calculated by the standard deviation due to random variation according to the binomial distribution in the case of purity and germination, and to the Poisson distribution in the case of the other seed count, multiplied by the square root of the factor *f* given in Table 2E, respectively. The spread between containers is characterised by the calculated range to be compared with the corresponding tolerated range.

2.9.2.1 Definitions of terms and symbols

No number of containers in the lot

N number of independent container-samples

n number of seeds tested from each container-sample (1000 for purity, 100 for germination and 2500 for other seed count, see 2.9.1.3)

X test result of the adopted attribute in a container-sample

$\sum$ symbol for sum of all values

Mean of all *X* values determined for the lot in respect of the adopted attribute:

$$\overline{X} = \frac{\sum X}{N}$$

Range found as maximum difference between independent container samples of the lot in respect of the adopted attribute:

$$R = X_{max} - X_{min}$$

Note: for precision of *X* for the R value test, see 2.9.1.1 'Remarks' to the H value test.

2.9.2.2 Sampling the lot

Sampling for the R value test is the same as for the H value test (see 2.9.1.2); the same samples must be used.

2.9.2.3 Testing procedure

The same testing procedures of purity, germination and the other seed count are used for the R value test as are used for the H value test (see 2.9.1.3). For calculations, the same set of data must be used.

2.9.2.4 Use of tables

Seed lot off-range heterogeneity is tested by using the appropriate table for tolerated, i.e. critical range:

- Table 2G for components of pure seed analyses,
- Table 2H for germination determinations, and
- Table 2I for numbers of other seeds.

Find the value $\overline{X}$ in the 'Average' columns of the appropriate table. When entering the table, round averages following the usual procedure; read off the tolerated range which would be exceeded in only 1 % of tests from seed lots with an acceptable distribution of the attribute:

- in columns 5–9 for cases when $N = 5$ to 9,
- in columns 10–19 for cases when $N = 10$ to 19, or
- in column 20 when $N = 20$.

If the calculated R value exceeds this tolerated range, then the lot is considered to show significant heterogeneity in the off-range sense. If, however, the calculated R value is less than or equal to the tabulated tolerated range, then the lot is considered to show no heterogeneity in the off-range sense with respect to the attribute being tested.

When using the tables, round averages to the next tabulated value (if in the middle, then downwards).

2.9.2.5 Reporting results

The result of the R value heterogeneity test for seed lots in multiple containers must be reported under 'Other determinations', as follows:

- $\overline{X}$: mean of all X values determined for the lot in respect of the adopted attribute;
- N: number of independent container samples;
- No: number of containers in the lot;
- the calculated R value;
- the statement: 'This R value does/does not indicate significant heterogeneity.'

2.9.3 Interpretation of results

Whenever either of the two tests, the H value test or the R value test, indicates significant heterogeneity, then the lot must be declared heterogeneous. When, however, neither of the two tests indicates significant heterogeneity, then the lot must be adopted as non-heterogeneous, having a non-significant level of heterogeneity.

Table 2G Part 1. Maximum tolerated ranges for the R value test at a significance level of 1 % probability using components of purity analyses as the indicating attribute in non-chaffy seeds

Average % of the component and its complement		Tolerated range for number of independent samples (N)		
		5–9	10–19	20
99.9	0.1	0.5	0.5	0.6
99.8	0.2	0.7	0.8	0.8
99.7	0.3	0.8	0.9	1.0
99.6	0.4	1.0	1.1	1.2
99.5	0.5	1.1	1.2	1.3
99.4	0.6	1.2	1.3	1.4
99.3	0.7	1.3	1.4	1.6
99.2	0.8	1.4	1.5	1.7
99.1	0.9	1.4	1.6	1.8
99.0	1.0	1.5	1.7	1.9
98.5	1.5	1.9	2.1	2.3
98.0	2.0	2.1	2.4	2.6
97.5	2.5	2.4	2.7	2.9
97.0	3.0	2.6	2.9	3.2
96.5	3.5	2.8	3.1	3.4
96.0	4.0	3.0	3.4	3.7
95.5	4.5	3.2	3.5	3.9
95.0	5.0	3.3	3.7	4.1
94.0	6.0	3.6	4.1	4.5
93.0	7.0	3.9	4.4	4.8
92.0	8.0	4.1	4.6	5.1
91.0	9.0	4.4	4.9	5.4
90.0	10.0	4.6	5.1	5.6
89.0	11.0	4.8	5.4	5.9
88.0	12.0	5.0	5.6	6.1
87.0	13.0	5.1	5.8	6.3
86.0	14.0	5.3	5.9	6.5
85.0	15.0	5.4	6.1	6.7
84.0	16.0	5.6	6.3	6.9
83.0	17.0	5.7	6.4	7.0
82.0	18.0	5.9	6.6	7.2
81.0	19.0	6.0	6.7	7.4
80.0	20.0	6.1	6.8	7.5
78.0	22.0	6.3	7.1	7.8
76.0	24.0	6.5	7.3	8.0
74.0	26.0	6.7	7.5	8.2
72.0	28.0	6.9	7.7	8.4
70.0	30.0	7.0	7.8	8.6
68.0	32.0	7.1	8.0	8.7
66.0	34.0	7.2	8.1	8.9
64.0	36.0	7.3	8.2	9.0
62.0	38.0	7.4	8.3	9.1
60.0	40.0	7.5	8.4	9.2
58.0	42.0	7.5	8.4	9.2
56.0	44.0	7.6	8.5	9.3
54.0	46.0	7.6	8.5	9.3
52.0	48.0	7.6	8.6	9.4
50.0	50.0	7.6	8.6	9.4

