Retaining seed

FACT SHEET

NORTHERN AND SOUTHERN REGIONS

Saving weather damaged grain for seed

Grain retained for seed that is harvested following wet conditions requires attentive management if a healthy crop is to be established next season. This management starts at harvest and continues through storage, handling and seeding.

Key Points

- Ideally retain seed from grain harvested before rain.
- Weather damaged grain is more susceptible to poor germination, low vigour and degradation during storage and handling, so extra care is needed.
- Harvest at low moisture and cool temperatures. Storage temperature and moisture must be monitored and controlled.
- Germination percentage should be checked at harvest, during storage and before seeding. Low germination seed should not be used.
- Do not retain seed from hybrid canola.
- Correct seeding depth, conditions and agronomy are essential when sowing weather damaged seed.

All crops are susceptible to deterioration in seed quality during wet harvests. Mild symptoms can be a loose and wrinkled seed coat. Severe symptoms can be seed staining and fully germinated seed. It is essential to recognise whether the damage is cosmetic or the symptom of a seed-borne disease and if it will impact on germination.

Due to the vulnerability of canola’s small seed it is recommended that unless it is harvested before any weather damage it should not be retained for sowing. Irrespective of availability, hybrid canola seed should never be retained for seed as the crop will not be true to the original first generation (F1) seed.

Any retained seed should be graded and tested for germination and vigour. Testing for seed-borne disease is also recommended, especially with saved pulse seed. Knowing the germination percentage at harvest will help determine how much extra seed may be required. Assessing germination during storage will indicate potential problems, while a germination test prior to seeding will allow sowing rates to be adjusted.

Wet Seed at harvest

Weather damage occurs when grain is subjected to wetting at harvest. Generally, grain will absorb moisture and start the chemical process that eventuates in germination; this may be indicated by discolouration or wrinkled and loose seed coats, especially in pulses.

When pre-harvest moisture is significant the seed will swell, often splitting the skin covering the growing point. This seed is referred to as being sprung. Once this has occurred the chemical reactions in the seed have greater access to oxygen and proceed at a faster rate.

If sufficient and prolonged moisture is available the embryo will grow and...
shoot, completing the germination process. However, if moisture is lacking and the seed dries the process will be incomplete. **Provided the seed dries out before the embryo starts to grow this seed could still be viable for sowing.** Much of a sprung seed’s energy store will have been used, greatly reducing the seed’s ability to complete the germination process. Seeds will often be lighter and seedling vigour is often markedly reduced.

Germination causes an increase in alpha-amylose, an enzyme that breaks down starch. The longer the grain sprouts, the greater the amount of alpha-amylose formed. This is measured indirectly using the falling number test. The falling number of badly sprouted wheat is about 62 seconds. High quality wheat gives a thicker paste, and the test then takes between 300 to 600 seconds. Conditions that favour sprouting are also conducive to fungal growth. Sprung seed is more susceptible to fungal attack and physical damage by handling. It is also more vulnerable to disease and rotting once sown.

**Harvest**

In wet harvests, when weather damage is occurring, it is important that retained seed is harvested as a priority but only at low moisture content. This is especially important where there is no aeration drying on-farm. If heat drying is used extreme care should be taken not to further damage seed quality (see Useful resources).

Generally, harvesting at a moisture content of about one per cent below receival standard is considered appropriate. Some pulse grains, particularly lupins are very susceptible to damage if harvested at very low moisture content.

Where grain has swollen and then shrunk, seed coats will have been stretched and can become wrinkled and loose. The kernel of pulses can also become very brittle and break during handling. Harvester settings and handling processes must ensure that seed coats and kernels are not damaged. Damaged seeds will deteriorate rapidly.

Seed quality can also decline during storage. Testing seeds’ germination capacity should occur before and during storage, and before seeding (see Seed testing).

Generally, a germination percentage of 80 per cent at seeding is considered acceptable. When testing at harvest the germination percentage should be higher.

With many weedy pulse and cereal crops in a wet season, desiccation or crop topping often becomes necessary. Depending on timing and chemicals used, this could affect seed quality for sowing.

