

# HOW TO BE A SEED CONNOISSEUR



Compiled by:

Utah Crop Improvement Association,  
Utah State University

Utah State Seed Laboratory,  
Utah Department of Agriculture and Food

20May2015

*Facing any quantity of seed in bags, totes, bulk in a truck or hopper, or even a packet, can be daunting for a farmer, rancher, revegetation specialist, or gardener. What is actually in that container of seed?*

***This bulletin will explain how to find out what is in that container of seed.***

***It is divided into three sections:***

- I. How to Decipher a Seed Analysis Label
- II. How to Comprehend a Certified Seed Label
- III. How to Take a Representative Seed Sample for Analysis

## I. HOW TO DECIPHER A SEED ANALYSIS LABEL

The seed analysis label, based on an official seed analysis report, is where the vendor describes the purity and viability of the components present in the container of seed. Other vital details include the lot number, viability test date, labeler name and address, etc. Understanding “what’s on the tag”, where the information came from, and how the components relate to one another helps seed buyers decide what and how much seed to buy.

- A. The U. S. Federal Seed Act (FSA) and State Seed Laws mandate that seed cannot legally be sold to the sower (end user who plants the seed) without a seed analysis label. Do not accept seed that does not have an analysis label (see FIGURE 1) printed on or attached to the container, or supplied with the shipping invoice for bulk seed. For specific questions about seed laws in individual states and their enforcement, consult the state seed control official in your state as listed by American Association of Seed Control Officials (AASCO), [www.seedcontrol.org](http://www.seedcontrol.org)

**Note 1:** Some revegetation species (including most natives) are not listed in and thus technically not covered under the FSA for interstate shipment; however most state seed laws are inclusive of all seed in commerce.

FIGURE 1. Example of information listed on a seed analysis label. Items listed in <brackets> are included only in certain circumstances; the notations in (parenthesis) specify the section(s) of the text explaining the item. The seed analysis label includes portions of the data listed on a seed analysis report (see I.B.).

<b>Quality Seed CO.</b>					
919 Conditioner Ave., Seed City, UT 84000-0000 <a href="#">(I.E.)</a>					
Variety: Rosana <a href="#">(I.F.1.)</a> <VNS> <a href="#">(I.F.1.a.)</a>			Kind: Western Wheatgrass <a href="#">(I.F.1.)</a>		
Pure Seed	95.36%	<a href="#">(I.F.2.a.)</a>	Germination	94%	<a href="#">(I.F.3.)</a>
Inert Matter	0.70%	<a href="#">(I.F.2.a.)</a>	<Germination>	89%	<a href="#">(I.F.3., 3.a.)</a>
Other Crop Seed	0.38%	<a href="#">(I.F.2.b.)</a>	<Hard/Dormant Seed>	5%	<a href="#">(I.F.3., 3.a.)</a>
Weed Seed	0.11%	<a href="#">(I.F.2.c.)</a>	<Total Viability>	94%	<a href="#">(I.F.3., 3.a.)</a>
Noxious Weed Seed	None	<a href="#">(I.F.2.d.)</a>	< TZ >	96%	<a href="#">(I.F.3.a.)</a>
<Restricted Noxious Weed Seed>	Wild oats 5 seeds/lb	<a href="#">(I.F.2.d.)</a>	Germ./ Viability		
<Origin>	UTAH	<a href="#">(I.E.)</a>	Test Date	10/2014	<a href="#">(I.F.3.b.)</a>
< Net Weight>	50 lbs.	<a href="#">(I.E.)</a>	Lot No.	RWW-05614	<a href="#">(I.E.; III.B.)</a>
			<Cert No.>	G-3974	<a href="#">(I.E.; II.A.)</a>

- B. A seed analysis report is the written documentation of a seed analysis test performed on a seed sample by trained seed analysts in a seed testing laboratory. Both governmental and commercial seed testing laboratories utilize seed testing rules

published by the Association of Official Seed Analysts (AOSA). A list of seed labs can be found at [www.aosaseed.com](http://www.aosaseed.com) and [www.seedtechnology.net/](http://www.seedtechnology.net/) Seed testing rules developed by AOSA are followed to divide working samples from the submitted seed sample, calculate the percentage by weight of the pure seed units of the main crop species (kind), and determine their percentage of viability. The percentages of other crop seeds and weed seeds found (both identified by species and number/pound; see Note 4 at I.F.2.c.) and inert matter are also calculated. All these percentages are referred to as “mechanical” quality factors. As only certain data from the analysis report information are required to be listed on a seed analysis label (e.g., percentage by weight of other crop seed and weed seed, but not their specific species as given on the report; see I.F.2.b.,c.), it may be advantageous for the sower to obtain a copy of the official seed analysis report from the vendor or seed laboratory for specific seed lots.

