COOPERATIVE EXTENSION SERVICE
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Basic Key to Better Crop Production

HIGH-QUALITY SEED

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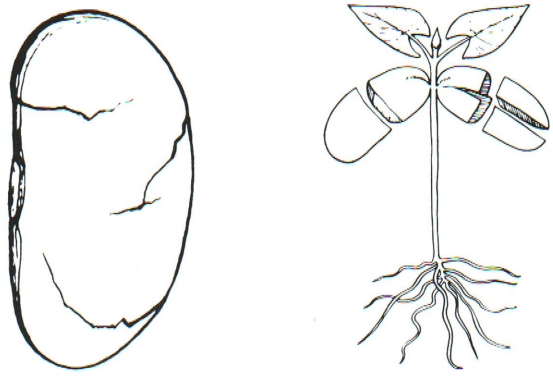
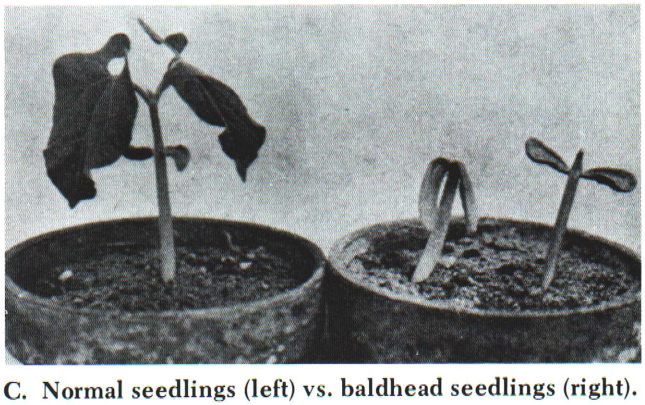
THE SELECTION AND USE of high-quality seed is one of the basic keys to satisfactory crop performance and competitive yields. Planting good seed is one of the easiest and most economical inputs into the production of any crop. No shortcuts or sacrifices should be attempted in order to reduce costs by planting seed of unknown or doubtful quality. Land, fertilizer and labor will be wasted on a poor stand and inferior plants if poor-quality seed is planted.

Quality of seed is reflected in several ways, including germination, seedling vigor, physical purity, uniformity in size and freedom from seedborne diseases.



A. Mechanically damaged seed (left). Seedling with broken cotyledons (right).



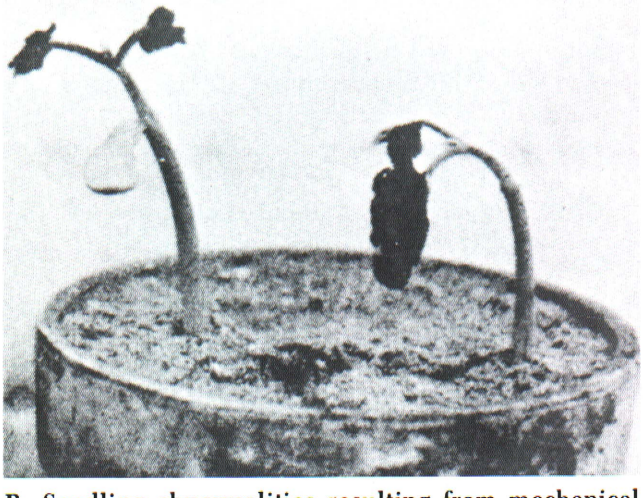
C. Normal seedlings (left) vs. baldhead seedlings (right).

CAUSES OF POOR GERMINATION

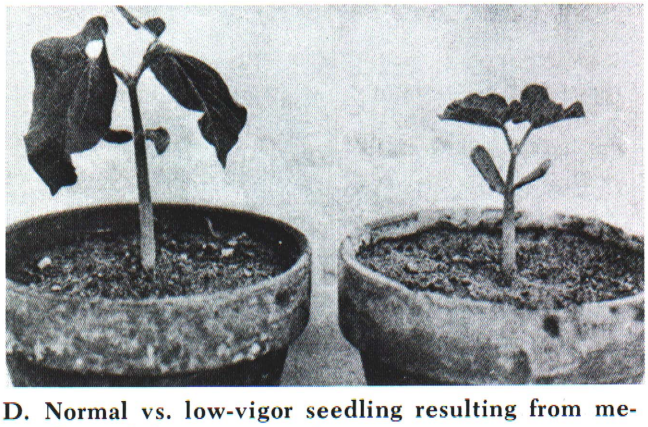
Mechanical Damage

Mechanical damage may be the greatest single cause of poor germination in crops such as dry edible beans and soybeans. It can occur at almost any point during harvesting, handling or processing. Though some seeds are more fragile than others, all may be injured, especially if handled roughly at low moisture contents.

Consequences of mechanical injury in bean seed are illustrated in Figure 1.



B. Seedling abnormalities resulting from mechanical damage.



D. Normal vs. low-vigor seedling resulting from mechanical damage to seed.

Figure 1 — Effects of mechanical damage in bean seed.

