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Cleaning and conditioning field crop seed

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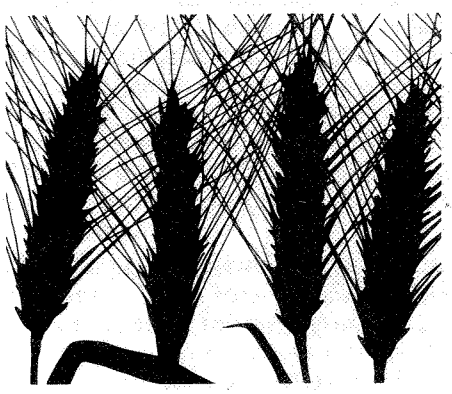
Quick Facts

- All crop seeds require cleaning and conditioning to make them suitable as seed stocks.
- Equipment should be selected to meet the conditioning needs of the seed and adjusted to produce maximum seed quality.
- Most seed stocks are treated to protect against diseases and insects during storage, germination and seedling growth. Federal and state laws require bags containing treated seed be properly labeled.
- Appropriate seed storage containers should be used, identified clearly to prevent mixing seed lots or misreading labels, and arranged and maintained to prevent insect, rodent or weather damage.
- Seed should be stored in cool, dry places.
- Good seed handling and process management practices are essential for successful operation of the cleaning and conditioning facility.

The production and conditioning of crop seeds used for seed stocks requires special handling to ensure high germination, purity and vigor. The seed conditioning process includes harvesting, drying, cleaning, packaging and storing.

Harvesting

Proper harvest of seed crops depends largely on equipment and harvest practices. Seed moisture content is also an important consideration and will influence harvest efficiency, timing and subsequent storage of seeds. As harvest approaches seed moisture content should be checked periodically. Thorough cleaning of the combine is essential to prevent seed contamination. Field-threshed crops may contain weed seeds, other crop seeds, immature or damaged seeds, non-uniform seeds of large and small sizes, undesirable plant material, rocks, clods, or other foreign matter; consequently, the combine should be adjusted to minimize damage and maximize seed purity.



Drying

At harvest, seed moisture content should be checked to determine if drying is necessary for safe seed storage. Drying temperatures and times should be regulated to lower seed moisture content without overheating, drying too rapidly, or overdrying, which may damage seeds and lower germination, cause stress cracks, or predispose seeds to mechanical damage.

Seed Cleaning

Field-threshed seed crops usually are not suitable for direct use as a seed product and require additional conditioning. Hence, seed cleaning usually is necessary to obtain the highest percentage of pure crop seed with maximum germination. Mechanical separation is based on physical

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To simplify technical terminology, trade names of products and equipment occasionally will be used. No endorsement of products named is intended nor is criticism implied of products not mentioned.

differences that exist between desirable and unwanted seeds and materials. Physical characteristics used for separation include: size, length, shape, weight, surface texture, color, reaction in liquids and electrical properties. Proper equipment is necessary to effectively eliminate unwanted material and achieve the seed quality you desire and buyers expect. An air-screen cleaner is the most basic piece of seed cleaning equipment and is used in nearly all conditioning facilities, regardless of seed type. The air-screen machine uses a combination of airflow and perforated metal screens to separate seeds on the basis of size, shape and resistance to airflow. Gravity separators are also commonly used, in association with air-screen machines, to separate seeds on the basis of weight. The gravity separator's most important function is to remove undesirable seeds or inert material that is similar in size, shape and seed coat characteristics to crop seeds but have different specific gravities.

Selecting the proper conditioning equipment depends on many factors including: the crop to be conditioned, seed quality standards, availability of equipment, ease to clean equipment, service and cost. A good selection of equipment is available to meet most general and specialized needs. Equipment should be carefully selected for versatility in handling many seed types under a variety of situations. Used equipment may be available that economically and effectively fits your needs. However, new equipment offers the latest in technological advancements and often is operated more efficiently; thus, produces a better product. Regardless of age, equipment should be inspected periodically for proper adjustment and maintenance. Equipment should be monitored continuously during the conditioning operation and adjusted when necessary to obtain the desired product quality. A significant amount of time is needed for operators to learn how to operate the equipment effectively. Generally, obtaining a high quality product is as much dependent on the operator as the equipment itself.