Table 2G Part 2. Maximum tolerated ranges for the R value test at a significance level of 1 % probability using components of purity analyses as the indicating attribute in chaffy seeds

Average % of the component and its complement		Tolerated range for number of independent samples (N)		
		5–9	10–19	20
99.9	0.1	0.5	0.6	0.6
99.8	0.2	0.7	0.8	0.9
99.7	0.3	0.9	1.0	1.1
99.6	0.4	1.0	1.1	1.2
99.5	0.5	1.1	1.3	1.4
99.4	0.6	1.2	1.4	1.5
99.3	0.7	1.3	1.5	1.6
99.2	0.8	1.4	1.6	1.7
99.1	0.9	1.5	1.7	1.8
99.0	1.0	1.6	1.8	1.9
98.5	1.5	1.9	2.2	2.4
98.0	2.0	2.2	2.5	2.7
97.5	2.5	2.5	2.8	3.1
97.0	3.0	2.7	3.0	3.3
96.5	3.5	2.9	3.3	3.6
96.0	4.0	3.1	3.5	3.8
95.5	4.5	3.3	3.7	4.1
95.0	5.0	3.5	3.9	4.3
94.0	6.0	3.8	4.2	4.6
93.0	7.0	4.1	4.6	5.0
92.0	8.0	4.3	4.8	5.3
91.0	9.0	4.6	5.1	5.6
90.0	10.0	4.8	5.4	5.9
89.0	11.0	5.0	5.6	6.1
88.0	12.0	5.2	5.8	6.4
87.0	13.0	5.4	6.0	6.6
86.0	14.0	5.5	6.2	6.8
85.0	15.0	5.7	6.4	7.0
84.0	16.0	5.8	6.6	7.2
83.0	17.0	6.0	6.7	7.4
82.0	18.0	6.1	6.9	7.5
81.0	19.0	6.3	7.0	7.7
80.0	20.0	6.4	7.1	7.8
78.0	22.0	6.6	7.4	8.1
76.0	24.0	6.8	7.6	8.4
74.0	26.0	7.0	7.8	8.6
72.0	28.0	7.2	8.0	8.8
70.0	30.0	7.3	8.2	9.0
68.0	32.0	7.4	8.3	9.1
66.0	34.0	7.5	8.5	9.3
64.0	36.0	7.6	8.6	9.4
62.0	38.0	7.7	8.7	9.5
60.0	40.0	7.8	8.8	9.6
58.0	42.0	7.9	8.8	9.7
56.0	44.0	7.9	8.9	9.7
54.0	46.0	7.9	8.9	9.8
52.0	48.0	8.0	8.9	9.8
50.0	50.0	8.0	8.9	9.8

Table 2H Part 1. Maximum tolerated ranges for the R value test at a significance level of 1 % probability using components of germination tests as the indicating attribute in non-chaffy seeds

Average % of the component	and its complement	Tolerated range for number of independent samples (N)		
		5–9	10–19	20
99	1	5	6	6
98	2	7	8	9
97	3	9	10	11
96	4	10	11	12
95	5	11	12	13
94	6	12	13	15
93	7	13	14	16
92	8	14	15	17
91	9	14	16	17
90	10	15	17	18
89	11	16	17	19
88	12	16	18	20
87	13	17	19	20
86	14	17	19	21
85	15	18	20	22
84	16	18	20	22
83	17	19	21	23
82	18	19	21	23
81	19	19	22	24
80	20	20	22	24
79	21	20	23	25
78	22	20	23	25
77	23	21	23	25
76	24	21	24	26
75	25	21	24	26
74	26	22	24	26
73	27	22	25	27
72	28	22	25	27
71	29	22	25	27
70	30	23	25	28
69	31	23	26	28
68	32	23	26	28
67	33	23	26	28
66	34	23	26	29
65	35	24	26	29
64	36	24	26	29
63	37	24	27	29
62	38	24	27	29
61	39	24	27	29
60	40	24	27	30
59	41	24	27	30
58	42	24	27	30
57	43	24	27	30
56	44	24	27	30
55	45	25	27	30
54	46	25	27	30
53	47	25	28	30
52	48	25	28	30
51	49	25	28	30
50	50	25	28	30

