



# Seed for Cereal Crops

A crop begins with the seed. The value of good seed cannot be overlooked if you want to produce a high yielding crop.

When farmers plan for seeding, there are two options for obtaining seed:

- buy pedigreed seed from a seed company or a seed grower
- use common seed from a personal source or another farmer

The Alberta Barley Production Surveys conducted in 1981 and 1991 show that top producers use pedigreed seed more often than the average producer (Table 1).

**Table 1. Alberta Barley Production**

1991	Per cent using pedigreed seed	Per cent using common seed
Top producers	47	53
Provincial average	15 - 20	80 - 85
<b>1981</b>		
Top producers	60	40
Low producers	25	75

Seed viability is influenced by many factors. Germination, vigor, genetics, weeds, disease and other factors must be considered when planning for seeding.

## Germination

A germination test should be done on any grain considered for seed. Germination refers to the ability of the seed to develop into a healthy seedling under optimum conditions.

This test should be performed by an accredited seed laboratory. Accredited labs employ professional analysts skilled at interpreting the results. They rate seed germination into four categories: normal, abnormal, dead and dormant (fresh). Tests are performed at 20°C with ample moisture for 7 days. The charge is minimal, and the information will tell whether

the sample is suitable for seed and what adjustments to the seeding rate may be necessary.

Studies have proven that increasing seeding rates to compensate for poor germination is not as effective as using good quality seed.

If a professional test is not possible, a home germination test may be performed; however, proper interpretation is critical. Some seeds may sprout but would never produce a viable seedling. A germinating seed must have the essential structures (roots and shoot) required to develop into a healthy plant. Roots and shoot must emerge from the seed free of deformities and with minimal disease present.

## Vigor test

Vigor indicates the potential for rapid, uniform emergence and development of normal seedlings under a wide range of field conditions. A vigor test is a germination test performed under conditions stressful to the seed.

Vigor indicates the ability of seed to germinate and grow rapidly under less than ideal conditions, often experienced in fields during the spring. An example of a vigor test would be a test done at 7°C in the dark with low moisture for 12 to 20 days. This test can be combined with a germination test to better determine the performance of seed if germination conditions are not optimal. Vigor should be within 10 per cent of the germination rating. Seeding rates should be adjusted to fall between the two ranges.

Environmental stress is not accounted for in a germination test. Seedlots with equal germination but different vigor can result in much different plant stand establishment. A two-year study by Morrison and others found that when two wheat seedlots of similar size but different vigor were exposed to trifluralin carryover, the seed with lower vigor showed reduced emergence and lower yield. Germination was greater than 95 per cent for both seedlots. Rapid and even emergence gives the crop a competitive advantage over weeds and makes efficient use of water and nutrients.

Recent research is showing that seed coming from a crop grown under good conditions (particularly balanced fertility) made the best seed with greater vigor, plant establishment and yield.

## Genetic purity

Genetic purity is important when you are choosing a variety for a specific trait. This purity will result in a more even crop response to environmental factors, and it reduces the risk of lower grades. If you choose a variety because it is early maturing, then having a mix of seed with some late maturing variety is not desirable. Should you decide to produce your own seed for next year, it is very important to start with varietal purity. Pedigreed seed guarantees very high purity levels.

## Weed free

Seed should contain as few weed seeds as possible. Each weed seed in a seedlot means another plant that will compete with the crop.

Weed type is important. Some weeds compete more aggressively with a crop or are harder to control than others. Noxious weeds pose more of a threat to crop production than nuisance weeds.

Introduction of a new weed to a farm through contaminated seed is a big threat. If you know where the seed is coming from, inquire about the weeds present on the field where it was grown. Make sure seed cleaning is done by a reputable seed cleaner. All pedigreed seed has a certificate of analysis explaining what weeds and other crops are present. Ask to see the certificate of analysis.

Refer to Table 2 to get an understanding of weed seed and other crop tolerances in wheat. Note that the tolerance for total noxious weeds greatly increases as you move from pedigreed seed to common seed.