Seed Treatment

Seed stocks often are treated chemically to disinfect exterior contaminants and to protect against seed-borne and soil-borne diseases. Treatments protect seeds during storage, germination and early growth. Some seed treatments provide systemic protection against disease and insect development during seedling growth. Many seed protectant chemicals are available and may be applied as a slurry, liquid or dust. Slurries are most commonly used. Seed protectants may contain one-, two- or three-way mixes of chemicals. Two- and three-way mixes generally include a fungicide, bactericide and/or insecticide. The most recent information on seed protectant chemicals can be obtained from plant pathologists and entomologists.

Chemicals applied often contain a dye that gives seeds a conspicuous unnatural color that indicates treatment. State and federal seed laws require that treated seed be labeled with the commonly accepted chemical name or abbreviation of the applied substance. Additional information required on the tag by individual states varies. Colorado also requires a warning on the tag stating that the seed cannot be used for food, feed or oil purposes.

Packaging

Prior to final sale, seed usually is packaged in some type of container; however, seed may be available in bulk. Containers range from large wooden or metal bins that hold several tons of seed to small paper or plastic bags that hold only a few seeds. Package selection should be based on several criteria including: handling ease, transport and storage, protection against contamination, seed damage or loss, escape of pesticides, consumer needs, and promotion and advertisement. Seed for the farm often is packaged in cloth, paper or plastic bags. Cloth bags may be made of natural materials such as jute, or synthetic materials such as nylon. Cloth bags can withstand rough handling but are not suitable for treated seed. Paper bags made of several layers of paper are quite strong and generally are used for treated seed. Polyethylene bags are strong and impermeable; however, their smooth surface can cause stacks to collapse. Bags can be closed by hand-tying with string or sewed with a stitching machine. Polyethylene bags may require heat-sealing.

Seed Storage

Proper storage of seed before and after conditioning is essential. Seeds should be stored at low temperatures and humidities. Some researchers state that for safe storage the sum of the percent relative humidity plus the temperature in degrees Fahrenheit should not exceed 100. Other researchers indicate that seed can be stored safely for one to three years if the combined total reaches 120 as long as the temperature contributes no more than half of the total. Direct exposure of seeds to weather is not advisable.

Insect infestations in stored seeds can be a serious problem. Seed handling equipment, containers and storage areas should be thoroughly cleaned to eliminate insects. Fumigating seeds before or during storage may be necessary to obtain good control of some insects. Some fumigants under certain conditions are harmful to seed germination. Seeds should be checked often to identify problems early and prevent severe losses due to insects or other factors.

Rodent infestations can quickly become a serious problem in seed conditioning operations. Spilled seed and debris on floors provide favorable habitats for rodents. Facilities should be kept clean and bags should not be stored directly on the

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floor, but elevated on pallets or other suitable devices. The conditioning facility should be inspected regularly for evidence of seed damage caused by rodents. Regular baiting or fumigating is recommended to control rodents.

Seed lots should be stored properly to prevent mixing with other crops, varieties or seed lots. Containers should be thoroughly cleaned before refilling and once filled should be clearly marked to identify the crop, variety, grower name, harvest date, field number and other pertinent information. Metal and wooden rectangular storage bins have been used extensively for many years. Large polyethylene bags (up to 2000 lb. capacity) are becoming more popular because of low cost and handling ease. These bags have two loops at the top that allow for easy transport with a forklift. The height of the bag can be easily adjusted with a forklift, thus seed damage during handling can be minimized. Bags are emptied using the drain spout at the bottom of the bag.

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Seed Handling and Process Management

Efficient and safe operation of seed conditioning facilities requires attention to many details. Proper seed handling and process management can save time and money, create an enjoyable and safe working environment, and produce a high quality product.

