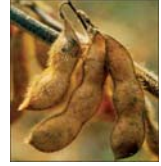




Row Crops Newsletter

Volume 2 - Issue 3

January 25, 2010



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Agronomy Facts: Seed Quality

Seed quality is very important in establishing a solid foundation in any cropping endeavor if the Good Lord gives us the right environmental conditions. If we have poor seed quality the Lord can give us the best environmental conditions and we will not be satisfied with the outcome. We may forget many things but we never forget a bad variety or a good variety with poor seed quality. These are things that etch vividly in our minds because we have to live with this all season. With seed and technology costing what they do, it becomes very important for us to have high quality seed at the grower level.

We often fail to remember that a seed is a living entity where life is occurring at a very slow pace. Yes, seed is respiring and generating energy at low levels but life is on-going. Many things can affect its quality prior to harvest, during harvest and once in the bin before being packaged and after the packaging process that enhance deterioration resulting in loss of seed quality and hinder stand establishment. Seed production, fields is where it all begins. These fields should be clean or noxious weeds and insects and good management adhered to from a fertility and irrigation standpoint. However, more important is what occurs environmentally prior to and at harvest. If the crop undergoes extreme drought prior to harvest, the level of cracked seed and splits can occur which can affect germination and vigor. If the crop undergoes extreme wet conditions during the dry-down period seed quality can be negatively affected, if seed is older than three years (not a problem in soybeans since soybeans at the supplier level are moved to the elevator unless they are treated) quality can be affected and if stored at high moisture quality can be reduced. However, seed quality can be estimated via germination and vigor tests. Most of our seed production occurs in areas where weather conditions are relatively cool and dry at harvest. Most of the soybeans and corn are produced in the mid-western states. However, some soybeans are still produced in Arkansas depending on the company. Remember, soybeans (high oil content crop) can lose quality once they come into the house and even after they have been packaged. With state and private sector quality assessment, it is rare to have a problem at the grower level but its best to know what the quality is.

Many people do not understand that there is a difference between standard germination and seedling vigor.

Germination and emergence: Germination is the process where the seed absorbs water and in the presence of the right temperature moves the water throughout the seed activating many chemical reactions that will hopefully build a solid seedling and mature plant. The first thing to emerge from the seed will be the root and followed by the emergence of the cotyledons (the first leaves that contain embryonic tissue that helps the plant sustain it-self until the first true leaf is formed). The stem below the cotyledon will break the surface first and when the sunlight strikes this stem it elongates

in a manner that brings the cotyledons above the surface. This concept is true for crops like soybeans and cotton (diacots) but not in corn (monocot). Diacots possess two cotyledon leaves while monocots possess only one. Therefore, you rarely see corn have emergence problems since it can pull through the soil easier. As temperature increases in the presence of water the germination process is hastened and emergence occurs in a shorter time-frame. This is why we recommend to plant specific crops at specific temperatures. For example corn will germinate and emerge at much lower temperatures than soybeans. If a soybean is planted into cold soil the germination process will be slow and the developing seedling will exhaust its stored embryonic energy pre-disposing it to various seedling diseases and delaying rapid grow-off. This can also occur by planting too deep or where packing rains develops a crust and restricts emergence. Under this situation the emerging cotyledons can be broken and cause a situation often referred to as breaking the seedling's neck. As you can see it is very important to plant into conditions suitable for rapid germination, emergence and grow-off but this is not always the case. Therefore, it is important to have seed with good germination and seedling vigor.

Standard Germination/Warm Tests: We often only look at standard germination but there is more. Percent germination is the percentage of seed that germinate in a designated time. Germination counts are taken across several days. There might be a count at three days, seven days and ten days to see what the percentage is. A germination of 80 or better percentage in a short time frame is desired. It should be noted that percent germination does not necessarily correlate to high seedling vigor. With low percent germination, we can increase our seeding rate to ensure an adequate stand. However, I have seen cases where adequate stands did not coincide with adequate growth and development of the crop due to low vigor. A **standard germination or warm test** only performs a test under ideal conditions and indicates the percent germination under ideal conditions (temperature, moisture, light and pathogens) for a particular crop. Therefore, standard germination reflects the maximum potential of a seed lot to produce healthy and mature plants under favorable environmental conditions which rarely exist. The standard germination test is designed to provide a first and final count. The first count considers the strongest seed that germinate first and form healthy seedlings. The final count is designed to provide a longer period in which weak seeds are coaxed or provided opportunities to be considered germinated. The germination package then becomes the sum of strong and weak seedlings. As you know, the weak seedlings in this mix or lot seldom perform adequately when placed under environmental hardships in the field. This is why farmers and seed producers have long recognized that the labeled percent germination often overestimates actual field emergence of seed lots and is why 80% on the tag rarely gives us 80% in the field (All seed lots must test at least 80%, but by law can be 10% above or below). For these reasons we have begun looking at and using different seed vigor tests to provide a more real world scenario.

Seed Vigor: Vigor relates to how well a variety grows off. Low vigor can be due to the intrinsic nature of the variety or it can be due to poor quality. Many varieties that possess small seeds generally show low seedling vigor but this does not correlate necessarily to low yields. For example the cotton varieties DP 33B, DP 5415RR, DP 458 BR and DP 555BR were small seeded varieties with very low vigor intrinsically. However, these varieties showed high yields despite their slow grow off. If I plant a known slow developing variety or plant into conditions that promote slow grow off, I do everything possible to insure that is protected from early season insects and diseases. I will also delay planting until the environment warms if planting a known low vigor variety. Sometimes the previous production season will be such environmentally that seed size will vary. I have seen years that allowed a normally small seeded variety be larger in size and years where normally large seeded varieties be smaller. The one type of low vigor you do not want is that related to poor seed quality. Low quality vigor is difficult to overcome in-season, it changes production practices, delays the crop making it susceptible to inclement environmental conditions and makes weaker plants serve as weeds. Poor vigor can be prevented via seed vigor tests.

