OREGON STATE UNIVERSITY SEED LABORATORY

TESTING THE QUALITY OF SEEDS IN CEREALS

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Cereal acreage in the state has increased. In addition to the importance of following proper cultural practices, planting high quality seeds is a crucial first step for a successful crop production. Seed quality depends on genetic components (defined by the variety), physical purity, viability, and seed health (i.e., disease). Seed tests provide information to help determine the quality of seeds. This information is needed to reduce the risks resulting from planting poor quality seeds.

As cereal growers become increasingly quality conscious, the OSU Seed Laboratory has received many questions such as:

- What weeds are present in the seed sample? Is there, e.g., jointed goat grass?
- Are the seeds still dormant? What is the germination? Would viability by TZ be different from germination results?
- Does pre-harvest sprouting affect seed germinability?
- Are there tests to determine cultivar purity? Or mixtures?
- Can winter varieties be distinguished from spring varieties?
- How many seeds are present in a pound?
- Can we determine the weight per bushel and seed moisture content?

The seed tests presented below are designed to answer these and other questions. They are listed in several publications of the Association of Official Seed Analysts (AOSA), such as the Rules for Testing Seeds, Cultivar Purity Testing Handbook, and Seed Vigor Testing Handbook. The following tests are available at the OSU Seed Lab.

Purity Test

The objective of a purity test is to determine the percentage of pure seed in a sample and quantifying the presence of contaminants such as weed seed, other crop seed, and inert matter, if they are present (Fig. 1). Purity test also includes the 'All States' noxious weed exam. The minimum sample size for purity test and noxious weed exam for cereals is 2 lbs.

Fig. 1. *Jointed goat grass, wild oat, bindweed, and ergot are among the common contaminants in cereals.*

Viability Tests

There are two main tests to determine the percentage of viable seed in a sample:

Standard Germination Test: It determines the percentage of seeds that germinate and produce normal seedlings under favorable conditions (Fig. 2).

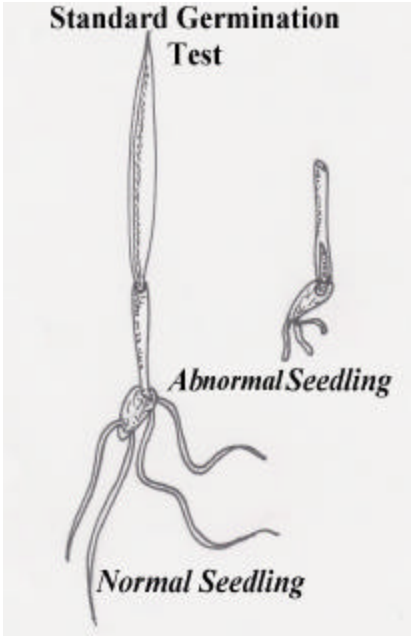

Fig. 2. *Seedlings that develop healthy root and shoot systems are considered normal.*

Tetrazolium Test (TZ): It is a fast, reliable viability test, widely known as TZ test. It determines the percentage of live and dead seeds in a sample within 24-48 hrs, regardless of the dormancy level of the seeds (Fig.3). The embryos of live seeds stain red whereas the embryos of dead seeds do not stain. Abnormal seeds exhibit different pattern of staining.

Fig. 3. *TZ test: (A) Viable wheat seeds with embryos uniformly stained red, and (B) non-viable seeds with unstained embryos.*

Vigor Tests

Vigor tests determine the potential for rapid, uniform emergence and development of normal seedlings under a wide range of field conditions. Seeds gradually lose vigor before they lose the capacity to germinate and finally die. This explains why some seeds may germinate well under optimum conditions of temperature, water, and light in the standard germination test; but when planted in the field (which may have stressful conditions), they produce poor stands. Some of the vigor tests for cereals are:

Cold Test: It predicts the potential the emergence of seeds under cold, wet field conditions (prevalent in the fall, winter and early spring). Varieties or seed lots differ in tolerance to such conditions.

Accelerated Aging Test: It predicts the potential storability of a seed lot. Seeds are stressed with high temperature and relative humidity for a period of time before germination. High quality seeds tolerate such conditions.

Genetic Traits and Varietal Identification Tests

Clearfield Bioassay Test: The purpose of this test is to determine the presence of Clearfield trait in wheat using 'Beyond' herbicide.

Phenol Test: It is a quick chemical test used to differentiate between some cultivars of wheat (Fig 4), barley, and oat. It is based on the color reaction between phenol solution and the seed coat of various cultivars.

A ***B***

Fig. 4*. Phenol test: Uniform ivory color reaction in a genetically pure wheat variety (A), and a mixture of color reaction in a sample containing more than one variety (B).*

Sodium Hydroxide Test: Sometimes it is difficult to distinguish between white and red wheat if seeds have been weather-damaged in the field or treated with a fungicide. This is a quick test to accurately distinguish between the two types based on the color reaction (Fig.5),

A ***B***

Fig. 5. *Sodium hydroxide (NaOH) test:* (A) Red wheat, and (B) white wheat.

***Fluorescence Test*:** Distinguish between white (fluorescent) and yellow (non-fluorescent) oat seeds. If the lemma and/or palea fluoresce under UV light, seeds are considered fluorescent.

Grow-out Tests: Useful to distinguish between winter and spring varieties, and to identify certain characteristics such as the presence of awns.

Other Tests

Seed Count: Determines the number of seeds per pound, which is used to decide the seeding rate.

Bushel Weight. Determine the direct weight per volume *(lbs/bushel).* Useful to assess the degree of grain filling, seed density, and loses during cleaning.

Moisture Test. Moisture influences the length of time seeds remain viable and the potential for safe storability. This is why it is useful to know seed moisture content after harvest and before and during storage.

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