**Note 2:** Seed labs may occasionally deviate from AOSA rules for specific seed samples (usually drawing upon analyst experience that may lead to a more realistic measurement of mechanical quality factors); such deviation must be listed on the analysis report by stating the rule and clearly describing the deviation from the rule.

**Note 3:** Seed labs may conduct other determinations upon request, such as calculations of pure live seed (see I.F.3.c), seed counts, moisture, weed and crop exams (see Note 5 at I.F.2.c.), etc. They may utilize chemical staining, DNA analysis, grow outs, or other seed examination or manipulation to provide information such as seed viability estimates (TZ; see I.F.3.a), disease incidence, vigor, fungal endophyte presence, varietal off-types, and presence or absence of certain genetic traits.

- I. C. Federal and State Seed Laws are “Truth in Labeling” laws and regulations. This means that informational items and mechanical quality factors must be truthfully represented, though in most cases there is no specified standard for mechanical quality levels. Notable exceptions include maximum allowable percentages for weed seed content in most states (see I.F.2.c), and minimum allowable seed viability percentages for vegetable and flower seed when sold in containers of one pound or less. One advantage of buying certified seed (see II.B.) is that for agronomic and many revegetation crop kinds, certified seed must meet specific standards for mechanical quality factors.
- D. Displaying analysis and certification information: When conditioned (cleaned) seed is being stored at or transported between seed conditioners, wholesalers, distributors, or vendors, analysis information does not have to be displayed on individual containers (except for interstate shipments of over 20,000 lb). However, as indicated above, seed laws require that when offered for sale to the sower, a complete analysis label must be printed on the bags (common for most agricultural seed), listed on an attached tag (common for most revegetation seed); a label or seed analysis report may be attached to individual totes or accompany the invoice or bill of lading for seed sold in bulk. Small containers of seed in garden stores may have printed labels or attached tags; vegetable or flower seed packets have an abbreviated label that includes the year packaged. If the seed is certified, an official certification label is attached to the bag or otherwise

supplied for bulk containers (see II.A.); in some states (e.g., Wyoming and Colorado) the analysis and certification information are combined on one tag.

- I. E. In addition to mechanical quality factors, general information required on the analysis label includes the identification and address of the seed labeler (seed conditioner and/or vendor); Origin (state or foreign nation, required only for alfalfa, field corn, and red clover); Net Weight of the contents (may alternatively be listed elsewhere on the container); Germination (or Viability) Test Date; and Lot Number. Treated Seed must list the treatment material on the container, analysis tag, or an additional label. Likewise, Inoculated Seed must list the inoculant type and expiration date. The lot number is a unique identification number assigned by the original seed conditioner for a specific amount of seed that has been harvested, conditioned and/or handled as a quantity of uniform consistency (see III.B). It is marked on a seed sample sent for analysis, and is listed on the seed analysis report. The lot number is normally marked on bags or other containers, and must be shown on seed analysis labels and invoices. For proprietary marketing purposes, a seed vendor may assign a different lot number to seed obtained from a conditioner or other vendors, though such lot number must be linkable to the original lot number by documentation on file and accessible to seed control and seed certification officials. For certified seed, the original lot number for which certification was granted must be written or stenciled on the bag, which must match the lot number on the certification tag.
- F. Following are descriptions of items that are listed on a seed analysis report:
1. Kind and Variety: Kind is the species or crop (e. g., corn, alfalfa, marigold, scarlet globemallow, antelope bitterbrush, crested wheatgrass, etc.) being offered for sale. A variety is a formalized, specific genetic subset of a kind, developed for certain beneficial attributes, and is defined in the FSA as being distinct, uniform, and stable according to its described method of reproduction. For purposes of labeling, the terms “variety” and “cultivar” are considered equivalent.
    - a. When officially named and released, a variety name is protected by the FSA in the sense that a specific name cannot be used for more than one variety of a specific crop kind. Some state seed laws require that for specific kinds (e.g., wheat or barley), the variety name must be stated on the label; otherwise variety not stated (VNS) may in most states be substituted for variety name. For some varieties, developers (owners) have been granted proprietary rights under federal patent laws such as Plant Variety Protection Act (PVPA); such status must be printed on the bag or a supplemental label. A variety with pending or granted PVP status means that unauthorized seed propagation and marketing, even if the variety name is not used, is prohibited, enforceable by the variety owner through civil court action. A PVP certificate can specify that seed of the

variety may be sold by variety name only as a class of certified seed; this election is enforced through Title 5 of the FSA.

