4-H Seed Judging

Seeds have been important to humankind since before the dawn of civilization. First, humans gathered seeds as a source of food, but later they learned to plant seeds and cultivate crops. Most important of all, seeds are the mechanism of survival of their species. Each seed contains stored food and a tiny plant that, when given the proper conditions, will develop into a new plant that will produce more seeds. Thus, the cycle of life continues through seeds.

In today's world of agriculture, crop production still begins with seeds. Because of mechanization and specialization, farming requires more seeds now than ever before. Having early, uniform stands with an exact number of plants per acre is extremely important. To reach these goals, farmers must plant high-quality seed.

The 4-H Seed Judging and Identification Contest is designed to help you learn to evaluate seed quality and to identify certain crop and weed seeds. When you know seeds and seed quality, you can better determine the true value of planting seeds.

Contest

It is possible to score a total of 500 points in the contest. Scoring is in these areas:

Seed judging will consist of three classes. Seed of any three of six crops – soybean, cotton, corn, wheat, oat, or rye -- will be judged. Each class will consist of four samples numbered from left to right. Mark the proper ranking on the official scorecard. You may use magnifying glasses. You may stir samples with pencil or card to aid inspections in determining the value of each samples. You are not allowed to handle samples. Notify contest officials of any irregularity. You can score 100 points for each class by correctly ranking the four samples in each class, for a total of 300 points.

Seed identification will consist of 10 seed samples for junior level competition and 20 seed samples for senior level competition. You must write the seed name legibly and spell it correctly, or it will be counted as a wrong answer. Scoring will be 10 points each for 10 samples or 5 points each for 20 samples. A perfect score for identification is 100 points. Time limits will be established and explained at the start of each contest.

An examination of 10 questions (true/false or multiple choice) will be given to each junior participant. Each question will have a value of 10 points, making a perfect score 100 points. Seniors will have a combination of true and false, multiple choice, and seed part identification. Here are some sample exam questions:

T F Soybean seeds may have a dark-colored seed coat or a light-colored seed coat.

T F Seeds may have a high germination percentage but be low in vigor.

Seeds require which of the following for germination? (a) soil, (b) water, (c) fertilizer, (d) oxygen.

Seed identification

You will be expected to identify the following seeds:

Field crop seeds

Cotton acid-delinted, Cotton gin run, Field corn, Sweet corn, Popcorn, Rice, Soybean, Wheat, Oats, Rye, Sunflower, Sorghum

Forage crop seeds

Crimson clover, White clover, Arrowleaf clover, Subterranean clover, Red clover, Sericea lespedeza, Korean lespedeza, Kobe lespedeza, Wild winter peas, Hairy vetch, Common type vetch, Alfalfa, Argentine bahiagrass, Pensacola bahiagrass, Dallisgrass, Ryegrass, Tall fescue, Johnsongrass, Millet (pearl and browntop), Sorghum-sudan hybrid

Weed seeds

Dock, Crotalaria, Cheat, Common morningglory, Johnsongrass, Teaweed, Hemp sesbania, Sicklepod, Smartweed, Wild barley, Balloonvine, Common bermudagrass, Cocklebur, Purple moonflower, Wild mustard, Wild turnip, Wild radish, Pigweed, Red rice

Vegetables

Cantaloupe, Cucumber, Lettuce, Okra, Pepper, Southern Pea, Tomato, Turnip, Watermelon

Seed Judging

Good seeds are basic to any crop production. In seed judging, you will consider the factors that determine the quality of the seed.

Genetic purity

Varietal mixtures may present such problems as different maturity dates, differences in plant size and growth habits, and differences in grain quality (in the case of wheat). These differences can cause problems in planting, cultivation, weed control, and harvesting, and may also reduce the value of the harvested crop. So, in most instances, you should avoid varietal mixtures. Varietal mixtures may or may not be obvious by looking at the seed. These are things to look for that can indicate varietal mixtures:

Soybeans — In soybeans, different colored hilum can help you detect mixtures. Colors are black, brown, buff, or colorless. Different varieties may have the same hilum color, but if you detect different colors, varieties have been mixed. Some varieties have a green and dark brown to black seed coat color; however, solid black beans can occur in some varieties and not be a varietal mixture.