Table 2H Part 2. Maximum tolerated ranges for the R value test at a significance level of 1 % probability using components of germination tests as the indicating attribute in chaffy seeds

Average % of the component	and its complement	Tolerated range for number of independent samples (N)		
		5–9	10–19	20
99	1	6	6	7
98	2	8	8	9
97	3	9	10	11
96	4	10	12	13
95	5	11	13	14
94	6	12	14	15
93	7	13	15	16
92	8	14	16	17
91	9	15	17	18
90	10	16	17	19
89	11	16	18	20
88	12	17	19	21
87	13	17	20	21
86	14	18	20	22
85	15	18	21	23
84	16	19	21	23
83	17	19	22	24
82	18	20	22	24
81	19	20	23	25
80	20	21	23	25
79	21	21	24	26
78	22	21	24	26
77	23	22	24	27
76	24	22	25	27
75	25	22	25	27
74	26	23	25	28
73	27	23	26	28
72	28	23	26	28
71	29	23	26	29
70	30	24	26	29
69	31	24	27	29
68	32	24	27	29
67	33	24	27	30
66	34	24	27	30
65	35	25	27	30
64	36	25	28	30
63	37	25	28	30
62	38	25	28	31
61	39	25	28	31
60	40	25	28	31
59	41	25	28	31
58	42	25	28	31
57	43	25	28	31
56	44	26	29	31
55	45	26	29	31
54	46	26	29	31
53	47	26	29	31
52	48	26	29	31
51	49	26	29	31
50	50	26	29	31

Table 2l Part 1. Maximum tolerated ranges for the R value test at a significance level of 1 % probability using components of other seed count analyses as the indicating attribute in non-chaffy seeds

Average count of other seeds	Tolerated range for number of independent samples (N)		
	5–9	10–19	20
1	6	7	7
2	8	9	10
3	10	11	12
4	11	13	14
5	13	14	15
6	14	15	17
7	15	17	18
8	16	18	19
9	17	19	21
10	18	20	22
11	19	21	23
12	19	22	24
13	20	23	25
14	21	23	26
15	22	24	26
16	22	25	27
17	23	26	28
18	24	26	29
19	24	27	30
20	25	28	30
21	25	28	31
22	26	29	32
23	27	30	33
24	27	30	33
25	28	31	34
26	28	32	35
27	29	32	35
28	29	33	36
29	30	33	37
30	30	34	37
31	31	34	38
32	31	35	38
33	32	36	39
34	32	36	39
35	33	37	40
36	33	37	41
37	34	38	41
38	34	38	42
39	34	39	42
40	35	39	43
41	35	40	43
42	36	40	44
43	36	41	44
44	37	41	45
45	37	41	45
46	37	42	46
47	38	42	46
48	38	43	47
49	39	43	47
50	39	44	48

Average count of other seeds	Tolerated range for number of independent samples (N)		
	5–9	10–19	20
51	39	44	48
52	40	45	49
53	40	45	49
54	40	45	50
55	41	46	50
56	41	46	51
57	42	47	51
58	42	47	51
59	42	47	52
60	43	48	52
61	43	48	53
62	43	49	53
63	44	49	54
64	44	49	54
65	44	50	54
66	45	50	55
67	45	50	55
68	45	51	56
69	46	51	56
70	46	52	56
71	46	52	57
72	47	52	57
73	47	53	58
74	47	53	58
75	48	53	58
76	48	54	59
77	48	54	59
78	49	54	60
79	49	55	60
80	49	55	60
81	49	55	61
82	50	56	61
83	50	56	61
84	50	56	62
85	51	57	62
86	51	57	62
87	51	57	63
88	52	58	63
89	52	58	64
90	52	58	64
91	52	59	64
92	53	59	65
93	53	59	65
94	53	60	65
95	54	60	66
96	54	60	66
97	54	61	66
98	54	61	67
99	55	61	67
100	55	62	67

Table 2l Part 1. Maximum tolerated ranges for the R value test at a significance level of 1 % probability using components of other seed count analyses as the indicating attribute in non-chaffy seeds (continued)

