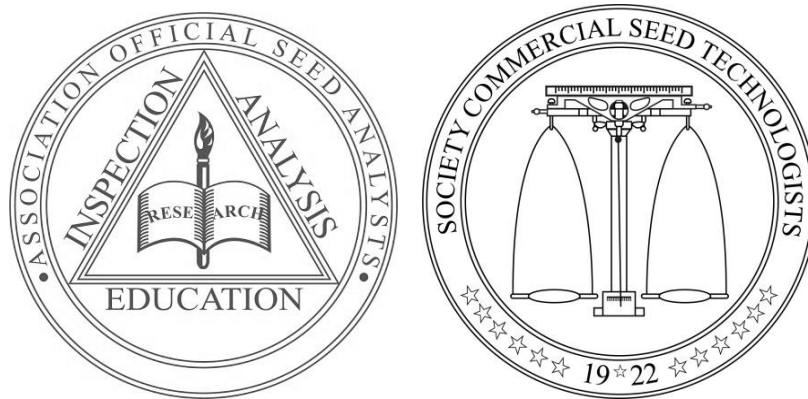


AOSA/SCST Report of Analysis Handbook



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Acknowledgements

The first handbook, *Instructions for Using the Report of Seed Analysis*, Contribution No. 34 to the Handbook on Seed Testing, was written under the leadership of Roger Danielson in the 1980's. The handbook included a template utilized by many seed laboratories in development of their own reports of analysis. Due to the increased complexity of reporting over the years with the addition of species, seed technologies, internet capabilities, etc., the Handbook Committee was charged by the Board of Directors with re-writing the handbook with the contributions of the SCST Ethics and SCST Teaching and Training committees. Major contributors include: Brenda Watts, Connie O'Brien, Rosie Nelson, and Jennifer Pernsteiner.

Introduction

As stated in the AOSA Rules for Testing Seeds, "Seed testing has been developed to aid agriculture in avoiding some of the hazards of crop production by furnishing needed information about seeds that are to be used for planting purposes." Reports of Analysis (ROA) are the ultimate products of a seed testing laboratory. Our customers (whether they are seed producers, seed buyers, internal company decision-makers, or taxpayers) expect information regarding the value of the seed. As an organization, our reputation depends on our members providing clear, understandable information that can be interpreted by the users of that information. As the seed trade becomes increasingly international, the importance of standardizing Reports of Analysis becomes even more critical.

Yet at the same time, the Report of Analysis is used for many different purposes, and issuing laboratories need to have flexibility in reporting information. For instance, regulatory agencies may need to report label-to-test comparison and/or violations. Certifying agencies may need to record information regarding additional examinations for applying standards, physical or genetic varietal purity, and/or certification status. Private laboratories may have internal quality control requirements. Commercial laboratories may have special customer requests or provide additional service testing.

The purpose of this handbook is to provide explanation and guidelines for increased clarity and standardization of Reports of Analysis, while retaining the flexibility to report a wide variety of information.

The goals of the ROA handbook are as follows:

- To provide a reference for those setting up a new laboratory reporting system or revising a current one.
- To increase the standardization of Reports of Analysis among laboratories.
- To provide an explanation and specific information regarding required components and answer basic questions.
- To provide a reference for suggested methods of reporting special cases that are not routine to the laboratory.
- To provide suggestions for the practical aspects of ROA such as liability statements, electronic reporting, checking database calculations, corrected reports, etc.
- To emphasize the ethics of reporting and explain what is expected of the analyst and the laboratory.
- To provide a self-analysis checklist to critique and improve a laboratory's current Report of Analysis.

Section 1: Explanation of Required Components

Section 15: Report of Analysis of the AOSA *Rules for Testing Seeds*, Vol. 1 describes the required information that is necessary on an ROA, for laboratory testing that was performed in accordance with the AOSA *Rules for Testing Seeds*. This section of the handbook is an expanded explanation of the required information listed in Section 15.