Minimizing loss from mechanical injury — Mechanical injury can be minimized by harvesting seed at safe moisture ranges (Table 1). Dry seeds are easily cracked or broken during threshing and processing, while high-moisture seed does not store safely. Even within "safe" moisture ranges, seed may be damaged by careless harvesting. Adjust the combine to the slowest speed that will adequately thresh the seed. Seed moisture can change considerably throughout the day, so frequent adjustments may be necessary.

Table 1 — Safe moisture ranges for harvesting and storage of Michigan field crop seed.

Crop	*Moisture range*
	%
Field beans	12-13.5
Soybeans	15-18.0
Corn	12-15.5
Small grains	11-13.0
Small-seeded grasses and legumes	10-13.0

Deterioration

Some deterioration occurs even under ideal storage and handling conditions, although good germination of most field crops can normally be maintained for at least one year. Under ideal conditions, seed may be safely stored for several years. However, under adverse storage conditions of high moisture, germination may decline rapidly.

Minimizing deterioration losses — Deterioration losses may be minimized by harvesting and storing seed at safe moisture levels (see Table 1), followed by a good quality control program. Poor quality seed loses viability more rapidly than higher quality seed, so have all lots tested immediately following harvest. Lots with low or marginal germination should not be held for seed.

Chemical Injury

Seeds may be injured by chemicals applied prior to harvest (insecticides, herbicides, defoliants) or by excessive or improper seed treatment after harvest. Mild chemical injury causes abnormal seedling growth in which the root-shoot axis is twisted and deformed (see Fig. 2) or exhibits a stubby, swollen appearance, particularly within the lower hypocotyl area. Such seedlings are incapable of producing normal plants under most conditions. Extreme chemical injury completely kills the seed. Note: **Similar symptoms may be caused by injury resulting from preemergence herbicide applications. Though the symptoms are similar, the latter should not be considered as a seed quality problem.**

Minimizing chemical injury — Minimize injury by careful use of chemicals, including seed treatment pesticides. The manufacturer's directions for chemical application should be followed carefully.

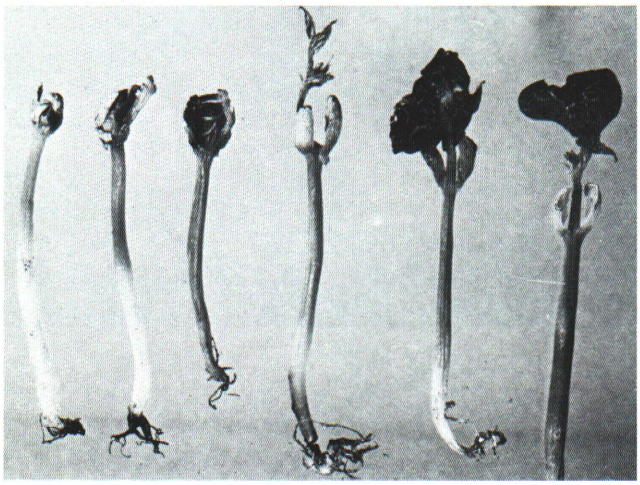


Figure 2 — Chemical injury of bean seedlings.

Preharvest Sprouting

Preharvest sprouting (Fig. 3) during wet weather is a problem in some crops. In wheat, the root-shoot axis may completely emerge through the seed coat and grow 2 to 3 mm, causing severe structural and nutritional loss. Milder preharvest sprouting causes the root-shoot axis to enlarge and break through the embryo (germ) membrane without further growth. Presprouted seeds may be capable of germination, but seedling vigor will probably be decreased.

Minimizing preharvest sprouting losses — Avoid presprouting losses by identifying problem lots and diverting them from seed use. Severe sprouting can be detected visually, but all potential seed lots should be tested in an official seed laboratory to determine the extent of damage. Preharvest sprouting in wheat can be minimized by growing sprout-resistant varieties such as Tecumseh, Arthur and Abe.

Figure 3 — Sprouted wheat seeds.

SEED (SEEDLING) VIGOR

Seedling vigor involves the difference in germination and seedling growth under field or stress conditions and that in the seed laboratory. Laboratory germination tests are highly standardized and provide the ideal environment for germination. Field conditions vary greatly and provide varying amounts of stress on the emerging

seedling from temperature, moisture, soil crusts, disease infestation, etc.

Poor seedling vigor is usually associated with poor germinability, although some low-vigor lots germinate well in the laboratory. Special stress tests (e.g., cold test, tetrazolium test, accelerated-aging test) have been developed for evaluating seedling vigor. Inquire about these from your seed-testing laboratory.

MECHANICAL QUALITY FACTORS

Physical Purity

Physical purity is perhaps the most important seed quality factor other than germinability. Most seed is cleaned and processed prior to planting to improve its purity. Contamination by **weed seed** and **other crop seeds** will contribute to a decrease in crop yield and quality, as well as the cost of weed control. **Inert matter** increases the volume and weight of seed lots, as well as storage and shipping costs. It also causes difficulty in planting by plugging equipment.