- I. F. 1. b. Many native plant kinds do not have developed varieties; the kind is listed on seed analysis labels as the species or common name, and sometimes with “Variety Unknown” in place of variety. However, verification of geographic source or other attributes of such seed is extremely important, and specific germplasm entities of a species may be marketed as “Pre-Variety Germplasm” (PVG), a type of certified seed (see II.C). A PVG entity may be marketed with a unique germplasm identification or designation (usually having geographic relevance), e.g., Eagle Germplasm (a released selection of Western yarrow sourced near Eagle, ID), though this is not to be construed as equivalent to an official variety name in the FSA sense.
  - c. To ensure that you are getting a certain variety and/or specific germplasm entity or geographic source of any crop kind or species, insist on certified seed (see II.A., B.).
2. Seed “Purity” is inclusive of the separated components of the purity working sample (see Note 4 at I.F.2.c.), each expressed in hundredths, i.e., xx.xx. **Percentages by weight** of the **Pure Seed** of the listed kind (or kinds if the seed is a mixture) + **Inert Matter** + **Other Crop Seed** + **Weed Seed** must add up to **100% in total**. All of these seed purity factors must be listed on the analysis label.
  - a. **Pure Seed and Inert Matter**. Pure seed (or “pure seed units”) are described as the basic seed entity that has the potential to germinate, and are defined for each species (including weed species) by AOSA rules (sometimes inclusive of attached seed appendages, or less than fully intact seeds). Immature, broken, or damaged seeds that do not conform to the definition of a pure seed unit (lacking the requisite percentage of embryo or endosperm development or other defined structures) are included in the inert matter percentage. Inert matter may also include stem pieces, chaff (including detached seed appendages), soil particles, insect parts, ergot bodies, rodent droppings, etc. For many agricultural and some revegetation species, >99% pure seed of the crop kind and <1% inert matter is common for commercially conditioned lots. Some grasses and forbs have more chaff (exfoliating external seed parts) and/or clusters (sections of seed heads that do not break up easily that increase inert matter, yielding pure seed in the 80%-95% range. For some chaffy species such as sagebrush, pure seed percentage in commercially marketed seed may range as low as 10% to 20%. Such seed (along with seed having prominent awns or other seed appendages) is referred to as “non-free flowing”. These tend to clump or bridge in the container or drill (or sampling trier, see III.D), and special planting or seed sampling techniques may be required.

I. F.2. b. Other Crop Seed is usually very low (<0.5%), but any amount of other crop seed, such as barley seed in wheat seed, can be a potential problem for the resulting field. If the specific kinds of other crop seed and their individual numbers of seeds per pound are a concern, a copy of the seed analysis report should be requested. For some seed lots, a small amount of other crop seed (for instance bluebunch wheatgrass seed in crested wheatgrass seed) may not be serious, since several species are often mixed together anyway for a revegetation planting. On the other hand, crested wheatgrass seed in a bluebunch wheatgrass seed lot may be a serious concern if a 100% native planting is desired. If the other crop seed percentage exceeds 5% for a given crop kind, then the lot must be labeled as a mixture, with that crop being listed separately as an additional kind.

Seed mixtures of different kinds, and seed blends of different varieties of the same kind, are often sold for turf, pasture and revegetation use. Effective sampling of mixes is difficult due to differential settling of seeds of varying size, shape, and density. Seed analysis for mixtures can be time consuming and prohibitively expensive, and different varieties of the same kind in blends usually cannot be visually differentiated. Thus, when vendors or sowers obtain components separately before custom mixing or blending, it is recommended that individual seed analysis and certification labels be retained for reference.

- c. Weed Seed percentage of 0.00 is preferable (and is expected for many agricultural crop kinds), but is not easily attainable for seed lots of many revegetation species. Of course, the less weed seed the better, but some weeds are worse than others for the intended planting situation (see noxious weed seeds below). This is complicated by the fact that many native species are considered as weeds in agronomic crops, but may be considered acceptable or even desirable in a revegetation planting. For help in making such decisions, a seed analysis report lists each weed species and number of seeds per pound individually. It is a violation of the Utah seed law for “common” and “restricted” noxious weed seed (see below) to total more than 0.5% (except for grass, flower, tree, and shrub seeds which may contain 1.0%; grass seed in addition may contain up to 2% weedy *Bromus* species). In seed laws of other Western states, maximum allowed weed seed content ranges from 1% in Idaho to 2.5% in New Mexico. AOSCA certified seed mechanical standards strictly limit the amount of weed seed allowed in released varieties (see II.B).
- d. Noxious Weed Seeds are of species which may be especially damaging to croplands and/or wildlands, and are of two types: a) Prohibited (even one seed found in an analysis test can result in a stop sale of the lot by Federal and State seed control officials), and b) Restricted (for which the name of the weed and

