

Seed Testing Definitions

I. Introduction

This document has been prepared by the AOSA and SCST to assist individuals working in the seed industry with understanding the seed testing requirements/ use of the AOSA Rules for Testing Seed for labeling seed for sale in the U.S.

The laboratory testing for law enforcement, labeling, or seed quality purposes should determine the following for the sample analyzed:

A. Purity Composition

% Pure Seed	% Inert Material	% Other Crop Seed	% Weed Seed*
*Number found and rate of occurrence of noxious-weed seeds per unit weight			

B. Germination/Viability

% Germination	% Hard Seeds*	% Dormant Seeds*	% Total Viable**
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*If applicable ** If applicable, AOSA Definition of Total Viable = germ + hard seed + dormant seed

II. Sampling

Seed testing begins with the sampling process. No matter how accurately an analysis is made, it can show only the quality of the sample submitted; therefore, it is the responsibility of the seed sampler to ensure that the sample is representative of the seed lot. Principles and procedures are found in the following literature:

- A. Association of Official Seed Analysts. AOSA Rules for Testing Seeds Vol. 1 Principles & Procedures. Section 1.
- B. Association of American Seed Control Officials. 2010. AASCO Handbook on Seed Sampling.
- C. Federal Seed Act Regulations. 2011. Sampling in the Administration of the Act, Sections 201.39 – 201.44.

III. Purity Analysis

The objective of a purity analysis is to determine the physical composition of the working sample. The purity working sample is separated into the following components:

- A. Crop kind and/or cultivar to be considered pure seed
- B. Other crop seed
- C. Inert matter
- D. Weed seed

Each of the four component parts is weighed and a percentage is calculated from the sum of the four component parts. This purity information is used to label the seed for sale and is reported on the analyst's Report of Analysis.

A. Definitions:

- 1. **Pure Seed:** Includes all seeds of each kind and/or cultivar under consideration which are present in excess of 5% of the whole (whole meaning the sum of the four components).

2. **Other Crop Seed:** Seed of plants grown as crops (other than the kind or cultivar included in pure) shall be considered other crop seeds, unless recognized as weed seeds by laws, regulations, or by general usage. Further classification of species is determined with the use of the reference, AOSA Rules for Testing Seeds Volume 3. Uniform Classification of Weed and Crop Seeds, AOSA 2013
3. **Weed Seed:** Seeds, florets, bulblets, tubers, or sporocarps of plants recognized as weeds by laws, regulation or by general usage shall be considered weed seeds. Further classification of species is determined with the use of the reference, AOSA Rules for Testing Seeds Volume 3. Uniform Classification of Weed and Crop Seeds, AOSA 2013
4. **Inert Matter:** Soil particles, stones, chaff, stems, leaves, flowers, cone scales, pieces of bark, pieces or resin, etc.. Pieces of broken and damaged seed units of crops which are half the original size or less. Damaged weed seed with over half the embryo missing.

IV. Noxious-weed seed examination

The objective of the noxious-weed seed examination is to detect the presence of noxious-weed seeds in a sample and determine the estimated rate of occurrence of the noxious weed seed in the seed lot. A noxious exam can be performed for a specific state, region or an “all states” exam (includes Federal Seed Act noxious weeds).

There are two classifications of noxious weeds: prohibited and restricted. Prohibited noxious weeds render the lot not fit for sale, no tolerance is applied. Restricted noxious weeds require the lot to be labeled as to the rate of occurrence of noxious weeds and tolerances can be applied. Reference the State Noxious-Weed Seed Requirements Recognized in the Administration of the Federal Seed Act

<http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5090172>

A. All States Noxious Weed Exam:

This is a comprehensive exam for all state and federal noxious weed seeds. An All-States exam may exclude certain states and this must be stipulated on the report of analysis (for example Hawaii is often excluded as everything is noxious).

B. Federal Noxious Weed Exam:

Seeds or bulblets considered noxious- Weed seeds in agricultural and vegetable seeds transported or delivered for transportation in interstate commerce (including Puerto Rico, Guam, and the District of Columbia). Agricultural or vegetable seed containing seeds or bulblets of these kinds shall not be transported or delivered for transportation in interstate commerce.

C. Individual State Noxious Weed Exam:

The classification of noxious weeds is according to individual state seed laws and is determined by the agricultural needs of each state.

D. Regional Noxious Weed Seed Exams:

A lab may be asked to conduct a noxious weed exam for a specific region. Example: A “Western States” examination (lab report must list the states that were included in the analysis)

E. Undesirable Grass Seed (UGS):

This examination determines the presence and rate of Undesirable Grass Seeds in a grass seed lot. UGS are not included in the All-States Noxious Weed Seed list. Undesirable Grass Seeds are restricted to lawn and turf seeds for these states: Delaware, Maryland, New Hampshire, New Jersey, Pennsylvania, Virginia, and West Virginia.