Seed can be moved by elevators, legs, conveyors or other types of equipment. Elevator legs are used for vertical movement of seed. Conveyors can be used for horizontal or inclined seed movement. Equipment used to move seed should minimize handling and seed damage. Augers should never be used to move seed stocks, as they can easily damage seed.

A dump pit is the site of initial seed deposit. It should be constructed of metal and free from cracks or places where seed can lodge. The incline of the dump pit should allow seed to flow freely. Once in the dump pit, seed usually is elevated into a storage bin or may go directly into a surge bin above the cleaner (air-screen machine).

Arrangement of equipment in the conditioning building is important. Equipment can be arranged horizontally using one level or vertically using several levels. Both arrangements have advantages and disadvantages. The type of arrangement used should be dictated by several factors, including seed type, equipment, space, ease to clean equipment and operator preference. Regardless of the equipment arrangement, seeds should be inspected as they pass through each piece of equipment and each phase of conditioning. Care should be taken to minimize the amount of seed handling and the distance seeds fall. Places where seeds strike surfaces should be padded to minimize seed damage, especially for large-seeded crops.

Seed can be shipped by truck, rail, boat or occasionally by air. Care must be taken to ensure that seed is not mechanically or weather damaged during shipping. Some states regulate shipment of seed stocks into their states. In some cases, states require that a sample of seed be sent to their state seed laboratory to test for pathological organisms that might be transported with the seed.

To determine quality, seed should be analyzed at an official seed laboratory or at a laboratory that employs a registered seed technologist. Several factors are evaluated to determine if the seed is suitable as a seed stock. Laboratory seed tests should be performed on the seed after harvest but before it enters the conditioning facility. This will inform the seed conditioning operator what is present in the seed and what operations are needed to properly condition the seed. A seed purity analysis will enable the operator to select screen sizes, make equipment adjustments, and determine if special operations are needed. Throughout the conditioning process a representative sample should be taken for the final germination and purity analysis. Germination tests are good for one year for seed sold in-state, but need updating every six months for seed sold out-of-state. All seed that is sold must contain an updated germination and purity analysis as dictated by state and federal laws.

Conditioning facilities must be cleaned thoroughly between seed lots to prevent contamination. Contamination lowers quality and selling price, and may cause problems from dissatisfied customers. The recommended procedure for cleaning the facility is to work downward from the highest point and finish the cleaning process by sweeping and/or vacuuming the floor. Compressed air and industrial vacuum cleaners are essential for thorough cleaning. After cleaning, the conditioning plant should be inspected by someone who is familiar with the facility to identify areas that may have been overlooked.

Detailed recordkeeping is vital to the success of any conditioning operation. Records should describe each seed lot's handling and conditioning operation, date and operator.

Seed conditioning facilities usually operate at a fast pace. Workers are near moving machinery, breathing dust-laden air, and may be using seed treatment chemicals; thus, they need appropriate protection. Proper clothing, safety goggles, particle masks and ear plugs should always be used. The facility should be properly ventilated and lit. Safety and health considerations of workers should be a high management priority.

Additional information regarding cleaning and conditioning seed can be obtained by calling or writing the Colorado Seed Growers Association (CSGA) office, C-3 Plant Sciences Building, Colorado State University, Fort Collins, CO 80523 (phone: 491-6202) or by reading the publications listed below.

Additional reading:

1. Copeland, L. O. 1984. Principles of seed science and technology, 2nd ed. Burgess Publishing Co., Minneapolis.

2. Justice, O. L., and J. N. Bass. 1978. Principles and practices of seed storage. Agriculture Handbook No. 506. United States Department of Agriculture. Science and Education Administration, Washington, D.C.

3. Vaughan, C. E., B. R. Gregg, and J. C. DeLouche (eds.) 1968. Seed processing and handling. Handbook no. 1. Seed Technology Laboratory, Mississippi State University, Mississippi State, MS.

4. Brick, M. A. Production of certified and registered seed. Service in Action sheet no. .302. Colorado State University Extension Service, Fort Collins, CO.

5. Ladd, S. L. Seed Certification. Service in Action sheet no. .300. Colorado State University Extension Service, Fort Collins, CO.