number of seeds per pound must be listed on the seed analysis label; in Utah, the limit is 27 seeds per pound). Weed seeds defined as prohibited, and the number of seeds per pound allowed for restricted weed seeds varies from state to state; the seed lot must meet the regulations of the state where it is being sold. Many agriculture and revegetation managers accept only seed lots which have been examined for all noxious weed seeds listed in adjacent states, or even “all states noxious”. Also, many states have noxious weed control and quarantine lists that include more species than are included on their seed law noxious weed seed lists; managers may be advised to request seed labs to test seed lots for these additional species (see Note 5 below). The added lab cost may be justified due to the potentially devastating economic and environmental costs of many noxious weeds (e.g., yellow starthistle, leafy spurge, various knapweeds, etc.) on critical projects if introduced by the seed planted. Access to state Noxious Weed Control and Quarantine lists is provided by the National Plant Board, [www.nationalplantboard.org](http://www.nationalplantboard.org)

**Note 4:** According to AOSA rules, each species has a specific working sample weight in grams (453.6g/lb), based on approximately 25,000 seeds, which is separated from the submitted sample. A “purity portion” of about 1/10 of the working sample is then separated and examined to calculate all purity analysis percentages, including weed seed. For example, the working sample weight for Western wheatgrass is 100g; the purity portion is 10g. All common and noxious weed seeds found in the purity portion are weighed to calculate the purity weed seed percentage; the common weed seeds are also listed on the analysis report by species as the number of seeds per pound (one seed found in 10g would thus be reported as 45 seeds/lb). Noxious weed seeds found in both the purity portion and balance of the working weight (100g in total, also referred to as the “noxious portion”) are combined and listed on the analysis report and on the analysis label by species as the number of seeds per pound (one seed found in 100 gm would thus be reported as 5 seeds/lb). The analysis label would indicate “None” or “None Found” if no noxious weed seeds are found in the noxious portion.

**Note 5:** Upon request, most seed labs will examine the entire noxious portion for all weed seeds and other crop seeds (usually termed a “bulk exam for weed and crop”) which are then listed by number/lb. This additional exam may be advisable where certain weeds or other crop species would be considered extremely deleterious on the planting site.

- I. F. 3. Germination (or actual germination) is the percentage of the pure seed units (based on four reps of 100 seeds) of the crop kind that imbibe water and develop a normal root and shoot in a given time period. Standardized laboratory germination methods are designated by AOSA rules appropriate to each species. For many agronomic crop kinds, the actual germination is routinely very high and thus stands alone on the analysis label as the indicator of seed viability. For some agronomic and many revegetation species (e.g., alfalfa, globemallow, penstemon, Indian ricegrass, etc.), the label may list the individual percentages of Germination and Hard Seed and/or Dormant Seed, and their sum as Total Viability. Hard seed is alive

but has an impermeable seed coat that must be scarified by mechanical means, acid treatment, or by frosting action or organisms in the soil before it will germinate. According to AOSA rules for some species such as alfalfa, the firm, intact ungerminated seeds at the end of the germination test are listed as hard seed and added to the germination percentage. Dormant seed is alive but needs a period of time or physiological stimulus to allow germination; determination of dormant seed is described in the TZ section below. AOSA testing rules for some species include various treatments such as light or temperature manipulation, or various chemical stimuli that partially overcome dormancy; such assisted germinates are normally included as actual germination on the analysis report.

- I. F. 3. a. In some instances, a TZ notation may be listed on a seed analysis report as “other determination”, and thus sometimes on the seed analysis label as a substitute for germination percentage. This means that pure seed units (two reps of 100 seeds) were soaked in a liquid solution of tetrazolium chloride to indicate live, respiring (red-staining) tissue in the embryo and other vital portions of the seed as a subjective measure of seed viability. This can be reported in less than 48 hours by a trained analyst following AOSA guidelines. It is the viability test of choice when immediate decisions on seed purchases must be made, since germinant, hard, and dormant seed all react similarly with the TZ solution; viable seeds exhibit staining within structures and tissues essential for seedling development as described in the AOSA TZ Handbook. However, not all states allow the TZ test to be used for stand-alone viability labeling. For some species with indeterminate seed maturation and with seed lots damaged by heat, insects, fungus, etc., the TZ test percentage reported could include weakly viable seeds that might not actually germinate and emerge in the field, so following up with an actual germination test may be advised. Seed laboratories normally (required by the FSA for some grasses) perform a TZ test on firm, intact but ungerminated seeds after the prescribed germination test; those that stain as viable are reported on the analysis report (and label) as dormant seed and as part of the total viability percentage.
- b. Check to make sure that the Germination (or Total Viability) test date as listed on the label has not lapsed according to State and/or Federal seed laws. In Utah, agricultural crop seed (including revegetation grasses) must be re-tested for viability and the label updated every 18 months; all other seed (vegetables, flowers, tree, and shrub seeds) must be retested and the label updated every 9 months. Seed lots shipped across state lines are required by the Federal Seed Act to be tested for viability within 5 months (or 15 months for some turf and pasture grasses) before shipping.



