bettercanola

MODULE 8:
SAFE STORAGE

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Canola Technology Update for growers and advisors

SAFE STORAGE

Aim

The aim of this module is to be aware of the storage requirements to maintain canola at optimum quality.

Learning Outcomes

After completion of this module participants will be able to:

- Understand how storage conditions can affect the quality of stored canola.
- Identify the optimum storage facilities and equipment for canola.
- Determine the best management practices for canola storage.

About the Author

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Philip is northern regions leader for the National Grain Storage Extension project funded by GRDC.

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1. SUMMARY

For safe storage and optimum quality, canola should be stored 'cool and dry'.

Store canola seed below 7.0% moisture content (mc) at 40% oil content. Samples with high oil content (50%), store safely at less than 6.0% mc.

Clean out storage facilities, grain handling equipment and headers to reduce carry over of storage pests from one season to the next minimises early infestation pressure.

Aeration to promote uniform, cool storage conditions is a key strategy for maintaining oil and seed quality. During summer, aim for stored canola temperatures in the range of 18°–23°C.

Canola stored at temperatures above 25°C, or with high moisture contents (above 8.0%) significantly increases the risks of seed quality damage.

1.1 Storing oilseeds

Choosing to store oilseeds on-farm requires attention to detail, as there are limited tools available when compared to cereal grain storage.

To retain canola's market value, care must be directed at maintaining oil quality, visual appearance, and freedom from moulds, insect pests and unregistered chemicals.

1.2 Seed quality and moisture content at storage

Windrowing canola may have advantages over direct harvesting of the standing crop. It hastens and evens out the drying rate of ripe canola. If direct harvesting, harvest at less than 7% mc to allow for crop maturity paddock variability.

Timing of harvest and header settings – drum speed, concave gap, and fan speed, have a significant impact on minimising trash / impurities and seed damage.

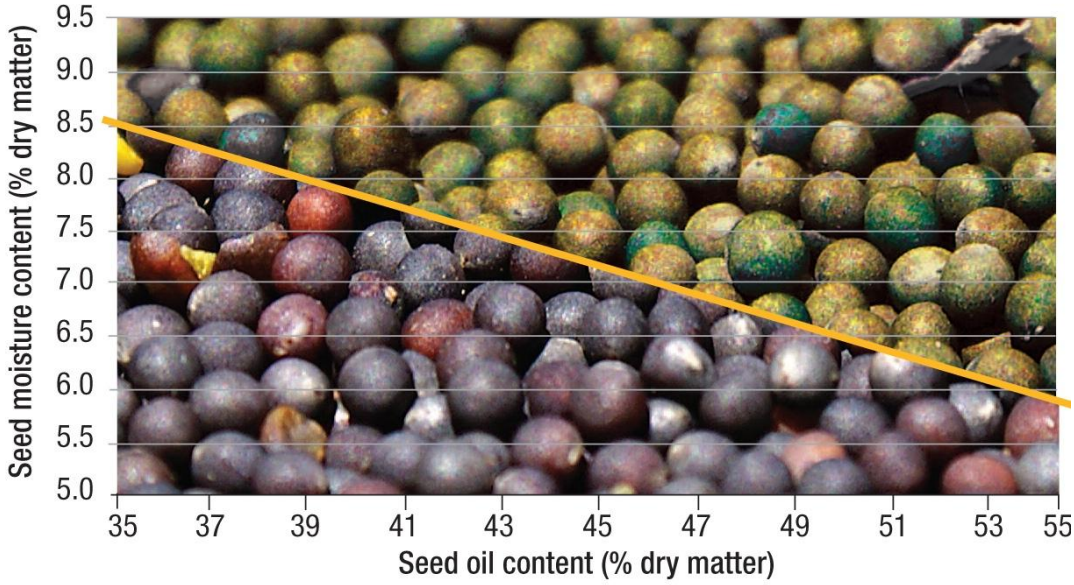
If admixture in the seed sample is high, fines can concentrate directly below the storage fill point leading to heating and fire risk. Larger pieces of crop trash may also concentrate along silo walls leading to mould development.

The presence of damaged seeds is more attractive to storage pests such as the rust-red flour beetle (*Tribolium castaneum*)

Safe storage moisture content depends on temperature and oil content. The higher the oil content and storage temperature, the lower the moisture content must be for safe storage.

Canola at 25°C with an oil content of 45% is safe to store below 7.0% mc. At 50% oil content, canola below 6.0% mc is safe. The aim is to store the canola in conditions that achieve an equilibrium relative humidity (ERM) of less than 60% in the storage. See Figure 1. This reduced the risk of mould development, canola self heating and oil quality deterioration.

Using aeration to cool seed temperatures to around 20°C or less is a key aid to reliable canola storage.



Note: The figure shows safe storage conditions for canola at 60 per cent equilibrium relative humidity.
The relationship between seed moisture content and oil content is shown at 25°C.
Canola stored at conditions above the line is at potential risk of seed and oil quality loss.