- A. Name and address of issuing laboratory.** Generally, the heading area on the ROA is used by the issuing seed laboratory to include their contact information. The ROA must contain the name and address of the issuing laboratory. Logos, phone number, fax number, and web address may also be included in this area. SCST logos, name, seal, and seal number are not to be used in conjunction with the laboratory contact information.
- B. Name of responsible individual from the issuing laboratory.** The signature of the person responsible for the content of the test information is required to make the Report of Analysis valid. Generally, this is the lab manager or supervisor accountable for the test results and not necessarily the person performing the tests. Signatures may be pre-printed or they may be actual hand-written signatures. There may be more than one signature on a report if there is more than one qualified person in the issuing laboratory. In some laboratories there is a purity supervisor and a germination supervisor, who would both qualify to sign the ROA. All Registered Seed Technologists have the qualifications to sign an ROA. SCST registered members may use the title “RST” and/or “RGT” as appropriate. Only registered SCST members may use the SCST logo and the SCST seal number on an ROA. The use of the SCST seal is optional.
- C. Unique laboratory test or sample number assigned by the issuing laboratory.** A test or sample number cannot be used more than once by the issuing laboratory. A unique test number or sample number can be used for all tests requested on one sample by the sender at the time the sample is received in the laboratory.
- D. Date report of analysis is issued.** This is the date that the report is issued, regardless of when the test(s) have been completed. An ROA, for various reasons, could be issued days or even weeks after testing is completed. According to the Federal Seed Act (FSA), dates should be reported as month and year. A date may be reported using the format: month, day, and year.
- E. Date germination test is completed.** This is the actual date that the *germination* test is completed and not the day the last test was completed. To meet FSA requirements, the germination date must be reported by month and year. However, the date may be reported using the format: month, day, and year. The FSA requires a germination date on labels so the AOSA *Rules* requires that labs provide this information.
- F. Applicant’s or Sender’s information, as stated by the applicant.** A sender may or may not supply all of the information listed below. Not all information submitted may need to be included on the ROA. Senders may request to have certain information regarding their seed lot included on the ROA for

their future use. When certain information is not provided by the sender indicate as such by terms such as “not provided” or “unknown”. Some laboratories include a liability statement in the Sender’s Information section of the report, such as: “The information provided here is that of the sender and not of the laboratory.”

1. Name and address of person or company submitting the sample to be tested and requesting an ROA.
2. The kind of seed, and/or whether the seed is a mixture, as indicated by the sender.
3. Cultivar or variety. If a variety name is not supplied, indicate “Variety Not Stated.”
4. Lot number. This is the number that identifies the applicant’s seed lot.
5. Lot size. The size could be reported in ounces, pounds, bushels, metric weight.
6. Origin. Where the seed has been grown/produced. Per FSA requirements some kinds of seeds require origin to be stated on the label.
7. Other. Name of seed treatment, coated seed, certification number, resampled, field or bin numbers, name of sampler or any other pertinent information as stated by the sender.

G. Condition of submitted sample. When the submitted sample is treated seed, inoculated seed, film-coated seed, coated or encrusted seed, or pelleted seed, this must be indicated on the ROA, usually in the ‘comments’ area. If the sender does not name a treatment, the fact that the seed is treated must still be indicated on the report.

H. Kind of seed. All crop kinds found in excess of 5% must be listed, even if the sample was not identified as a mixture by the sender. Only report the kind(s) to the level that the seed can be identified, either by visual characteristics alone or by conducting additional testing (ex: Sweetclover – *Melilotus* spp.) The kind(s) should be reported on the ROA by scientific name, or common name, or both. Different common names are used in different regions and countries, so the use of both names on the Report of Analysis is strongly encouraged to provide the clearest information. Common and scientific names used should be taken from Vol. 3 of the *AOSA Rules* or the Germplasm Resources Information Network (GRIN).

I. Purity Analysis information to be reported.

1. Weight of purity working sample to four significant digits.
2. Percentage by weight of pure seed, other crop, inert matter and weed seed. Report to two decimal places.
3. Scientific name, or common name, or both, of all other crop or weed seed found in the purity working sample. Common and scientific names used should be taken from Vol. 3 of the *AOSA Rules* or the Germplasm Resources Information Network (GRIN). The spaces headed ‘Other Crop Seed’ and ‘Weed Seed’ are to be used for this purpose. Again, use of both common and scientific names is strongly recommended. If no other crops or weeds are found during the test then the statement “None found” or some other indication must be used. Laboratories commonly list the number of seeds found and the number of seeds per pound or rate of occurrence per unit weight as additional information, but this is optional.