Small grains — In small grains, seed color (such as white oats and red oats or white wheat and red wheat) can help distinguish varieties.

Other grains — Seed color in sorghum and corn and seed length and width in rice can be helpful in distinguishing varieties.

You can be assured of genetic purity by buying certified seeds or by buying from a reputable seedsman who chooses not to certify his seeds.

Mechanical purity

Mechanical purity refers to the physical makeup of the seed lot. These are the physical components of a seed lot:

Pure seed — the primary kind of seed in the seed lot when other materials have been removed.

Inert matter — plant parts, stones, broken seeds that are less than half a seed; all foreign matter not seeds.

Other crop seed — seeds of other plants that are normally grown as crops, such as vetch in wheat seed.

Weed seed — seeds of any plant that is not considered a crop plant.

Vigor

Vigor is another measure of the physiological quality of a seed. Seeds that are alive and are capable of germination may not all have the same vigor. Seed may lose vigor, or become weak, but still be capable of germinating when conditions are very good. However, low-vigor seed may not produce a strong, healthy plant in the field or may not produce a plant at all. We know that strong, highly vigorous seeds germinate faster, produce plants that grow faster, are less susceptible to disease, and will produce a normal plant even when field conditions are not ideal for germination and plant growth.

However, there is currently no standard test for vigor. There are tests to measure some aspects of vigor, such as seedling growth, speed of germination, or emergence under unfavorable condition, but seed testing laboratories seldom offer such tests. In the future, it is possible that vigor tests will become standard procedure and can be used as another guide to seed quality.

As seeds get older, they lose vigor. Seeds may age faster if they are stored in too much moisture or too much heat, exposed to certain chemicals, or treated with too much chemical. For optimum vigor, seeds must be harvested and stored properly.

Mechanical damage

Seeds become bruised, cracked, cut, or broken during harvesting, handling, and processing. This is called mechanical damage (as opposed to damage by weathering in the field, heat damage, and so forth). Mechanical damage reduces the value of the seeds for planting purposes. The more severe the damage, the less the value of the seeds. In almost all instances, mechanical damage is determined by looking at the seeds and determining how many are cracked, cut, or broken. It is extremely difficult to determine bruising unless the seed is visibly damaged.

Insect damage

Insect damage reduces the value of seed for planting. If the damage is severe enough, the seeds may be completely worthless for planting. To determine if insect damage is present and how extensive it is, look for insects that might damage the seed and inspect seeds closely for damage.

Uniform size

Uniform size is particularly important with large seeds, such as soybean or corn, where setting planters to get a uniform planting rate is important. Seeds that vary widely in size make setting planters accurately and planting at a consistent rate impossible.

Germination

Percentage germination indicates the number of seeds that are alive and capable of producing a normal seeding or plant under favorable conditions. Obviously, a high percentage of a seed lot must be capable of germination if seeds are to be considered high quality. Germination is one measure of the physiology quality of the seed. Germination testing is a standard procedure; that is, every laboratory conducts these tests under the same conditions, for the same periods of time, and in the same way. Laboratories throughout the United States conduct tests alike.

General Information

Seed structure

A seed is a living organism, a tiny, embryonic plant in a resting stage with a small amount of food to supply the young plant for a short time when germination begins. A seed may be divided into three basic parts: the covering, the embryonic axis (the tiny plant), and the supporting tissues (food supply).

Crop seeds can be placed into one of two major groups: monocotyledons (monocots) or dicotyledons (dicots). Monocots have one cotyledon; dicots have two cotyledons. Examples of monocots are grasses -- such as corn, sorghum, wheat, oat, and others -- and members of the lily family, such as onion. Dicots include cotton, soybean, clovers, nearly all vegetables, and broadleaf weeds.

Cotyledons are sometimes referred to as “seed leaves”. They are not always visible in dry seeds or when a seed germinates. The one cotyledon (scutellum) of corn is not visible unless the grain is cut. It is not even visible when the seed germinates. The cotyledons of peas can be seen in the dry seed but do not emerge above the ground when the seed germinates. The cotyledons of soybeans can also be seen in the dry seed and emerge above the ground when the seed germinates.

