

Seed viability and testing

Introduction

Many plants are propagated directly from seed. For efficiency, growers must know characteristics of their seed such as: seed viability, percent germination, seed contamination.

Seed companies test samples of all the seeds they sell to seed purity, viability, germination and vigor. Companies also recommend to growers the optimum conditions for growing the seed.



Objectives

1. Learn which tests are used to assess seed viability.
2. Compare a several seed viability tests including visual assessment, seed floating, Tetrazolium chloride staining and germination.

Seed testing

Several tests have been developed that determine viability and vigor. We will be using two of these.

1. *Triphenyltetrazolium (viability) test (TZ or TTC test)*

Seeds are soaked in triphenyltetrazolium chloride which reacts with enzymes in living tissue and produces a red color within hours. The TZ test works by having dehydrogenase enzymes in seeds (or any living tissue) react with triphenyltetrazolium chloride. In the process hydrogen ions are released to the oxidized, colorless tetrazolium salt solution which then changes to a red or pink color as it is reduced by the hydrogen ions. The TZ test is often referred to as a topographical test because interpretation depends not only on the presence of a red color, but also on the pattern (topography) of staining. The most important areas to stain are those that contain meristems, the radicle tip and the shoot apical meristem. The tetrazolium test is useful because it is quick and suitable for determining viability of dormant seeds which do not germinate using the direct germination test because these seeds require lengthy pre-germination treatments. Seeds that need treatments to break their dormancy are good example.

2. *Direct Germination Test*

This is the standard test for seeds of annual, biennial, and herbaceous perennial seeds. Seeds are placed in an environment suitable for germination and the final percentage of seeds that germinate is calculated. Suitable containers include Petri dishes for small seeds, plastic boxes, or small flats. The seed may be germinated on blotter paper, paper towels, perlite or sand. A representative sample of the seed lot must be obtained and then is reduced in size to produce the Working Sample, the seeds which are actually tested. Replicates, usually of 100 seeds each, are always run. Direct germination tests last from several days to several weeks.

Prepared by Ali and Mark Bell October 29, 2007

Materials required

Seeds of Pistachio, Fava bean and citrus.

Large (12 ounce) clear plastic cups
Plastic Petri dishes
10% bleach solution
“Kimwipe” tissues
Tape

Singled-edged razor blades
2,3,5-triphenyltetrazolium chloride (TTC), 0.5% solution
Paper towels
Sealable plastic bags

Method - Tetrazolium Viability Test

1. Cut each of the seeds in half and lay them in a Petri dish.
2. Add the TTC solution to the dish to just cover the seeds.
3. Set aside for 30 minutes to 1 hour to allow the color on the seed to develop.
4. Record the number of seeds in which the embryonic tissue stains red.

(Picture: TTZ test picture from Mid West Seed Services)



Method - Germination tests

Each person will receive a small amount of different types of seeds.

1. Clean each batch of seeds by placing them in a container of 10% bleach. After 15 minutes, carefully pour off the bleach solution and thoroughly wash the seeds in running tap water.

Note: Each seed type is laid out in rows on a single paper towel and then rolled up.

2. For each seed type
 - a. Lightly moisten a paper towel and lay it flat on a clean surface.
 - b. Lay 10 seeds in a row about 1 inch from one edge of the paper towel (See figure).
 - c. From the edge near the seeds, fold the paper towel over to cover the seeds.

Depending on the seed type, up to 100 seeds are usually tested for each plant type.

- d. Then place a new row of 10 seeds and fold the towel over the seed again.
- e. Make sure the towel is moist not wet – if too wet, the seed will rot.
- f. Place the folded paper towel in a Ziplock bag that is left slightly opened.

3. Place the plastic bag with seeds in a warm location and be sure to keep the seed and towel moist.
4. After a few days, unroll the moist paper towel and record the number of germinated seeds.
5. Express your data for each species as a percent of the viability measured above.