**Table 2. Standards for pedigreed wheat seed**

Grade name	Wheat Maximum number of seeds per kg						Minimum per cent germination	
	Noxious weeds			Total barley, rye & triticale	Total other crops including barley, rye & triticale	Additional common wheat in durum wheat & durum wheat in common wheat	Common wheat	Durum wheat
	Primary	Primary plus secondary	Total weed					
Canada Foundation No. 1	0	0.0	2	0.2	0.5	0	85	80
Canada Foundation No.2	0	0.1	4	1.0	2.0	0	75	70
Canada Registered No.1	0	0.0	3	0.5	1.0	0	85	80
Canada Registered No.2	0	0.1	6	1.0	2.0	0	75	70
Canada Certified No.1	0	0.0	3	1.0	2.0	5	85	80
Canada Certified No.2	0	0.5	6	2.0	5.0	10	75	70
Common No. 1	0	2.0	10	10.0	10.0	12	85	80
Common No. 2	2	4.0	20	20.0	20.0	24	70	70

## Disease

Many diseases can be carried on seed, the most common being smuts and bunts. Most seed-transmitted diseases can be tested for. If using your own seed, you need to recall if there were any diseases infecting the kernels or heads of the crop. Seed treatment with an appropriate fungicide is an effective way to prevent seed-borne disease transmission.

## Size and appearance

Make a visual inspection of the seed. The seed should be large, uniform, dry and have good color. It should not be weathered, light, undersized, shrunken, broken, immature, damaged, diseased, sprouted or frozen. Discolored kernels may indicate disease or weathering. Cracked or broken kernels and peeling suggest physical damage during harvest or handling. Hulless barley can be particularly susceptible to microscopic cracks not visible to the naked eye.

Large plump kernels contain more food reserves. These reserves act as an energy source during germination. Research in both Manitoba and Alberta indicates that large seed produces stronger, healthier seedlings and will result in higher yields.

Research by Darwent and Drabble at Beaverlodge in 1992 indicates larger wheat seed had less plant stand reduction and produced better yield when exposed to ethalfluralin (e.g. Edge) carryover and deeper seeding. In 1988 and 1989, Morrison and others found that large vigorous wheat seed out-yielded smaller seed with similar vigor when exposed to trifluralin (e.g. Treflan) levels representative of carryover.

When cleaning seed, ensure a good cut is taken. Adjust the cleaner to remove as many small or medium-size seeds as possible and all the weed seeds and foreign material if possible.

## Age

Germination and vigor decline as the age of seed increases. It is best to select the newest seed that meets your requirements. If seed is carried over from one year to the next, germination and vigor should be rechecked.

Germination certificates are only valid for nine months.

## Weathering of grain

Grain being considered for seed should be chosen from a field that has been exposed to the least stress-inducing weather. Drought, frost, hail and inclement harvest conditions will all affect seed quality.

Dr. Martin Entz with the University of Manitoba found that weathered wheat and barley seed had significantly lower germination than non-weathered seed in cold germination tests. Germination rates were only slightly different under standard germination tests, suggesting that weathering reduced vigor. Weathering of crop in a windrow was more severe than when standing. Field performance tests showed that weathered seed resulted in up to 10 per cent lower yield than non-weathered seed.

## Label and certificate of analysis

A certificate of analysis is available for every lot of seed graded in Canada. The certificate of analysis contains the type and number of weed and other crop seeds found in a 1 kg sample. Germination percentage and germination date are also listed.

In addition, a label is found on all graded, bagged seed. The label shows the following information: name and address of seller, name of seed type, name of variety (if pedigreed) and grade. It is recommended that you retain a seed sample and label from every seed lot sown. This practice will enable the seed lot to be traced in case of germination or weed problems.

*If seed is carried over from one year to the next, germination and vigor should be rechecked.*

## Buying seed

Farmers have the option of buying seed from another farmer, a seed grower or seed company. In most cases, buying seed from a company will involve the purchase of pedigreed seed. However, Common No. 1 and Common No. 2 commercial seed is also available. Standards for commercial seed are lower than for pedigreed seed. Commercial seed has lost its variety identification.

Pedigreed seed will fall into one of five categories, as defined by Canadian Seed Growers Association:

- Breeder seed
- Select seed
- Foundation seed
- Registered seed
- Certified seed

Only the last three seed categories are usually available commercially, with the certified level being the most commonly sold. The highest level of commercial seed is foundation and this level decreases with each generation grown through registered to certified seed.

The minimum standards for each category of seed are clearly defined by the *Canada Seeds Act*, and the seed is grown by members of the Canadian Seed Growers Association under their rules and regulations. These procedures and standards are supervised and enforced by the Canadian Food Inspection Agency of Agriculture and Agri-Food Canada to ensure the seed meets the following criteria:

- is true to variety
- meets the disease-free standard
- meets the standard of purity with regard to freedom from weed seeds and other crop seeds content
- meets the germination standard

Certified seed is the most commonly purchased pedigreed seed. Certified seed is true to variety, but as noted in Table 2, there is a tolerance allowed for weed seeds and seeds of other crops. The higher the pedigreed class of seed, the fewer the contaminants allowed. Table 2 outlines the standards for pedigreed wheat seed per kg.