Average count of other seeds	Tolerated range for number of independent samples (N)		
	5–9	10–19	20
101	55	62	68
102	55	62	68
103	56	62	68
104	56	63	69
105	56	63	69
106	57	63	69
107	57	64	70
108	57	64	70
109	57	64	70
110	58	65	71
111	58	65	71
112	58	65	71
113	58	65	72
114	59	66	72
115	59	66	72
116	59	66	73
117	59	67	73
118	60	67	73
119	60	67	73
120	60	67	74
121	60	68	74
122	61	68	74
123	61	68	75
124	61	68	75
125	61	69	75
126	62	69	76
127	62	69	76
128	62	70	76
129	62	70	76
130	63	70	77
131	63	70	77
132	63	71	77
133	63	71	78
134	64	71	78
135	64	71	78
136	64	72	78
137	64	72	79
138	64	72	79

For higher other seed counts, tolerances (R) are calculated by using the following formula and rounding up to the next whole number:

For N = 5–9: $R = \sqrt{(\text{average count of other seed})} \times 5.44$

For N = 10–19: $R = \sqrt{(\text{average count of other seed})} \times 6.11$

For N = 20: $R = \sqrt{(\text{average count of other seed})} \times 6.69$

Table 2I Part 2. Maximum tolerated ranges for the R value test at a significance level of 1 % probability using components of other seed count analyses as the indicating attribute in chaffy seeds

Average count of other seeds	Tolerated range for number of independent samples (N)		
	5–9	10–19	20
1	7	8	9
2	10	11	12
3	12	14	15
4	14	16	17
5	16	18	19
6	17	19	21
7	19	21	23
8	20	22	24
9	21	23	26
10	22	25	27
11	23	26	28
12	24	27	30
13	25	28	31
14	26	29	32
15	27	30	33
16	28	31	34
17	29	32	35
18	29	33	36
19	30	34	37
20	31	35	38
21	32	36	39
22	33	36	40
23	33	37	41
24	34	38	42
25	35	39	42
26	35	40	43
27	36	40	44
28	37	41	45
29	37	42	46
30	38	42	46
31	38	43	47
32	39	44	48
33	40	44	49
34	40	45	49
35	41	46	50
36	41	46	51
37	42	47	51
38	43	48	52
39	43	48	53
40	44	49	54
41	44	50	54
42	45	50	55
43	45	51	55
44	46	51	56
45	46	52	57
46	47	52	57
47	47	53	58
48	48	54	59
49	48	54	59
50	49	55	60

Average count of other seeds	Tolerated range for number of independent samples (N)		
	5–9	10–19	20
51	49	55	60
52	50	56	61
53	50	56	62
54	51	57	62
55	51	57	63
56	52	58	63
57	52	58	64
58	52	59	64
59	53	59	65
60	53	60	65
61	54	60	66
62	54	61	66
63	55	61	67
64	55	62	68
65	56	62	68
66	56	63	69
67	56	63	69
68	57	64	70
69	57	64	70
70	58	65	71
71	58	65	71
72	58	65	72
73	59	66	72
74	59	66	73
75	60	67	73
76	60	67	74
77	60	68	74
78	61	68	75
79	61	69	75
80	62	69	75
81	62	69	76
82	62	70	76
83	63	70	77
84	63	71	77
85	63	71	78
86	64	71	78
87	64	72	79
88	65	72	79
89	65	73	80
90	65	73	80
91	66	74	80
92	66	74	81
93	66	74	81
94	67	75	82
95	67	75	82
96	67	75	83
97	68	76	83
98	68	76	83
99	68	77	84
100	69	77	84

Table 2I Part 2. Maximum tolerated ranges for the R value test at a significance level of 1 % probability using components of other seed count analyses as the indicating attribute in chaffy seeds (continued)

Average count of other seeds	Tolerated range for number of independent samples (N)		
	5–9	10–19	20
101	69	77	85
102	69	78	85
103	70	78	86
104	70	79	86
105	70	79	86
106	71	79	87
107	71	80	87
108	71	80	88
109	72	80	88
110	72	81	88
111	72	81	89
112	73	81	89
113	73	82	90
114	73	82	90
115	74	83	90
116	74	83	91
117	74	83	91
118	75	84	92
119	75	84	92
120	75	84	92
121	76	85	93
122	76	85	93
123	76	85	93
124	76	86	94
125	77	86	94
126	77	86	95
127	77	87	95
128	78	87	95
129	78	87	96
130	78	88	96
131	79	88	96
132	79	88	97
133	79	89	97
134	79	89	98
135	80	89	98
136	80	90	98
137	80	90	99
138	81	90	99

For higher other seed counts, tolerances (R) are calculated by using the following formula and rounding up to the next whole number:

For N = 5–9: $R = \sqrt{(\text{average count of other seed})} \times 6.82$

For N = 10–19: $R = \sqrt{(\text{average count of other seed})} \times 7.65$

For N = 20: $R = \sqrt{(\text{average count of other seed})} \times 8.38$