The cotyledons of cotton are enclosed and hidden by the seed coat. They can be seen if the seed coat is removed or the seed cut. The cotyledons emerge above the ground when the seed germinates. The cotyledons of cotton look much more like leaves than do the cotyledons of soybeans and will actually grow some after emergence, whereas cotyledons of soybeans do not.

Cotyledons supply food for the young plant until it can develop roots and leaves and manufacture its own food. Some seeds also have food stored in the endosperm, another seed part. All grasses and some dicots have endosperm tissue. In corn and wheat, for example, the endosperm is a major part of the seed and is made up of starch. We depend upon this starch as a major source of the carbohydrates in our daily diets.

Germination

All seeds require moisture, oxygen, and a favorable temperature for germination. Some seeds also require light.

Germination occurs in several steps. The first is the absorption of water (imbibition). Water is necessary for the biochemical reactions of growth to begin, but too much water may inhibit germination. Oxygen is also necessary for the beginning of growth. Most seeds require air, but some seeds, such as rice, can germinate and begin growth under water. There are critical temperatures above and below which seeds will not germinate. Most crop seeds will germinate between 55 and 110 degrees Fahrenheit. However, the most favorable temperature is generally 75 to 85 degrees Fahrenheit. Most agricultural seeds do not require light; exceptions are tobacco, certain varieties of lettuce, and certain grasses that must have light to germinate.

As the seed absorbs water, it swells and germination begins. Some seeds swell much more than others. Cells begin to enlarge and divide as growth starts. The first evidence of growth is the root breaking through the seed coat or seed covering. This is common to all agricultural seed. Growth of the upper portion of the seedling differs with different plants.

In one group, which includes soybeans and cotton, the hypocotyl elongates (becomes longer), pushing the cotyledons above ground. Then the true leaves form above the cotyledon.

In another group, which includes peas, the epicotyl elongates and the cotyledons stay below the soil.

In the third group, which includes corn, the cotyledon and the endosperm remain underground. The coleoptile pushes through the soil, and the first leaves break through the coleoptile. Most monocots have a similar emergence pattern.

Glossary

Coleptile — the sheath that encloses the leaves and stem tip in the embryo of grasses.

Coleorhiza — the sheath that surrounds the primary root in the embryo of grasses.

Cotyledon — food storage tissues of the embryo, sometimes called seed leaves or embryonic leaves.

Dicotyledon — seeds having two cotyledons.

Dormant seed — seeds that are alive and capable of germination but that do not germinate when given the requirements for germination.

Embryo — the tiny plant formed in a seed.

Endosperm — stored food of seed outside the embryo.

Epicotyl — the part (stem) of an embryo or seedling above the cotyledons.

Genetic — characteristics or traits that are inherited, passed on from parents to offspring.

Germination — the emergence and development of the parts of the embryo that are necessary for the development of a normal plant under favorable conditions.

Hard seed — seeds that do not absorb water in a germination test because the seed coat does not allow water to pass through.

Hilum — a scar left where the seed breaks away from the plant on which it developed; very prominent in some seeds, not visible in others.

Hypocotyl — the part of the embryo or seedling below the cotyledon and above the root.

Imbibition — the process by which seeds absorb water.

Inert matter — pieces of seed not more than one-half the original seed and all foreign matter not seed.

Monocotyledon — seeds having one cotyledon.

Noxious weed seeds — seeds from any plant considered to be extremely harmful to agriculture and difficult to control by normal agricultural practices.

Pericarp — seed coat and ovary wall fused together to form a seed covering of grass seed.

Physiological — dealing with the processes of life and living organisms.

Plumule — the growing point of the upper portion of a seedling or embryo.

Primary root — the root arising from the radical of the embryo.

Pure seed — the principal kind and variety of seed in a lot.

Radicle — the root tissue of the embryo.

Scutellum — the cotyledon of a grass embryo.

Secondary root — any root other than the primary root.

Seed coat — protective covering of the embryo.

Seed lot — a uniformly blended quantity of seed identified by a proper mark or number.

Seminal root — roots arising from the first node above the radical in a corn seed.

Variety — a group of individuals within a kind or species that have similar characteristics but are different from others of the same kind; example: Dare soybeans and Bragg soybeans.

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