- I. F. 3. c. Pure Live Seed (PLS) is not required to be listed on the label, but much revegetation seed is sold on a PLS basis and many seed mixes are specified in PLS pounds. This is due to the fact that many native species vary greatly in intrinsic seed quality factors of purity and viability, and these factors can additionally be affected by environmental conditions on a given year or at a given location. A fair market value of seed lots not meeting high “agricultural” mechanical quality standards can thus be standardized utilizing PLS. PLS is calculated by multiplying the % pure seed by the % total viability. The resulting percentage is helpful in determining seeding rates and true cost per viable unit of seed. Example: an analysis label on a 50 pound bag of seed indicates 92% pure seed and 87% total viability, thus  $.92 \times .87 = .80$  or 80% PLS. This means that for each pound of bulk seed in the bag, 80% (or a total of 40 pounds in the 50 pound bag) are viable seed units of the crop kind or species listed on the label, and can be expected to germinate and grow under favorable conditions. If a planting plan calls for 8 PLS pounds per acre, then  $8\text{lbs} \div .80 \text{ PLS} = 10 \text{ lb}$  of bulk seed per acre. If the cost of the bulk seed is \$3.50 per pound, then the actual cost for viable seed units is  $\$3.50 \div .80 \text{ PLS} = \$4.38$  per PLS lb.

## II. HOW TO COMPREHEND A CERTIFIED SEED LABEL

*The certified seed program is a third party process, and official seed certifying agencies serve as intermediaries for tracking seed genetic identity and genetic purity from plant breeders to seed producers/collectors and on to end users. Protocols enacting strict requirements for field or wildland seed production along with high genetic and mechanical quality standards ensure that “what’s on the tag is what’s in the bag”.*

- A. Certified seed has an official certification label or tag (in addition to the seed analysis tag) attached to or printed on the bag, or a bulk certificate or certification tag attached to or printed on the bill of lading or invoice for seed sold in bulk containers. In addition, the certification number may sometimes be listed on the analysis tag. Don’t be misled by a vendor who says “we don’t have the tags yet”, the seed “came from a field planted with certified seed”, “the collectors said it came from that general area”, or “it’s just as good as certified”. Seed lots must meet strict requirements and standards before certification tags or labels are issued; therefore, if the certification labels are not present, don’t accept it as certified seed. Following are benefits of insisting on certified seed:
1. The certified seed process is provided by Seed Certifying Agencies which are members of the Association of Official Seed Certifying Agencies (AOSCA). This is a third-party service provided in most U.S. states, Canada, and some other countries including Australia and Argentina (see [www.AOSCA.org](http://www.AOSCA.org) for a listing).

Seed Certification is accomplished through records of seed source and generation, field/wildland site and conditioning facility inspections, and results of formal seed sample analysis.

II. A. 2. Certified seed verifies the variety or germplasm identity. Certification assures that the seed in the container, as listed on the certification tag, is the variety or germplasm claimed. This applies to seed whether field produced, or wildland collected for direct revegetation use (labeled as to state, county and elevation or other geographic description). This verification is extremely important as new varieties and germplasms are developed, and when trying to match the geographic seed source or zone with a specific geographic planting area. The seed laboratory does not verify the variety or germplasm identity unless costly chemical or DNA tests are specifically requested; when a seed analysis report lists a variety name or germplasm ID, it is noted only as “sender’s information”. For instance, a typical seed analysis report does not state whether a crested wheatgrass seed sample received is actually Hycrest or Hycrest II or Fairway or Nordan or Ephraim or CDII or Douglas or RoadCrest; likewise it does not differentiate between subspecies of big sagebrush or most species of penstemon or globemallow, and certainly cannot confirm the geographic area where such seed was collected (or a specific germplasm entity if field produced).

B. For plant materials (including those of native species) that have been formally released as a variety, AOSCA generation-based classes of 1) FOUNDATION SEED (white tag); 2) REGISTERED SEED (purple tag); or 3) CERTIFIED SEED (blue tag) will be written across the top of the tag (FIGURE 2). “Blue tag” seed is the generation that is intended for commercial field or revegetation planting.