**Grain must not be retained for seed when glyphosate has been used in pre-harvest applications.**

**Storage**

Achieving and maintaining low temperature, humidity and grain moisture content for stored grain is critical if grain has been weather damaged (Table 1). As weather damaged seed deteriorates faster than sound seed it should not be stored for more than 12 months (Figure 1).

A germination test (see Seed testing) should be carried out on stored grain one to two months after storing to reassess its viability.

**Sowing**

Weather damaged grain is likely to have a lower germination percentage and poorer vigour, so seeding rates will need to be adjusted accordingly. A laboratory seed test should be used to establish the germination percentage of on-farm retained seed before sowing, especially if it has been weather damaged. A vigour test is also recommended.

Purchased seed will be certified and should include details of germination percentage.

It is essential that nothing makes it harder for the germinating seed to reach the surface and establish. Sowing too deeply, cold or wet soil, some seed dressings and herbicides and hard setting soil, can all reduce seedling emergence.

The coleoptile is a protective sheath surrounding the first leaf of cereals. This protects and guides the shoot as it grows through the soil. If the seed is sown deeper than the length of the coleoptile the plant can fail to emerge. Coleoptile lengths vary between varieties. For example, the

![FIGURE 1 Influence of storage temperature and moisture on seed vigour](image)

**TABLE 1 Storage conditions required to maintain seed quality of key grain crops**

<table>
<thead>
<tr>
<th>Grain Type</th>
<th>Maximum Temperature (°C)</th>
<th>Maximum Moisture Content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>Canola</td>
<td>20</td>
<td>7</td>
</tr>
<tr>
<td>Pulses</td>
<td>20</td>
<td>12.5</td>
</tr>
</tbody>
</table>

SOURCE: GRDC Stored Grain Extension Project
wheat varieties Wyalkatchem\textsuperscript{10} and Axe\textsuperscript{10} have moderately short coleoptile lengths, while Scout\textsuperscript{10} and Correll\textsuperscript{10} have moderately long coleoptiles. Details can be found in regional sowing guides and on the National Variety Trials (NVT) website (www.nvtonline.com.au).
The ideal seeding depth for wheat is 30 to 35mm for semi-dwarf varieties, through to 50 to 70mm for tall wheat varieties, which have a longer coleoptile length.

Barley has a shorter coleoptile length than wheat and so the ideal sowing depth is 20 to 30mm.
Canola has small seeds and should be sown 12 to 25mm deep. Poorer establishment occurs with smaller seed, therefore grade the retained seed and sow only the larger fraction.
Lupins should be sown no deeper than 30 to 50mm depending on soil type and species. Other pulses tolerate sowing at depths of 50 to 80mm but must be sown below the depth at which herbicides are incorporated.
Coleoptile lengths are shortened by some seed dressings and also from use of dinotroaniline herbicides (such as trifluralin, pendimethalin and oryzalin).

Seed dressings containing the fungicides fluquinconazole, flutriafol or triadimenol, can all reduce coleoptile lengths under certain conditions. These seed dressings should be avoided on weather damaged seed, particularly when used in conjunction with herbicides such as trifluralin. Some new seed dressings contain the fungicide ipconazole, which has a reduced impact on coleoptile length, similar to triticonazole.

Care must be taken to sow the seed just below the herbicide layer and to avoid soil containing herbicide to be thrown into the furrow by the seeding implement. Check with the supplier or manufacturer of seed dressings and chemical treatments to determine if they will reduce the coleoptile length or affect emergence.