Seed Vigor Tests: Seed development encompasses a series of stages as it moves from fertilization to nutrient accumulation, to seed dry down and to dormancy. Each stage represents a change in morphological and physiological developments that can alter seed performance. The point at which a seed obtains its maximum dry weight is called physiological maturity. At this point it has its greatest potential for maximum germination and vigor. Seed generally achieve maximum physiological maturity at moisture levels too high for storage forcing delayed harvest until harvest maturity is reached enhancing safe storage while remaining high enough to minimize harvest damage. Between physiological maturity and harvest maturity the seed is exposed to environmental conditions that could adversely affect seed quality reducing storage quality.

Physiological maturity is the stage at which translocation of food materials to the seed stops and represents the highest quality level but moisture is too high (20%) for storage. **Harvest maturity** occurs 7-10 days following physiological maturity and is an important process where moisture is lost from the plant and is safe for storage.

Seed vigor includes seed properties that determine the potential for rapid and uniform emergence and the development of a normal seedling under a wide range of field conditions. In vigor tests seed samples are exposed to stresses like mechanical damage, storage at high temperature and/or high relative humidity, soil pathogens, cold following water absorption and others. Following the stress period, the seed are germinated under normal growing conditions and the number of well-developed seedlings documented and is the vigor of the lot. Some of the more commonly used vigor tests include the following.

1. **Tetrazolium staining (Tz test):** This is a fairly fast (24 Hrs) test relative to seed quality. Living cells have active dehydrogenase enzymes that yield Hydrogen (H⁺) ions. In this test seed are imbibed in water and then soaked in a solution of tetrazolium chloride. As the seeds respire the tetrazolium reacts with the H⁺ and forms an insoluble red pigment that indicates the presence of living tissue. Based on the staining patterns, seeds are categorized into high, medium and low vigor seed. The Tz test has proven beneficial in determining mechanical damage of soybeans and sprouting in small grains. This test is available for all field crops.
2. **Accelerated Aging (AA) Test:** This test predisposes the seed to artificial stressful conditions in chambers of high temperatures (41 degrees C) and humidity allowing the seed's respiration levels to increase. The seed are then germinated under ideal conditions. High quality seed will germinate and form normal seedlings while low quality seed will deteriorate and produce abnormal or dead seedlings. It is recommended that a number of 80% or higher be achieved to be considered high vigor seed. This test is available for small grains, soybeans, corn and dry beans. This test is strongly recommended for soybeans and takes about 12 days.
3. **Cold Test:** The cold test is used to help predict how a seed might perform if planted in cool, wet soils that we see with our early spring plantings. Seeds are planted in a non-sterile sand/soil mixture in a cold chamber at 10 degrees C for a set time frame (seven days without light) and transferred to a chamber to grow under ideal conditions (25 degrees C) for five to seven days. High quality seed will produce normal seedlings while low quality seed will not survive or produce abnormal or dead seedlings. Most cold tests of 75% or better is considered of high quality. This test is available for corn, soybeans, dry beans and cotton and takes about 14 days. Yet another cold test is the **Saturation Cold Test** that subjects the seed to more severe conditions than the first. Another cold test used in cotton is the **Texas Cool Test** and is a very accurate vigor test.

Other tests run on seed include the following.

1. **Transgenic testing:** This confirms whether the seed contains the Roundup Ready, Boll Guard or STS technologies in-order to quantify the purity level of the trait.
2. **Seed Count Test:** This allows us to know how many seed are in a pound and helps us with our new planters and seed drop rates with our new technologies and varieties. This has been occurring in corn for many years but has just recently shown up in cotton. You can also see it in soybeans and small grains.
3. **Seed Moisture Test:** Allows us to know the moisture levels for safe storage. This can be conducted on the farm through portable moisture meters.
4. **Seed Purity Analysis:** The purity test is a physical evaluation of a set amount of seed that is evaluated for percent pure seed, inert matter, weed seed, other crop and other varieties. These results are used to label seed and determine if it is in compliance with certification, state and federal regulations.

I firmly believe in testing seed for vigor from a reputable third party prior to planting. This is why I recommend getting the seed in the house as soon as possible or request the farm supplier to provide some type of vigor test on the lot designated to you. Seed and technology is too expensive today to take lightly since much of your production cost is rolled into the seed.

Another recommendation is to consider using labeled seed treatments to protect against insects and diseases early in the season. Many of these treatments can be purchased through the basic supplier or be added at the dealership. I strongly encourage this when planting early. With soybeans I strongly recommend the seed be inoculated with Rhizobium, especially where soybeans have not been grown for three years. Rhizobium is a live bacterium that should not be out-dated and should be kept in a cool and dark area until use. Rhizobium forms galls on the root, with a pink inner color if functioning and allows the soybean to fix atmospheric nitrogen.

Yet another housekeeping matter is to pull your planter out and make sure everything is in working order and calibrated for the crop you are going plant. At planting take time to make sure depth and rate is set appropriately.

Seed can be tested at the Mississippi State Seed Testing Lab. This seed can be sent by your local Extension Service. Most basic companies have seed lots tested either internally or at the university level and this information can be presented to you by the farm supplier if requested. When asking for the information, you should ask for the standard germination, year of origin and a vigor test (Accelerated Aging and etc).

For additional information feel free to contact me at 601-813-7166 or 601- 765-8252.