J. Noxious Weed Seed Examination information to be reported.

1. Weight of noxious weed seed working sample to four significant digits.
2. The name of each noxious weed kind found reported by scientific name, common name, or both. Common and scientific names used should be taken from Vol. 3 of the AOSA *Rules* or the Germplasm Resources Information Network (GRIN). Use of both names is strongly encouraged for clarity when interpreting state and federal seed law requirements.
3. The number of each noxious weed kind found and rate of occurrence per unit weight must be reported. If none are found during the examination the statement “None found” or other indication must be used.
4. If a noxious weed seed examination is not conducted, the statement “Not conducted”, N/A, or some other indication must be used.
5. It is important for clarity that the limitations of the noxious weed exam are defined. A laboratory may perform a noxious weed exam using the requirements of a particular state, but the ROA results may be used outside of that state. If a noxious weed exam includes only one or a cluster of states, the state or states should be listed. Postal abbreviations for the states should be used. For example:
 - ND Noxious Weed Seed
 - IA, MN and WI Noxious Weed Seed
6. All States Noxious: Laboratories have been known to have different criteria for defining “All States Noxious.” An All States Noxious weed seed exam should include any and all noxious weeds seeds listed in the current “State Noxious-Weed Seed Requirements Recognized in the Administration of the Federal Seed Act.” For example, if a state such as Hawaii is excluded, the limitation must be explained. A disclaimer such as “All States except Hawaii” should be included in the ‘Noxious’ section of the ROA to clarify the examination conducted.
7. UGS: If a turf grass or turf mixture (by definition of Vol. 3 Uniform Classification of Weed and Crop Seed) is being reported with an All States Noxious, it is important to indicate whether or not Undesirable Grass Seed (UGS) is included as part of the noxious weed seed exam. UGS are ten species deemed undesirable in seven eastern states (MD, VA, WV, PA, NJ, NH and DE). These species are bentgrass, bermudagrass, annual bluegrass, rough bluegrass, meadow fescue, tall fescue, orchardgrass, redtop, timothy, and velvetgrass.

K. Germination or Viability analysis information. (Refer to AOSA *Rules* Vol. 1 sec. 6.7 for rounding procedure.)

1. Percentage of normal seedlings as a whole number.
2. Percentage of hard seed, if applicable, as a whole number.
3. Percentage of dormant seeds, if applicable, as a whole number.
4. Recommended but not required: Number of days in the germination test. Do not include pre-chill period; do include days if test is extended. If the test is terminated before the final day count listed in Table 6A of the AOSA *Rules* Vol. 1, list the number of days actually in test.

L. Stand-alone Tetrazolium Test information to be reported.

1. Percentage of viable seed as a whole number. (Refer to AOSA *Rules* Vol. 1 sec. 8.6a.)
2. Percentage of hard seed, if applicable, as a whole number. (Refer to AOSA *Rules* Vol. 1 sec. 8.6a.)

The Viability section of the ROA can be used to report stand-alone tetrazolium tests. Extra columns or rows in the Viability section (see ROA template at the end of the handbook) can be utilized for this purpose. Another option is to report the results in 'Other Determinations.' For example:

- TZ=95%, Hard seed 2%, 200 seeds tested

M. Deviations from AOSA Rules. Any deviations from the methods described in the AOSA *Rules* for the kind(s) under consideration MUST be stated on the report of analysis. The following statement must be made. "(Insert name of test) was not conducted in accordance with the AOSA Rules for Testing Seeds." This statement must then be followed by a citation of the AOSA rule and a description/explanation of the deviation. For example:

- Dormancy determination was not conducted in accordance with the AOSA Rules for Testing Seeds. Viability of un-germinated seed is to be determined at the end of the prescribed test period. Dormancy on this report was determined as the difference between the TZ percentage and the germination percentage.
- Germination test was not conducted in accordance with the AOSA Rules for Testing Seeds. A 5-day pre-chill at 10C is prescribed before the germination period for dormant seed. A second pre-chill for 5 days at 5C was conducted after two weeks in an attempt to further break dormancy.

N. Tests not requested. In the event a purity analysis, noxious weed seed exam, or a germination test is not requested by the applicant, this must be stated on the ROA. A simple statement, such as "germination only" or "purity only" or "noxious weed exam only," would meet this requirement. Another method would be to list all requested tests; thus if a purity, germination or noxious test is not listed, it was not requested.

O. Other determinations. When tests other than purity analysis, noxious weed seed examination or germination test are conducted the results must be reported as 'Other Determinations.' It may also be acceptable to report such results under 'Comments' or 'Additional remarks.' See Section 2 of this handbook for more information and examples of other tests.

P. Printing of Reports. Laboratory ROAs must be typewritten or machine printed. Reports must not be issued that contain alterations or erasures.