Purchase seed from a reputable supplier who is distributing locally grown seed. This approach will lessen the chance of introducing new weeds to your farm. Ask for the certificate of analysis. This certificate must be supplied by the seed dealer upon the buyer's request.

Pedigreed seed is convenient since it does not require the farmer's time and expense in arranging to get his own seed cleaned, and pedigreed seed usually reduces the amount of time granaries are required for seed storage. If delivery is taken in the spring, storage costs are lower, spoilage risk is reduced and farm management time is freed for other purposes.

## Varietal recommendations

The use of varieties recommended for your specific growing conditions will maximize your return. Newer varieties with superior characteristics are continually appearing. Do a continuing evaluation of the variety you grow; compare it to the latest varieties. The variety chosen should be the variety recommended for the specific end use. For example, many farmers still sow malting varieties when 75 per cent of the barley grown in the province is used for feed. Generally speaking, feed barley varieties will out-yield malting varieties.

Variety information can be obtained from the factsheet *Varieties of Cereals and Oilseed Crops for Alberta* (Agdex 100/32) and *Alberta Crop Variety Select* (the computer version). These information sources are available at Alberta Agriculture Food and Rural Development offices as well as on the Internet at <http://www.agric.gov.ab.ca>.

## Growing your own seed

1. Start with pedigreed seed.
2. Use a clean field – lowest weed (including volunteer crops) and disease levels.
3. Supply adequate nutrients for a healthy crop.
4. Ensure effective weed control.
5. Don't harvest immature seed. Harvest at 30 per cent kernel moisture or less.
6. Handle seed carefully.
7. Store dry.
8. Clean heavily to select the biggest seed.
9. Ensure germination and vigor are acceptable.

### Advantages

- no new weeds or diseases brought to your farm
- can be less expensive

## Plant breeders' rights

The *Plant Breeders' Rights Act* came into effect on August 1, 1990.

Legislation allows plant breeders to legally protect new varieties of plants. The holder has the right to sell and produce the variety in Canada. Farmers may save and use their own seed of protected varieties without infringing on the holder's rights. However, it is illegal to sell seed from protected varieties without authorization.

## Seed management

### Seed handling and storage

Handle clean seed to prevent contamination from any source (from weed seeds, other crop seeds or insects). Store in a clean weather-tight bin, free of insects and other seeds. Move in a clean truck; use a clean auger.

The most recent seed drill survey showed a drop of over 11 per cent in the number of samples grading Common No. 1 at the seedbox compared to the same samples taken at the cleaning plant. The seed was contaminated with weeds or other crop seeds after it had been cleaned.

## Drying

Potential seed is often harvested tough in years with poor drying conditions. Over-drying and drying of grain at high temperatures can damage viability. Seed should only be dried to safe storage moisture levels. Maximum drying temperatures and maximum moisture levels for safe storage of cool seed are as follows:

wheat	60°C	14.5%
oats	50°C	14.0%
barley	45°C	14.8%
rye	45°C	14.0%

If long term storage is anticipated, lower moisture levels may be required.

## Seed treatment

Research has shown that seed treatment can increase yield, although increased yields do not occur in all cases. Seed treatment chemicals provide economical insurance against several diseases and wireworms.

Rye seed should always be treated with a fungicide because it is very susceptible to seed decay, and most varieties are susceptible to stem smut. The seed of other cereal crops should be treated with a fungicide if smut has been observed in a crop to be used for seed. Many growers treat their seed every second or third year if they are not sure whether or not smuts are present.

Cereal seed should be treated with an insecticide if wireworm damage is known to occur or when seeding the first crop after breaking grassland. Using insecticide-treated seed for two years after breaking grassland is usually a good idea.

Individual varieties should be assessed for disease susceptibility and treated with a fungicide if necessary prior to planting. Seed treatment should occur as close to planting as possible. Hulless barley germination and vigor have been decreased by some seed treatment, particularly if treated well before seeding. Hulless barley should be treated at the recommended rate as close to seeding as possible.

## Seed dollars and sense

**Good seed does not cost; it pays. Always clean your best grain for seed, or better yet, plant pedigreed seed.**

Prepared by Trevor Schoff and Murray McLelland, Alberta Agriculture Food and Rural Development.

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## References

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