Undesirable Grass Seeds include: Bentgrass (Creeping, Colonial, and Velvet) [*Agrostis* spp.], Bermudagrass [*Cynodon* spp.], Annual bluegrass [*Poa annua*], Rough bluegrass [*Poa trivialis*], Meadow fescue [*Festuca pratensis*], Tall fescue [*Festuca arundinacea*], Orchardgrass [*Dactylis glomerata*], Redtop [*Agrostis gigantea*], Timothy [*Phleum pratense*], and Velvetgrass [*Holcus lanatus*].

V. Germination Testing

In seed laboratory practice, germination is defined as the emergence and development from the seed embryo of those essential structures that, for the kind of seed in question, are indicative of the ability to produce a normal plant under favorable conditions. Laboratory determinations are based on the AOSA Rules for Testing Seeds, Vol. 4, Seedling Evaluation.

A. Normal seedlings:

Seedlings are classified as normal if they have no defects or only slight defects that will not impair the continued development of the seedling or plant when grown in soil under favorable conditions. Specific descriptions of normal seedlings are used to determine the essential seedling structures for each family.

B. Abnormal seedlings:

Seedlings are classified as abnormal if they have defects that will prevent them from developing into mature plants when grown in soil under favorable conditions. These defects are not to be considered abnormalities if they are caused by test conditions. To classify a seedling as abnormal the analyst must judge the defect to be so severe that further development of the seedling would be unlikely. Specific abnormalities are listed in the seedling descriptions of each family.

C. Hard seeds:

Seeds that remain hard at the end of the prescribed test period because they have not absorbed water due to an impermeable seed coat. The percentage of hard seed is to be reported in addition to the percentage germination.

D. Dead seeds:

Seeds that at the end of the test period are not hard or dormant and have not produced any part of a seedling.

E. Dormant seed:

Viable seeds, other than hard seeds, that fail to germinate when provided the specified germination conditions for the kind of seed in question. Viability of ungerminated seeds may be determined by any appropriate method or combination of methods. The percentage dormant seeds, if present, may be reported in addition to the percentage germination. If the presence of dormant seeds is suspected but not determined the statement "viability of ungerminated seeds not determined" must be stated on the germination analysis report.

F. Total viability:

The sum of percentage germination plus dormant plus hard seeds.

Note: In all cases, and as defined in the AOSA Rules for Testing Seeds, the percentage of germination, dormancy and/or hard seeds, whichever is present in the seed test, shall be included on the report of analysis if total viability is reported. Reporting of total viability will be in addition to, and not in lieu of, reporting percentage germination, dormancy and/or hard seed.

VI. Other Determinations

When tests other than purity analysis, noxious weed seed examination or germination test are conducted the results are reported as other determinations.

Pure Live Seed	$\text{PLS} = \frac{\text{Pure seed (\%)} \times \text{Total viable seed (\%)}}{100}$
Soil and/or Ergot Examination	Determines the percentage of soil and ergot in the sample.
Tetrazolium Test	Chemical test for determining seed viability. Please see your specific state labeling laws regarding the TZ test.
Seed Treatment	Detection by bioassay protocol. Effectiveness of a seed treatment determined by comparing the inhibition produced by test sample to a check sample.
Seed Count	Gives the approximate number of seeds per pound.
Moisture Test	Determines the percentage of moisture content of seed. Must be submitted in a sealed plastic bag to be accurate.
Vigor Test	Cold test, Saturated Cold Test, Accelerated Aging, Stress Test
Varietal Purity	Visual, chemical reaction or growout type tests. Quick inexpensive tests to distinguish or narrow down the varieties or cultivars in question. Examples: hilum examination, peroxidase test, oat fluorescent, NaOH for wheat and phenol test for wheat. Grow out tests: hypocotyl color, plumule color or ryegrass fluorescence.
Fungal Endophyte	A fungal endophyte test may be used to determine the amount of fungal endophyte (<i>Acremonium</i> spp.) in certain grasses.

VII. Requesting the Tests You Need

Please indicate the tests you require on the sample:

- ☐ Germination ☐ Dormancy check
- ☐ Purity
- ☐ Noxious Exam (circle): All States, Federal Noxious, Undesirable Grass Seed,
Western Noxious (see IV D)
- ☐ TZ (stand-alone)
- ☐ Seed Count
- ☐ Moisture
- ☐ Vigor Test: AA, Cold, Saturated Cold, Stress Test
- ☐ Other: _____