1. If any error was detected in the original report of analysis, a revised report should be issued with the statement "Revised Report".
2. All spaces on the report must be filled in. If data is not provided, a dash, X, asterisk, "N/A" or "not conducted/not requested" are all appropriate to fill in the spaces. According to the FSA, the term "None found" when used on a report means that a test was conducted and nothing was found. Using zero "0" as a placeholder should only be used when testing provides this information.

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- Q. Insufficient sample size.** When the size of the submitted sample is less than required under AOSA *Rules* section 1.4, a statement regarding the insufficient sample size must be stated on the ROA. For example:
- Noxious exam was not conducted in accordance with the AOSA Rules for Testing Seeds. 200 grams of seed are required to be examined. Not enough seed was submitted for a complete noxious exam.
- R. De-coated seeds.** When coated kinds from the Poaceae or mixtures of other kinds are de-coated for germination testing, the following statement must be made on the report of analysis: “Germination results based on pure seed units de-coated prior to germination testing.” It is also recommended that the ROA should state how the seed was de-coated. For example:
- Seed washed under running water and air dried overnight.
- S. Three-part purity.** When an applicant requests the results of the purity analysis combine the categories of other crop and weed seed into one category called other seeds, the percentages of other crop seed and weed seed as defined by sections 3.3, 3.4, 3.5, and 4 shall be reported under additional determinations. This option provides flexibility to meet customer needs while presenting the information necessary to meet seed law requirements.

Section 2: Additional Tests and Optional Information

Many laboratories conduct additional tests other than those required by regulation. They may conduct proprietary tests, genetic tests, cultivar determinations, TZ tests and many others. Laboratories may also be asked to include additional information about observations made during testing. The purpose of this section is to provide suggested reporting methods and examples for this type of information. Laboratories that rarely conduct these tests will have a reference, with a goal towards increased uniformity among Reports of Analysis.

Optional Viability Information

% Total Viable – The formula for reporting % Total Viable is as follows:

$$\% \text{Total Viable} = \% \text{Germination} + \% \text{Hard seed (if applicable)} + \% \text{Dormant seed (if applicable)}$$

Note: All percentages must be rounded to the correct whole number according to the procedure described in the AOSA Rules. %Total Viable may be reported in the Viability section of the ROA as an additional column, or in 'Comments' or 'Other Determinations.' Total Viability, if reported, ". . . will be in addition to, and not in lieu of, reporting percentage germination, dormancy, and/or hard seed." See AOSA Rules Vol. 1 sec. 6.2j.

%Pure Live Seed (PLS) – The formula for calculating PLS is as follows:

$$\% \text{Pure seed} \times \% \text{Total Viable} / 100 = \% \text{ PLS (Correctly rounded to a whole number according to AOSA Rules.)}$$
 See AOSA Rules Vol. 1 sec. 6.2 k.

Abnormal and Dead% - Labs may choose to report the percentage of abnormal and dead seed. Additional columns may be added to the Viability Analysis section of the ROA or the information can be noted in 'Comments.' For example:

- Abnormal seedlings 5%, Dead seed 2%

Abnormal types – Labs may choose to include information on the main types of abnormal seedlings found in a germination test.

- Abnormal types: mechanical damage, decayed cotyledons

Planting parameters – Labs may choose to include information about the planting parameters used in conducting the germination test, under 'Comments.' This information provides transparency and information for reproducibility. For species not included in the AOSA Rules, providing this information is strongly recommended.

Dormancy breaking methods – If a dormancy breaking method is used during the germination test, there are benefits to noting the method on the ROA. If the lot is retested and there is a difference in the results, a comment regarding the dormancy breaking method on the ROA could help explain the variance. Regulatory laboratories would have the information needed to reproduce the testing method. This provides transparency in reporting. If the dormancy breaking method is listed in the "Fresh and dormant seed" column of Table 6A of the AOSA Rules, the statement is optional but recommended. However, if a method not described in the AOSA Rules is used, it MUST be described on the ROA, along with the statement: "Determination of dormant seed was not conducted in accordance with AOSA Rules for Testing Seeds." See AOSA Rules Section 15 m.

Number of seeds planted in the germination test – Although not required by AOSA Rules, the number of seeds planted in the germination test are often reported. If less than the prescribed amount of seeds is planted, it must be stated as a deviation from the AOSA Rules. See AOSA Rules Section 15 m.

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Number of days tested – Although not required by AOSA *Rules*, many labs report the number of days in a germination test, and this practice is recommended. Do not include pre-chill period; do include days if test is extended. If the test is terminated before the final day count listed in Table 6A of the AOSA *Rules* Vol. 1, list number of days actually in test.

