

RETAINING SEED FACT SHEET



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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. Seed management starts at harvest and continues through storage, handling and seeding.

Photo: Dr J Barrero, CSIRO



Front and back images of wheat grains that are affected by pre-harvest sprouting. They have absorbed water and have started to germinate. Those showing embryo development – shoot and/or roots – will not be viable as seed.

10mm

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-amylase, an enzyme that breaks down starch. The longer the grain sprouts, the greater the amount of alpha-amylase 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.

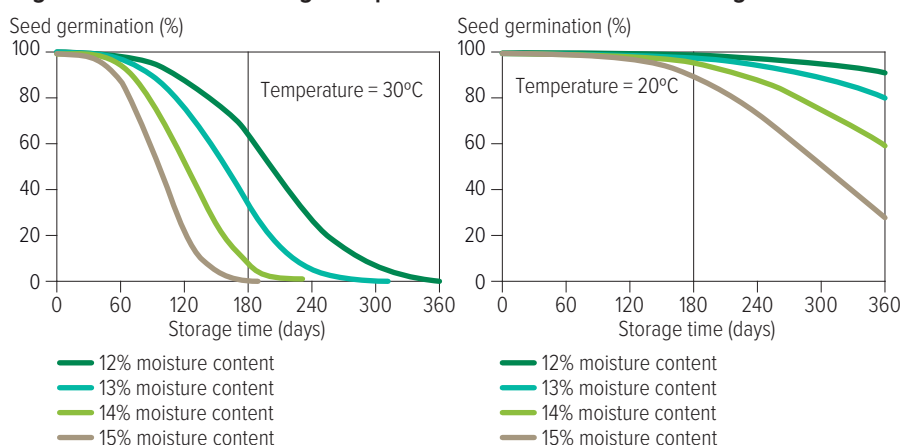
Harvest

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.

Figure 1: Influence of storage temperature and moisture on seed vigour.



NB: The figure on the left shows the influence of moisture content on germination of wheat stored at 30°C and the figure on the right shows the influence of moisture content on germination of wheat stored at 20°C.

Source: CSIRO Stored Grain Research Laboratory

Table 1: Storage conditions required to maintain seed quality of key grain crops.

| | Maximum temperature (°C) | Maximum moisture content (%) |
|---------|--------------------------|------------------------------|
| Cereals | 20 | 12 |
| Canola | 20 | 7 |
| Pulses | 20 | 12.5 |

Source: GRDC Stored Grain Extension Project

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 wheat varieties Scepter[®] and Vixen[®] have short coleoptile lengths, while Sunchaser[®], LRPB Bale[®], Calibre[®] and Valiant[®] have long coleoptiles. Details can be found

in regional sowing guides and on the National Variety Trials (NVT) website (grdc.com.au/nvt-crop-sowing-guides).

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.

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 at harvest and during storage:

- Set out two sheets of absorbent paper towelling and randomly count out 100 seeds, do not discard damaged ones.

Figure 2: Seeding rate calculation

$$\text{Seed rate (kg/ha)} = \frac{\text{Target plant density (pl/m}^2\text{)} \times \text{100 seed weight (grams)} \times 1000}{\text{Germination percentage} \times \text{Establishment percentage}}$$



Canola seed germination test showing after seven to 10 days viable seeds emerging.

- Place the 100 seeds in a grid fashion onto the absorbent paper towel taking care to ensure the seeds do not touch.
- Wet up the absorbent towel until it is moist but not saturated.
- Roll up the paper towel so that seeds are firmly secure inside the roll ensuring good contact between the seeds and paper.
- Store in an indoor location at a temperature of about 20°C or lower. Keep the paper towel moist but not wet as over-watering can result in fungal growth and possible rotting. (It can help to seal inside a plastic bag.)
- After seven to 10 days the majority of viable seeds will have emerged. Count only normal, healthy seedlings (shoots or roots). If you count 78 normal vigorous seedlings the germination percentage is 78 per cent.
- While 80 per cent germination is considered acceptable for cereals and pulses, results above 90 per cent are required for canola. Certified canola seed is generally sold with 90 per cent germination.
- The results from a laboratory seed germination test should be used in the seeding rate calculation (Figure 2).

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 aschochyta and botrytis (lentils, chickpeas, faba beans). Once a satisfactory germination percentage is known, seed should be tested for disease.



Photo: Felicity Pritchard

One sprouted canola seed in the centre of the pod – the funiculus that connects the seed to the pod should not be confused with a sprouting embryo.



Photo: Emma Leonard

Lentils harvest pre (left) and post-rain (right), showing seed coat wrinkling and discolouration. Weather damaged pulse seed is more vulnerable to physical damage during handling.

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.

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

GrainGrowers – Falling numbers guide 2021 <https://www.graingrowers.com.au/news/falling-numbers-guide-2021>

Stored Grain Information hub www.storedgrain.com.au

GRDC GrowNotes™ Grain Storage <https://storedgrain.com.au/grdc-grownotes-grain-storage/>

Successful Storage in Grain Bags <https://storedgrain.com.au/successful-storage-in-grain-bags/>

Dealing with High Moisture Grain <https://storedgrain.com.au/dealing-with-high-moisture-grain/>

Vigilant Monitoring Protects Grain Assets <https://storedgrain.com.au/monitoring-protects-grain/>

The WA Guide to High moisture Harvest Management, Grain Storage and Handling

<http://www.sepwa.org.au/high-moisture-harvesting-project>

List of Seed Testing Laboratories in Australia <https://www.asf.asn.au/seeds/technical-notes/>

National Variety Trials nvt.grdc.com.au

State department sowing guides grdc.com.au/nvt-crop-sowing-guides

WA Department of Primary Industries and Regional Development (DPIRD)

Factors affecting grain crop seed germination <https://www.agric.wa.gov.au/barley/factors-affecting-grain-crop-seed-germination>

Grain storage: maintaining grain quality <https://www.agric.wa.gov.au/barley/grain-storage-maintaining-grain-quality>

Pulse Australia

Grain bags for Pulse Storage <https://www.pulseaus.com.au/growing-pulses/publications/grain-storage-bags>



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