Source: CSIRO Stored Grain Research Laboratory

Figure 1: Potential unsafe storage limits for Australian Canola varieties at 60% equilibrium relative humidity and 25°C

1.3 Types of storage

Ideal storage for canola is a well designed cone based sealable silo fitted with aeration.

The aim is to minimise damage to seed, ease of cleaning / hygiene for empty storages and suitability for effective use of aeration cooling.

If seed requires insect pest control, the silo is then sealed (gas tight) for the required period as stated on the label (usually 7–10 days) to enable an effective phosphine fumigation to take place.

For all storage types, extra caution should be taken to prevent storm rain / water ingress into storages.

Image 1: Aerated, sealable silo

1.4 Hygiene – Structural treatment

Most insecticide storage surface treatments are not to be use on storages for holding canola. Warning: if unregistered chemical residues are detected by grain buyers, this can have serious long term consequences for domestic and export markets.

Inert dust or Diatomaceous earth (amorphous silica) is a naturally occurring mined product with insecticidal properties. Products such as Dryacide ® can be applied as a dust or slurry spray onto internal surfaces of storage areas and equipment. Once grain residues have been physically removed or washed out of storages and equipment, Dryacide ® can be applied as a non-chemical treatment to reduce insect pest carry over.

Insects survive in any sheltered place with grain residues in grain hoppers, augers, field bins and inside headers. All of these attractive locations require attention.

Some Pyrethrin + piperonal butoxide based products (eg. Rentokil's Pyrethum insecticide spray – mill special ® or Webcot's S-Py natural pyrethrum Insecticide ®) are registered for moth control in oilseed storage areas or storage sheds. They can be used as a structural surface spray or fogging / misting treatment. These are not to be applied as a grain treatment. Use only as labels direct.

1.5 Aeration

Aeration should be considered as an essential storage tool for canola.

Correctly managed, it creates uniform, cool conditions in the seed bulk and slows most quality deterioration processes:

Aeration:

- Maintains oil quality – free fatty acid, rancidity, colour and odour
- Reduces the risk of 'hot spots', moisture migration and mould development
- Slows or stops storage insect pests breeding cycles by maintaining grain temperatures below 20C. eg. Rust-red flour beetle breeding cycle ceases at 20°C
- Maintains germination and seed vigour for longer when kept cool and dry

1.5.1 Aeration cooling

Fan/s providing low air flow rates around 2–4 litres per second per tonne (L/s/t) can both cool seed and provide uniform seed temperature and moisture conditions in the storage.

Always check the fan's design and capacity, as canola being a much smaller seed adds significantly more back pressure to the aeration fan. This means that an aeration system set up to produce 2–3 L/s/t in cereal grain will typically be reduced by 40–60% if used on canola. In some cases, an aeration fan may not be able to create any airflow through canola.

Well managed cooling aeration typically sees seed temperature fall safely to around 20°C and below within days.

Regular checking of canola in storage is essential. Make visual inspections, check seed moisture, use a temperature probe to monitor bulk seed temperature and sieve for insects.

1.5.2 Automatic controllers

Often 'aeration cooling' fans are simply turned on & off manually or a timer clock is used. However there is a lot to be gained by investing $5000 to $7000 in an automatic controller that selects the optimum run times and ambient air conditions to have fans on. The controller continually monitors air temperatures and relative humidity (RH) and may select air from only 2 or 3 days in a week or fortnight. One unit has the capacity to control fans on multiple silos.

1.5.3 Standard aeration fans operation

- Run fans 24 hours per day during the first 4–5 days when grain is first put into the silo. This removes the 'harvest heat'. Smell the air coming from the silo top hatch. It should change from a warm humid smell to a fresh cool smell after 3–5 days. The first cooling front has moved through.

- For the next 5–7 days set the controller to the "Rapid" setting. This turns fans on for the coolest 12 hours of each day to further reduce the seed temperature.

- Finally set the controller to the "Normal" mode. The fans are now turned on for approximately 100 hours per month, selecting the coolest air temperatures and avoiding high humidity air.

1.5.4 Aeration drying

Well designed – purpose built high flow rate aeration drying systems with air flow rates of 15–20 L/s/t, can dry seed reliably. During aeration drying, fans should force large volumes of air through the grain bulk for longer periods of time. This ensures drying fronts are pushed quickly through so seed at the top of the silo is not left sitting at excessive high moisture contents.

Oilseeds seeds are generally well suited to this form of drying as 30°C ambient air at 30-50% relative humidity can reduce moisture content without the risk of heat damage to seed oil quality. Monitor regularly and take care that seed in the silo base is not over dried.

Do not attempt to use aeration cooling equipment fans with low airflow rates of 2–3 L/s/t to dry high moisture seed.

Automatic aeration drying controllers are also available to run fans at optimum ambient air conditions. Some controller models provide the option to switch to either cooling or drying functions. Ensure the controller is fitted with a good quality relative humidity sensor.