Extending a test – If extending a germination test, one option is to note the number of days tested. However, not everyone reading the ROA may know the required days for testing. To be clearer, a comment can be added such as:

- Germination test extended for two days.

Vigor Tests –The Viability section of the ROA can be used to report some types of vigor tests. Extra columns in the Viability section (see template) can be utilized for this purpose. Some labs start new rows for each test and have a column labeled ‘Test Conducted’. Some vigor results that could be reported here are Accelerated Aging Cold Test, and Cool test. Another option for vigor tests is to report the results in ‘Other Determinations.’ For example:

- Accelerated Aging: 88%
- Electrical conductivity: 70 $\mu\text{mho cm}^{-1} \text{g}^{-1}$

Viability comments – As a service to customers, or upon request, additional remarks or observations made during the germination test can be noted. For example:

- Germination: Presence of pathogens noted
- Germination: Seed was treated with (name of product) in the lab prior to germination testing.
- Germination: 25°C on rolled towels.

Paired tests – In the case of paired tests, both germination results must be reported. See AOSA *Rules* Vol. 1 sec. 6.9 n(3).

Multiple embryos – For crops with seed units containing more than one embryo (such as *Beta vulgaris*), there may be occasions where the laboratory is requested to report the total number of normal seedlings in the germination test. For example:

- ___ normal seedlings per 400 seed units

Optional Purity Information

Inert matter types – Information on the type(s) of inert matter can be useful information to a customer and is often reported by laboratories in a section labeled ‘Inert Matter’. Examples:

- Live insects
- Sclerotia counts, sclerotia %
- Ergot counts, ergot %
- Broken seed, chaff, empty florets, plant material
- Soil
- Rodent droppings

Cultivar Purity Tests

Ryegrass fluorescence – According to the AOSA *Rules* Vol. 1 sec. 5.2 b (2), “A fluorescence test shall be made on all samples of ryegrass for which the percentage(s) of perennial ryegrass (*Lolium perenne*) and/or annual (Italian) ryegrass (*L. multiflorum*) is to be reported.” Calculations must be generated according to section 5.2b (2). Test fluorescence (TFI) is used to calculate the percent annual ryegrass and percent perennial ryegrass.

Contaminating ryegrass species is reported in ‘Other Crop’ as a percent to two decimals. If testing a single species of ryegrass and the fluorescence calculations result in 5% or greater contamination of the other ryegrass species (annual in perennial or vice versa), the contaminating species must be reported as a pure seed component and the seed lot is considered to be a mixture.

Test fluorescence is reported to two decimal places and is commonly reported in ‘Other Determinations’.

Varietal fluorescence may also be reported. Example:

- Test fluorescence= ____%.
- Varietal fluorescence= ____%

Customers sometimes request that only the fluorescence level be reported and not the fluorescence calculation results. If the ROA will be used for labeling purposes, the seed kind would be reported as “Ryegrass – *Lolium spp.*” and the customer should be informed that they may not have the information they need for accurate labeling.

Trait (Genetic) testing – Although report forms created specifically for Herbicide bioassays, ELISA tests, DNA tests, and other trait tests provide room for detailed information, another option is to report results on the ROA. Any results of this can be reported on an ROA in ‘Other Determinations.’ For example:

- 0.51% of seedlings tested by herbicide bioassay were non-tolerant for (name of herbicide).
- ELISA strip test results= _____

Seed morphology - Offtype seeds can be noted, usually in ‘Other Determinations.’ For example:

- Four gray hila soybean offtypes (0.12g) found in 500.6 grams.
- ____% (by weight) fluorescent oats in a non-fluorescent variety.
- ____% (by number) wrinkled peas in a non-wrinkled variety.

Grow-out tests – If purity percentages are based on the results of a grow-out this must be noted, usually in ‘Comments.’ The results of the grow-out may also be reported. For example:

- Pure seed % is based on a grow-out test.
- Grow out test: 2 of 15 fluorescent ryegrass seedlings were annual-type.

Quick tests – Tests that take advantage of cultivar or species differences by using or observing chemical reactions or observations can be reported. These tests are used to separate cultivars or species, such as the hard and red fescue fluorescence test using ammonium hydroxide, peroxidase test of soybeans, or the copper sulfate-ammonia test for white sweetclover. Record the percentage of each in ‘Other Determinations,’ and/or note the method in comments.

- Of the total number of normal seedlings, ____% fluoresced green and ____% fluoresced yellow.
- Pure seed is based on a 400-seed copper sulfate-ammonia test.