**Seed testing**

**Germination**

While a laboratory seed test for germination should be carried out before seeding to calculate seeding rates (Figure 2), a simple on-farm test can be done in soil at harvest and during storage:

- Use a flat, shallow seeding tray (about 5cm deep). Place a sheet of newspaper on the base to cover drainage holes and fill with clean sand, potting mix or freely draining soil. Ideally the test should be done indoors at a temperature of about 20\degree C or lower.
- Randomly count out 100 seeds, do not discard damaged ones and sow 10 rows of 10 seeds at the correct seeding depth. This can be achieved by placing the seed on the smoothed soil surface and pushing in with a pencil marked to the required depth. Cover with a little more sand/soil and water gently.
- Keep soil moist but not wet as over-watering will result in fungal growth and possible rotting.
- After 7 to 10 days the majority of viable seeds will have emerged. Count only normal, healthy seedlings. If you count 78 normal vigorous seedlings the germination percentage is 78 per cent.

**Disease**

Grain retained for seed from a wet harvest is more likely to be infected with seed-borne disease. It is also more likely to suffer physical damage during handling, increasing the potential for disease.

Seed-borne disease generally cannot be identified from visual inspection, so requires laboratory testing. This is particularly important for seed-borne diseases of pulses, for example blackspot (field peas) and ascochyta and botrytis (lentils, chickpeas, faba beans). Once a satisfactory germination percentage is known, seed should be tested for disease.
Frequently asked questions

Can I retrieve and sow seed that is warehoused at a central grain receival site?

It is only possible to retrieve grain from your farm if it has been warehoused. Retrieving warehoused grain will depend on each facility, store manager and variety licence owner. Unless grain is delivered to a specific variety segregation, the grain is likely to have been mixed with multiple varieties of the same quality. It will also be mixed with weed seeds that may not all be present on your farm.

Sowing such a mixture of seed presents multiple agronomic problems, including mixed growing patterns, different disease resistances, different herbicide tolerances and uneven ripening. Marketing may also be a problem and details of market opportunities would need to be confirmed prior to sowing.

Retrieving warehoused grain is highly undesirable.

Is seed retained from previous harvests likely to be of better quality?

The quality of retained seed that has been stored over several seasons will depend on its quality prior to storage and the storage conditions. A pre-seeding germination test is essential for any seed sown after more than one season in storage. In some cases older seed may be better than seed from the current harvest. It may also be worse – remember that with pulses there were quality issues of low germination, seed size and vigour with seed harvested in 2009-10 due to the sharp seasonal finish. Seed-borne virus levels were also high.

Can I obtain better quality seed of the same variety from another grower?

Growers cannot sell, trade, barter or give away seed of a variety protected by Plant Breeders Rights (PBR) for propagation unless they have an authorisation from the PBR owner of the variety. Any such authorisation is provided through a contract between the PBR owner or commercialising party and the grower.

Useful resources:

- National Variety Trials
  - www.nvtonline.com.au
- Pulse Australia
  - www.pulseaus.com.au
- Australian Oilseeds Federation
  - www.australianoilseeds.com
- State department sowing guides – check your state government website
- Stored grain website
  - www.storedgrain.com.au
- Grain Quality and other Ute Guides
- Drying malting barley – Graincorp growers pages
  - www.graincorp.com.au
- Buying and feeding weather damaged grain – Dairy Australia
  - www.dairyaustralia.com.au
- Weather damaged cereal seed

DISCLAIMER

Any recommendations, suggestions or opinions contained in this publication do not necessarily represent the policy or views of the Grains Research and Development Corporation. No person should act on the basis of the contents of this publication without first obtaining specific, independent professional advice. The Corporation and contributors to this Fact Sheet may identify products by proprietary or trade names to help readers identify particular types of products. We do not endorse or recommend the products of any manufacturer referred to. Other products may perform as well as or better than those specifically referred to. The GRDC will not be liable for any loss, damage, cost or expense incurred or arising by reason of any person using or relying on the information in this publication.

CAUTION: RESEARCH ON UNREGISTERED PESTICIDE USE

Any research with unregistered pesticides or of unregistered products reported in this document does not constitute a recommendation for that particular use by the authors or the authors’ organisations.

All pesticide applications must accord with the currently registered label for that particular pesticide, crop, pest and region.

Acknowledgements: Allan Mayfield, Andrew Rice, Daryl Mares, Wayne Hawthorne, Don McCaffery, Trent Potter, Peter Botta.