Certification for released varieties also means that the seed meets high standards (meeting or exceeding those set by AOSCA) for genetic purity, pure seed and viability percentages, and containing strictly limited amounts of other crop seed, weed seed, inert matter, and diseased seed. Some seed lots of varieties in short supply may be labeled as “Substandard” on the certification tag; this means that a mechanical quality factor (not affecting varietal or germplasm identity and genetic purity) does not meet normal certification standards. The substandard factor will be listed on the certification tag, e.g., “substandard--low viability”, or “substandard--excessive inert matter”. However, any applicable state seed law limitations must be met, and the sower must determine whether such seed meets their mechanical quality expectations.

C. Accessions of native or naturalized revegetation plant materials (wild collected or field grown) that have not been released as a variety are referred to as Pre-Variety Germplasm (PVG) by AOSCA. These plant materials are categorized and labeled (FIGURE 2) as 1) SOURCE IDENTIFIED SEED (yellow tag): Lists original collection

location as identified by state, county, and elevation or other geographical description, though nothing is known or claimed about germplasm performance or special traits; 2) SELECTED SEED (green tag): Developer claims promise of superior and/or identifiable traits as contrasted with other germplasm accessions or selections of the same species; or 3) TESTED SEED (blue tag): Requires progeny testing by the developer to prove that superior and/or identifiable traits of interest are heritable in succeeding generations. Information listed on a PVG certification tag includes a) the scientific and common species name (and optional germplasm identification notation), b) location (minimum of state, county, and elevation) of the originally collected material (designated as generation zero, G0), and c) location (state, county, and elevation) and generation (G1, G2, G3, etc.) of the material when field grown. Seed that is wild collected for direct revegetation outplanting is designated as G0/G0, indicating that it is not eligible for stock seed for field production unless more collection site information is supplied. Also noted on the tag may be information as to whether the material is indigenous to the site where collected, and whether or not genetic manipulation such as recurrent selection or hybridization was performed (listed as Manipulated-Track vs. Natural-Track). Since PVG seed is usually sold on a PLS basis (see I.F.3.c), seed mechanical quality standards may not be a criteria for PVG tagging for some certification agencies, including Utah. Some revegetation seed purchasing agencies, however, set internal standards for seed quality factors that may be more stringent than some state seed laws or even AOSCA mechanical quality allowances for varieties. A seed analysis report is thus indispensable in evaluating PVG seed quality.

### **III. HOW TO TAKE A REPRESENTATIVE SEED SAMPLE FOR ANALYSIS**

*The seed laboratory analysis report specifically pertains to the submitted seed sample.*

*Whether the report accurately represents the seed lot from which the sample was drawn depends entirely on how well the sampling protocol was followed. This section explains how a seed sample can be truly representative of the original container(s) of seed.*

- A. A key person in the analytical testing process is the one who takes the seed sample. This person may be 1) an official (State or Federal) government seed inspector or third-party seed certification representative, 2) a seed producer, conditioner, or dealer, or 3) seed purchaser (e.g., farmer, rancher, public land management agency representative, etc.). Seed samples may be taken (drawn) by any of these persons implementing established AOSA/AASCO seed sampling procedures using proper seed sampling tools and methods described below; a person may obtain a seed sampler certificate by completing training courses as sponsored by AASCO. To mechanize the sampling process, many conditioners of high-volume agricultural crops install an auto-sampler which draws sub-samples as the lot

comes off the conditioning equipment. For critical seed lots or to resolve disputes regarding seed purity or quality, it may be advantageous for a seed vendor or purchaser to arrange for a government seed inspector to draw an official sample.