Growth chamber testing – Testing for plant morphological characteristics used to distinguish cultivars, offtypes, species and/or types. Report results in ‘Other Determinations.’

- Of 200 seedlings tested, 2.2% had purple hypocotyls.

Miscellaneous Tests and Remarks

Mixtures – For labs which test mixtures, the ROA template is designed to list the pure seed components in additional lines. The viability results should be aligned with each pure seed component.

Seed Count – Report as the number of seeds/lb. in ‘Other Determinations’ to the nearest whole number. For reports used within the US, seeds/lb. is standard. If requested, conversion to other weight units may be necessary for reports used outside of the US.

Pathogen test results - These results can be reported separately with a specialized format to provide detailed information regarding the test results. However, if reporting all test results for the sample on the same report, use ‘Other Determinations.’ For example:

- Loose smut=2.0%
- Anthracnose test is negative

Moisture tests – Report moisture % to the nearest tenth percent (i.e., one decimal place) in ‘Other Determinations’ (see section 11.4 AOSA Rules.) The method of testing is also recommended to be reported. For example:

- Moisture=12.1% by electronic moisture balance

Certification status, Quality status, Regulatory violations – When laboratory results are used to make determinations regarding the status of a seed lot for internal quality control, certification standards, or regulatory violations, the ROA can be modified to include an area for providing this information.

Section 3: Special Considerations

Seed testing laboratories need to consider liability and control of Reports of Analysis. These and other considerations are mentioned below, along with suggestions for increased clarity and uniformity.

Standard report form - There is no required format for a Report of Analysis. The AOSA *Rules* merely require that the information described in Section 15 of the AOSA *Rules* is provided and can be easily identified. However, uniformity in reporting is strongly encouraged by all laboratories. A standardized layout aids potential users of ROA's, including those from other countries, in finding and understanding the information provided. An ROA template is included at the end of this handbook. For laboratories that issue ROA's used for export, use of this format will provide confidence to import authorities that all of the required information has been provided. The template is based off of the ROA developed by the USDA for the Accredited Seed Lab program.

A ROA template for use when conducting tests according to Canadian Methods and Procedures for export to Canada is also included at the end of the handbook.

Signatures, logo, and use of RST seal - The issuing laboratory is responsible for the accuracy of the test information appearing on the report form. The ROA should have the signature of the person responsible for the content of the test information. The person responsible for the signing of the report does not have to be the person performing the tests. Signatures may be pre-printed or they may be actual written signatures. There may be more than one signature on a report if there is more than one qualified person in the issuing laboratory. SCST members may use the title "RST" or "RGT." The SCST logo and the SCST seal number may be used on an ROA; use of the SCST seal is optional. The title of the Report of Analysis should not refer to SCST, as this form is not issued by the Society.

Liability statement – A liability statement is recommended to establish the scope of legal responsibility of the ROA. Some examples of standard liability statements:

- Sample tested as submitted, information based upon received sample.
- Laboratory is not responsible for variety determination.
- Laboratory disclaims any responsibility for the accuracy of the sampling.
- Laboratory makes no other warranties of any kind, expressed or implied, including but not limited to the implied warranties of merchantability or fitness for a particular purpose.

Merging seed analysis reports –

- Never merge test results onto one report that came from different seed lots.
- Each laboratory testing the same seed lot should report results independently. For example, if one lab tests purity/germination and a second lab retests the germination of a particular seed lot, each lab reports their own results. Copies of both documents should be used to substantiate seed quality of the seed lot. However, if a lab subcontracts another lab to conduct certain tests from a seed lot, the results can be combined onto one ROA. Permission from the second laboratory (preferably in writing) must be granted. Also, it must be made clear which test(s) were conducted by each laboratory. Example:
 - Electrophoresis test conducted by _____, lab number _____.
- When merging test results obtained from different samples from the same seed lot onto one report it must be made clear on the report what sample each test result represents. Each sample should have a unique laboratory number.

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Integrity - A laboratory must always maintain the highest level of integrity when issuing ROAs. This is especially important to protect the SCST and AOSA organizations and individual laboratories from questionable reports that might create unfavorable or undesirable consequences. Customers must be provided with the accurate seed quality information they request and need.

Using results of another RST to issue ROA –A new RST working for a company may use test data from a previous RST's work for issuing reports of analysis if the following conditions are met:

- The seed lot in question has not been altered (i.e., reconditioned or re-bagged) since the initial testing was done.
- The germination test data is in compliance with Federal Seed Act requirements (if applicable.)
- The previous tests were conducted by or under the supervision of an RST.