Minimizing physical impurities — Physical impurities are removed only by seed processing. This requires basic seed cleaning equipment such as an air screen separator (fanning mill) or the gravity separator. Other equipment may be needed for special contamination problems. If farm processing equipment is not available, seed processing may be done by local elevators, seed dealers, or other seed producers.

Seed Size and Planting Quality

The influence of seed size on germination potential, early seedling vigor and crop yield is not always predictable. It is usually best to select seed of uniform size from which excessively large or small seed has been removed. While such seeds may germinate, they may be a detriment to precision planting, especially with standard planting plates. The importance of this aspect of seed quality is illustrated by specific screening requirements (Table 2) which limit the percent of off-sized seed acceptable in Michigan Certified seed.

PHYTOSANITARY (DISEASE-FREE) STANDARDS

Crop losses by seedborne diseases can be substantial even though other seed quality factors are acceptable. This is especially true for field beans and small grains but can occur in all crops. Field bean seed may be infected internally or infested externally by bacterial blight organisms which can result in a diseased (blighted) crop and reduced yields. External blight can be eliminated by proper seed treatment; internal blight infection must be avoided only by selecting blight-free seed. Losses in small grain from disease problems such as seed rots, seedling blights, loose smut and bunt or stinking smut can be minimized by seed treatment.

Table 2 — Required screen sizes for cleaning certified seed

Crop	*Maximum top screen*	*Recommended bottom screen*	*Minimum permissible bottom screen*
Soybeans (all varieties)	19/64	12/64 × 3/4	11/64 × 3/4
Kidney beans	28/64	14/64 × 3/4	12/64 × 3/4
Navy beans (all varieties)	19/64	12/64 × 3/4	11/64 × 3/4
Oats (except Mariner)	11/64 × 3/4	4½/64 × 1/2 or 1/14 × 1/2	4½/64 × 1/2 or 1/14 × 1/2
Mariner oats	"	"	1/16 × 1/2 or 4/64 × 1/2
Barley (6-row)	16/64	5/64 × 3/4 or 1/13 × 3/4	4½/64 × 1/2 or 1/14 × 1/2
(2-row)	"	5½/64 × 3/4 or 1/12 × 3/4	"
Wheat (all white varieties except Tecumseh)	16/64	6/64 × 3/4 6/64 × 1/2	4½/64 × 3/4 or 1/14 × 3/4
Wheat (Tecumseh and red varieties)	"	5½/64 × 3/4 or 1/12 × 3/4	5½/64 × 1/2 or 1/12 × 1/2

SEED QUALITY STANDARDS

Table 3 shows quality standards required for Michigan Certified seed. These standards represent quality levels which should be expected for uncertified seed as well. Any sacrifice of seed quality will be at the risk of crop loss from low performance seed.

Seed purchased from elevators or seed dealers is required by law to be labeled for seed quality. When planting home-grown seed or seed purchased from a neighbor, a 1-2 lb sample should be sent to a recognized seed laboratory for a complete analysis. Such tests are inexpensive and will help avoid consequences of planting seed of unknown or doubtful quality. The Michigan Department of Agriculture seed laboratory is located at 1615 South Harrison Road, East Lansing, MI 48823.

Table 3 — Minimum quality standards for Michigan certified seed.

Crop	*Germination*	*Purity*
	%	%
Soybeans	80	98.5
Field beans	90	99.0
Corn and small grains	90	99.0
Small-seeded grasses and legumes	90	99.0

SELECTING THE RIGHT VARIETY

Each crop variety differs in some important respect from every other variety. These differences may be very great or may be hardly noticeable. Regardless of the crop, the selection of the right variety is an important part of selecting high-quality seed. The following criteria should be considered when selecting the variety which best suits your needs.

1. Maturity — The time required for the variety to reach maturity will limit the use of a variety in certain locations. For example, soybean varieties such as Corsoy and Amsoy 71 should not be selected for planting in the northern fringes of Michigan's soybean area. Early maturing varieties such as Hodgson or Swift should be planted to avoid losses from early frosts.

2. Disease and Insect Resistance — Crop losses may be avoided by selecting varieties with resistance to insects and diseases.

3. Winter Hardiness — Winter wheat and barley varieties differ widely in their ability to withstand severe winter weather. Only the most winter-hardy varieties should be planted on the northern fringes of the winter wheat and barley areas.

4. Yielding Ability — Some varieties have the genetic potential for greater yields than others. If all other characteristics are equal, higher yielding varieties should be used.

5. Lodging Resistance — This characteristic describes the tendency of a variety to be broken or bent to the ground by blowing wind or weight of the developing seed. Good lodging resistance reduces losses during harvesting. It also reduces losses in crop quality by preventing contact between the seed and damp soil.

6. Other Considerations — Several other considerations may also be used when selecting the right variety. These include plant height, presence or absence of awns (beards), seed size, chemical composition of the seed and nutritional value of the crop.

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