- III. B. While the ideal seed lot would be completely uniform, with every portion of each container consistent as to seed mechanical quality factors, this is seldom achieved. Variability in a seed field or seed collection area (differential moisture conditions, patchy frost or weed infestations, indeterminate seed ripening, stand unevenness, etc.) is not uncommon. The seed conditioning process tends to even out such variability. But special efforts may be necessary to mix the lot uniformly, or alternatively to separate the seed into two or more lots that may be more internally consistent. When service samples are drawn by the conditioner for the purpose of obtaining test results for a newly conditioned seed lot, it is especially important to obtain a representative sample. This decreases the chance that an official sample drawn at some later date by as authorized by a seed control official for truth in labeling testing may lead to different seed analysis results. Any deficiencies are subject to allowable tolerance percentages published by AOSA and AASCO, but deficiencies greater than these tolerances may lead to label violations, which may result in stop sales or fines. It should be noted, however, that a proper sample drawn from the original seed lot will represent that total lot, while subsequent seed samples taken from subsets of the lot (as remaining in a warehouse or as shipped to customers), will represent only those subsets; this can lead to discrepancies in analysis results as compared with the original intact lot.
- C. Before starting to sample, determine the seed lot number(s) and the number of bags or other containers of the seed actually present; it is not uncommon for seed representing more than one lot to be shipped on the same truck or pallet. Always check to make sure that the lot number written or stenciled on each container is referenced on the attached seed labels or shipping invoice. The number of containers to be sampled is determined by the number of containers of each separate lot at the present location. (see III.G.1).
- D. In order to secure a representative sample, multiple portions of similar size must be drawn from evenly distributed parts of the quantity of seed to be sampled. In some cases, a fork lift may be necessary to provide access for sampling tightly stacked pallets of seed. For free-flowing seed in bags or bulk, seed probes or triers (pointed metal tubes with one side open or slotted) long enough to sample all portions of the bag should be used. For large bulk bags or bins, an extra-long, large diameter trier may be necessary (see III.G.2). A double sleeve tube-type trier is inserted in closed position and opened when in proper position; a single tube slotted trier is inserted with slots down and inverted when in proper position to allow seed to flow in. A short, pointed and slotted “thief” trier or “cheater” probe must never be used to obtain a seed sample for testing. For non-free-flowing seed (seed with excessive chaff or projecting seed parts such as certain grass or shrub seed) which are difficult to sample with a probe or trier, a sample may be obtained by hand sampling. This is done by thrusting the open hand (fingers together) into the bag or bulk

and withdrawing a fist full of seed. In all cases, cores or handfuls should be taken from different areas of the container(s) to account for uneven distribution or settling of contents.

- III. E. When sampling seed in bags, take care not to unduly tear the container when inserting the trier, or to push it through the opposite side. Whenever possible, insert the trier at a point where the seed exerts the least pressure on the bag. Care should also be exercised in closing holes made by the trier. Holes in loosely woven cloth or poly bags may be closed by stroking the point of a trier across the opening in several directions. Holes in tightly woven cloth bags and paper or polyethylene bags may be closed with pressure sensitive tape with care taken to brush dust from the area before applying the tape.
- F. Seed sample containers must be large enough to hold the proper amount of seed of each species for the testing required (see III.G.3). Pre-addressed paper envelopes or cloth bags with plastic liners are available from some seed laboratories; food-type plastic bags can suffice when protected by another container. An attached sample label or form should list name and billing address of sender, crop kind and lot number, analysis procedures requested (e. g., purity analysis, germination and/or TZ, state noxious weed and/or weed seed lists to be consulted, weed and crop, etc.; see I.F.1.,2.,3. and Note 3 at I.B.), and any other information necessary for the lab to process the sample, such as whether the seed is treated, pelleted, etc. If the seed is treated, include the name of the treatment used. Some seed testing laboratories will not accept treated seed for testing purposes; check with the lab before submitting a treated sample.
- G. The following detailed directions for sampling seed are based on rules and regulations established by AOSA and AASCO:
  1. Seed in bags: a) when more than one core is drawn from a bag, follow different paths; when more than one handful is taken from a bag take them from well-separated points; b) for quantities of six bags or less, each bag shall be sampled; for quantities of more than six bags, five bags plus at least 10% of the total number of bags in the lot present shall be sampled, rounding numbers with decimals to the nearest whole number. Regardless of the lot size, it is not necessary to sample more than thirty bags.

EXAMPLES:

# Bags in Lot	< or =6	7	10	23	50	100	200	300	400
# Bags to Sample	*	6	6	7	10	15	25	30	30

\*Sample each bag, or a total of at least five cores or handfuls from the bags present

2. Bulk seed: Obtain a composite sample by inserting a trier or thrusting the hand into the bulk, as circumstances require, to obtain a composite, or gross, sample of at least as many cores or handfuls of seed as if the same quantity were in bags of an ordinary size. Take the cores or handfuls from well distributed points throughout the bulk.