If the current RST feels the previous test results may not be accurate for whatever reason, it is his/her responsibility to convince his/her employer that the tests need to be repeated.

Reporting percentages - All purity percentages on ROA's must be reported to two decimal places. Make sure that the purity percentages add up to 100.00%. [AOSA *Rules* Vol. 1 sec. 3.1 b (5)]. Germination results are reported as whole numbers. The sum of all germination components must be 100 -- see AOSA *Rules* Vol. 1 sec. 6.7a. Check with your database programmer to assure that calculations are being rounded and reported correctly according to the AOSA *Rules*.

Automated remarks – For consistency of reporting within the laboratory, an automated list of frequently used remarks is recommended from which the analyst can select when appropriate. Examples:

- Seed treated with (*name of product*).
- Coated seed washed under running water and air dried overnight.
- Revised report - _____ corrected.
- Sample retested for germination due to replicates out of tolerance. Results are the average of 800 seeds.

Issuing reports - In the age of computers, many reports are issued as a secure PDF file, and issued electronically via email. The SCST is able to issue an electronic version of the seal via email that can be imported to computer programs that are used to issue reports. With security measures in place, electronic signatures can be used on ROAs. Only the responsible person for signing the ROA should have access to create reports using electronic signature(s). Some laboratories issue hard copies of reports on "safety" paper that cannot be copied without leaving a watermark. Some hard copies cannot be emailed as a scanned PDF file, as the watermark and or an embossed seal will not scan.

Invoicing of costs - Billing for tests is more appropriately done on a separate invoice.

Record retention - According to the FSA, a complete record of the origin, treatment, germination, and purity of each lot must be kept for a minimum of three years for any agricultural seed offered for interstate commerce. For vegetable seed offered for interstate commerce, a complete record of treatment, germination and variety must be kept for three years. The FSA does not require that a copy of the Report of Analysis be kept. However, seed testing laboratories should keep records for a time as a service to their customers who may need access to test results.

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Rules for testing - The Report of Analysis should describe what testing rules have been used. Examples:

- Rules followed other than AOSA: None
- Tests are conducted according to. . . (ISTA Rules, Canadian Methods and Procedures, Federal Seed Act)
- Cold test: Proprietary

Report revisions - If any error is detected in an original Report of Analysis, a revised report should be issued with the remark "Revised Report". Under no circumstance may a report be revised to alter the results of a test unless a numerical error or a typing error was made. Senders' information may be changed if requested by the sender. The reason for revising a report should also be stated. Caution should be used when revising any report!

Section 4: Checklist of Requirements for the Report of Analysis

Does your Report of Analysis (ROA) measure up? This checklist can be used to review your ROA for required components.

- Name and address of issuing laboratory.
- Name of responsible individual from the issuing laboratory.
- Unique laboratory test or sample number assigned by the issuing laboratory.
- Date report of analysis is issued.
- Date germination test is completed.
- Applicant's information, such as kind of seed, cultivar, lot number, lot size, certification number, treatment, etc., as stated by the applicant.
- When the submitted sample is treated seed, inoculated seed, film-coated seed, coated or encrusted seed, or pelleted seed, this must be indicated.
- Kind of seed by scientific name, or common name, or both.
 - When a purity analysis is conducted the following information must be reported under Purity Analysis:
 - Weight of purity working sample.
 - Percentage by weight of pure seed, other crop seed, inert matter and weed seed found in the purity working sample, given to two decimal places.
 - Scientific name, or common name, or both, of all other crop seed or weed seed found in the purity working sample.
 - If no other crop or weed seed are found, this must be indicated.
- When a noxious weed seed examination is conducted the following information must be reported under Noxious Weed Seed Examination:
 - Weight of noxious weed seed working sample.
 - Scientific name, or common name, or both, of noxious weed seed found, the number of each type found and rate of occurrence per unit weight.
 - If no noxious weed seed are found, this must be indicated.
- When a germination test is conducted the following information must be reported under Germination Test:
 - Percentage of normal seedlings as a whole number.
 - Percentage of hard seed, if applicable, as a whole number.
 - Percentage of dormant seeds, if applicable, as a whole number.
- When a stand-alone tetrazolium test is conducted the following information must be reported under Tetrazolium Test:
 - Percentage of viable seed as a whole number.
 - Percentage of hard seed, if applicable, as a whole number.
- Any report of analysis containing tests not conducted in accordance with the AOSA Rules, when such rule exists, must contain this statement in the remarks section of the report: *"(Insert name of test) was not conducted in accordance with the AOSA Rules for Testing Seeds."* This statement must then be followed by a citation of the AOSA rule and a description/explanation of the deviation.
- In the event a purity analysis, noxious weed seed exam, or a germination test is not requested by the applicant, this must be stated on the report of analysis
- When tests other than purity analysis, noxious weed seed examination or germination test are conducted the results must be reported as other determinations.
- Laboratory reports of analysis must be typewritten or machine printed. No report must be issued that contains alterations or erasures.