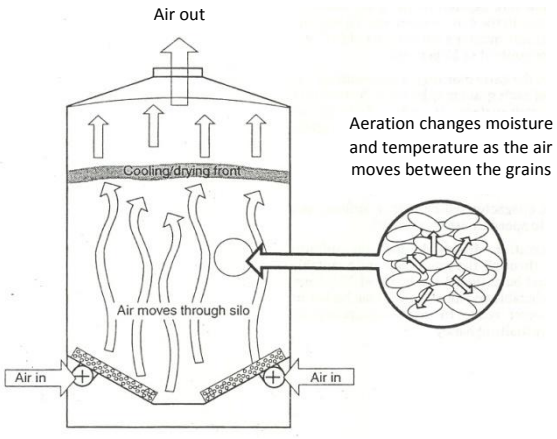


Figure 2: Cooling / drying fronts in the aeration process (C. Newman Agric. WA)

1.5.5 Heated air drying

For hot air drying of canola seed, fixed batch, recirculating batch or continuous flow dryers are all suitable for reducing moisture content.

Always consider the blending option first if low moisture canola seed is available.

Canola seed dries very rapidly when compared to the cereal grains, so close attention must be given to temperature control and duration to ensure seed is not over dried. A wise precaution is to use the minimum amount of additional heat.

- Use air temperatures in the 40–50°C range.
- Stay close at hand and monitor moisture content every 15 minutes.
- Over drying of canola seeds can occur rapidly. Seek advice if drying canola for first time.
- For batch dryers when moisture content reading reach 8.5%, turn off heat source and move to the seed cooling phase with fan only. Retest once cooled.
- Use belt conveyors or run auger full when moving seed to reduce seed damage.
- Aim to make good use of storage aeration fans, before and after the drying process.

1.5.6 Fire risk

The dust and admixture associated with oilseeds presents a serious fire risk. Harvesting and drying operations are high risk operations where constant vigilance is required. Good housekeeping in and around equipment and keeping a close eye on problem sites reduces the threat.

In case of a fire, ensure appropriate equipment is at hand and a plan of action understood by operators.

Without careful management, high moisture content canola seeds and/or high levels of admixture pose a risk of mould formation, heating and fire through spontaneous combustion.

1.6 Insect pest control

There are a number of insect pests that will infest stored oilseeds, usually favouring the grain surface. These are the Rust-red flour beetle (*Tribolium Castaneum*), Indian meal moth (*Plodia interpunctella*), Warehouse moths (*Ephestia spp.*) and Psocids (*Liposcelis spp.*)

Image 2: Rust-red flour beetle

Image 3: Indian Meal moth

These pests multiply rapidly given food, shelter and warm, moist conditions. They can complete their full life cycle in about 4 weeks under optimum breeding temperatures of around 30ºC.

Only a few treatments are registered for insect control in oilseeds. Phosphine, Pyrethrins, Diatomaceous earth (DE) and Ethyl Formate as Vapormate®.

Pyrethrins and DE use should be limited to storage area treatments and Vapormate® is restricted for use by licensed fumigators only. This leaves phosphine as the key farm storage treatment for oilseed storage pests.

Phosphine fumigation must take place in a gas tight, well sealed silo. If the silo passes the standard 3 minute pressure test, it shows there are no serious leakage points. Given this, phosphine gas can be held at high enough concentrations in the silo for enough time to kill all the life stages of the pest (eggs, larvae, pupae, adults).

A number of silo manufacturers make an aeratable, sealable silo, which passes the Australian Standard pressure test – AS 2628.

Like most oilseeds, canola seed has the ability to adsorb phosphine gas and so it is important to use the full, correct label dose rate.

By using phosphine bag-chains, belts or blankets, placement and removal of the treatment is simplified. If using the standard phosphine tablets, ensure tablets are kept separate from the canola seed by using trays so the spent tablet dust can be removed following fumigation.

If aeration cooling has been in use and the seed temperature is less than 25°C ensure the fumigation exposure period is 10 days or more. See label for details.

Once the fumigation is completed, release the seal, vent the gas and return the stored canola to aeration cooling.

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2. FURTHER REFERENCE RESOURCES

- ”Safe storage for Oilseeds“ AOF http://www.australianoilseeds.com/__data/assets/pdf_file/0006/4110/Oilseeds_Flyer.pdf
- “Store canola cool and dry to enhance oil quality“ by Len Caddick (2002) Kondinin – Farming Ahead No. 132 p.19–21
- “Storing oilseeds” (March 2012) GRDC Fact Sheet www.storedgrain.com.au
- “Aerating stored grain – cooling or drying for quality control” (July 2011) GRDC Booklet www.storedgrain.com.au
- How Aeration Works – GRDC Update Advice
- http://www.grdc.com.au/uploads/documents/aeration2004_2.pdf
- “Fumigation with phosphine – other controlled atmospheres” (Jan. 2011) GRDC Booklet www.storedgrain.com.au
- Canola commodity standards – Grain Trade Australia (GTA) www.graintrade.org.au