- III. G. 3. The size of the fully drawn seed sample consisting of cores or handfuls from containers or bulk is dependent on the size of the seed lot, and a sub-sample usually needs to be taken. This can be done by thoroughly mixing the entire sample in a hard-sided container such as a metal bucket (plastic containers tend to retain dust and chaff due to static electricity) and sub-sampling by hand or a seed scoop. Alternatively, the mixed sample can be carefully placed on a tarp or table and selecting random “pie” portions of the whole. A measuring cup can be useful to estimate the approximate volume needed, but an inexpensive postal scale can serve well to weigh out more exact samples. The following are minimum weights and estimated volumes of seed samples to be submitted for analysis; the sample sizes are based on the weight (or volume) of the crop kind which would provide at least 25,000 seeds for purity, viability, and noxious weed working samples:
- a. Two ounces (approx. 55 grams or  $\frac{3}{4}$  - 1½ cups) of seeds similar to or smaller in size than the following: bluegrasses, orchardgrass, timothy, birdsfoot trefoil, white or alsike clover, penstemon, globemallow.
  - b. Five ounces (approx. 150 grams or 2-2½ cups) of seed similar in size to the following: alfalfa, smooth or meadow brome, crimson or red clover, flax, lespedeza, millet, rape, ryegrasses, crested or bluebunch wheatgrass, basin or Russian wildrye, forage kochia, Indian ricegrass, squirreltail, Lewis flax. Rabbitbrush and sagebrush have very small seeds, but require this amount due to typically low pure seed percentage (“chaffy” seed).
  - c. Nine ounces (approx. 250 grams or 3-3½ cups) of seed similar in size to the following: tall or intermediate wheatgrass, fourwing saltbush (de-winged), mountain brome, wild sunflower, Utah sweetvetch (out of the pod). Winterfat, cliffrose, lomatium, or winged fourwing saltbush require up to 8 cups to obtain this weight of seed due to seed appendage volume; use of a postal scale may be more appropriate.
  - d. One pound (approx. 500 grams or 4-4½ cups) of seed similar in size to the following: proso, sudangrass, balsamroot, Utah sweetvetch (in the pod; may need more than 4 ½ cups to reach this weight).
  - e. One and one-half pounds (approx. 750 grams or 5-5½ cups) of seed similar in size to the following: antelope bitterbrush, mountain lupine.
  - f. Two pounds (approx. 1000 grams or 6-6½ cups) of seed similar in size to the following: cereals (wheat, barley, oats, etc.), sorghums, vetches, safflower, beans, peas.
- H. It is very important to handle seed samples properly between the time they are sampled and when they are sent for analysis. Seed samples should not be exposed to the sun or stored in a vehicle cab or other enclosed area where high temperatures, even for a short time, may damage seed viability. If requesting a moisture test, place seed sample in an airtight container.

- I. Extreme care must be used in the sampling process to prevent cross-contamination of seed lot samples. Completely empty out triers, and make sure that any containers or cloth mats used to accumulate seed during the sampling process are properly cleaned. Picking out any portion of the sample (chaff, broken or poorly developed or off-type seeds, weed seed, mouse droppings, etc.) can of course improperly bias the seed analysis results, and must not be done!

**Conclusion:**

*For any container of seed, the primary goal of seed laws and seed certification programs is to make sure that “the tag is on the bag”, and that “what’s on the tag is what’s in the bag”. Once this basic goal is met, it is up to the sower to match the (a) variety and/or germplasm genetics and (b) mechanical quality of the seed, with (c) proper geographical and environmental site characteristics, (d) proper planting techniques, and (e) application of sufficient moisture. Ignoring such “seed savvy” may lead to an unfortunate and expensive misuse of that container of seed.*

**Note 6:** References to requirements contained in Federal and State seed laws and regulations, and in seed certification standards, are accurate as to the date of this publication but may be subject to change in the future.

**If you have read and understood and implemented all of the information in this bulletin,**

**CONGRATULATIONS!**

**YOU ARE NOW A SEED CONNOISSEUR!**

For questions or further information, contact:

Utah Crop Improvement Association, 4855 OMH, Utah State University, Logan, UT 84322-4855: Stanford Young, PhD (Research Professor, USU; Secretary/Manager, UCIA), 435-797-2082, [stanford.young@usu.edu](mailto:stanford.young@usu.edu) ; or Michael Bouck (Foundation Seed Manager, USU, Certified Seed Supervisor, UCIA), 435-881-2058, [michael.bouck@usu.edu](mailto:michael.bouck@usu.edu)

Utah Department of Agriculture and Food and Utah State Seed Laboratory, Box 146500, 350 N. Redwood Rd., Salt Lake City, UT 84414-6500: Ronald Larsen (Seed Program Manager and Seed Control Official), 801-538-7187, [rlarsen@utah.gov](mailto:rlarsen@utah.gov) ; Stanley Akagi (AOSA Certified Seed Analyst), 801-538-7182, [sakagi@utah.gov](mailto:sakagi@utah.gov) ; or Terry Freeman (AOSA Certified Seed Analyst), 801-538-7182, [terryfreeman@utah.gov](mailto:terryfreeman@utah.gov)

FIGURE 2. Examples of AOSCA Pre-Variety Germplasm (SI, S, T) and Variety (F, R, C) certification tags