AOSA/SCST Report of Analysis Handbook

- If any error was detected in the original report of analysis, a revised report should be issued with the statement "Revised Report."
- When the size of the submitted sample is less than required under section 1.4, a statement regarding the insufficient sample size must be stated on the report of analysis.
- When coated kinds from the Poaceae or mixtures of other kinds are de-coated for germination testing, the following statement must be made on the report of analysis: Germination results based on pure seed units de-coated prior to germination testing.
- When an applicant requests the results of the purity analysis combine the categories of other crop and weed seed into one category called other seeds, the percentages of other crop seed and weed seed as defined by sections 3.3, 3.4, 3.5, and 4 shall be reported under other determinations.
- Upon customer request, pure seed units with accessory structures protruding more than the largest dimension of the fruit or cluster of fruits shall be reported as the 'percentage of seed units with appendages attached.'

**Issuing Laboratory Name – Address – Contact Information
Report of Seed Analysis (AOSA Template)**

NAME AND ADDRESS OF SENDER:

Date received	Date issued	Lab/Test no.
SENDERS INFORMATION* Kind: Variety: Genus/species: Lot number: Size of lot: Field/bin number: Other: *The information provided here is that of the sender and not of the laboratory		

Tests requested:

PURITY ANALYSIS

(_____ Grams analyzed)

VIABILITY ANALYSIS

Germ-ination %	Dor-mant %	Hard Seed %	Total Viable %	No. Seeds Tested	Days Tested	Date comple ted		

PURE SEED COMPONENT(S):

%

COMMENTS:

Other crop seed: %
 Inert matter: %
 Weed seed: %

OTHER CROP SEED:

Kind

(EX: ALL STATE)* NOXIOUS WEED SEEDS (_____ Grams analyzed)

Kind

No. Found

No./lb.

INERT MATTER:

*(except _____)

WEED SEED:

Kind

OTHER DETERMINATIONS:

RULES FOLLOWED OTHER THAN AOSA:

SIGNATURE: _____
 Name, Title and/or Seal #

The purity and germination test results reported on this form have been carried out in accordance with AOSA Rules unless otherwise specified. Test results reflect the condition of the submitted sample and may not reflect the condition of the seed lot from which the sample was taken.

**Issuing Laboratory Name – Address – Phone – Fax - Email
Report of Seed Analysis for Export to Canada (Canadian Template)**

NAME AND ADDRESS OF SENDER:

Date received	Date issued	Lab/Test no.
SENDERS INFORMATION*		
Kind:		
Variety:		
Genus/species:		
Lot number:		
Size of lot:		
Field/bin number:		
Other:		
*The information provided here is that of the sender and not of the laboratory		

Tests requested:

PURITY ANALYSIS

(_____ Grams analyzed)

GERMINATION ANALYSIS

PURE SEED COMPONENT(S):

Germination %	Hard Seed %	Germ incl. Hard Seeds %	Pure Living Seed %	Days Tested	Date completed	No. Seeds Tested
%						

COMMENTS:

Other crop seed: %
Inert matter: %
Weed seed: %

NUMBER PER WEIGHT ANALYSIS - _____ g. analyzed

Name	No. per _____ g.	Name	No. per _____ g.	Name	No. per _____ g.
Prohibited Noxious:		Other Weed Seeds:		Other crop seeds:	
Primary Noxious:					
Total (Primary):					
Secondary Noxious:		Total weed seeds of all kinds:		Total other crop:	
Total (Primary +Secondary):				Sweet clover:	
Rules followed other than Canadian Methods and Procedures:				Brassica crops:	
				Sclerotia/Ergot:	

OTHER DETERMINATIONS:

SIGNATURE: _____
Name, Title and/or Seal #

CFIA Laboratory Recognition Number: _____

Test results reflect the condition of the submitted sample and may not reflect the condition of the seed lot from which the sample was taken.