Retaining canola seed
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Key messages
- Farmers can retain stored open-pollinated (OP) seed and use OP seed grown on their own farm from year to year – but it is always wise to check germination every year.
- Previous work indicates that yields of retained hybrid canola can be reduced by 25% in higher rainfall areas.
  - In low and medium rainfall areas keeping seed from hybrid TT varieties may increase variability in flowering and result in increased anther sterility.
  - In lower rainfall areas yields are reduced by an average of 4% - equivalent to 50kg/ha – therefore the cost of buying fresh hybrid TT seed each year often outweighs the reduced performance of retained hybrid seed.
- Currently OP canola varieties are a better choice in lower rainfall areas.

Background
The majority of canola varieties grown in WA are open-pollinated (OP) and triazine tolerant (TT). WA growers are currently reliant on one breeding company (Nuseed) releasing OP varieties. There are concerns amongst growers and the industry that the rate of release of OP varieties will slow down and farmers may be forced to keep the same variety for many years. Similarly growers may move towards using hybrid TT seed which have a higher upfront cost than OP varieties. Inevitably some farmers may consider keeping seed from hybrid TT crops to use as seed in the following year.

To test if keeping OP and hybrid seed for many years, or using seed kept from multiple years of harvesting canola results in reduced performance in the low and medium rainfall zones we conducted three field experiments comparing generations of OP TT canola and eight field experiments comparing generations of hybrid canola. In some of the OP TT generation experiments we had extra treatments of +/- graded seed (>1.85mm sieve), but we report here on comparisons between ungraded commercial seed (Generation 1) and graded Generation 2, 3 and/or 4 seed as that closely mirrors the way in which growers could manage their seed lots. In the retained hybrid seed experiments we had a number of treatments – including combinations of +/- grading, low and high densities (25 or 40 treatments). Figure 1 Generation 3 hybrid plant from Wittenoom Hills in 2016 – this plant had male sterile flowers and flowered earlier than most of the plants in the plot, so initially it could not be fertilised by its neighbours - hence the missing pods at the base of the plant. Once the neighbouring plants started flowering, this plant could receive pollen and set pods higher up the plant.
Keeping seed for many years in storage can sometimes be ok

In a number of experiments we have used the same seed source which has been kept in normal office spaces or in sea containers within sheds without mishap. We tested the seed each year and found the germination rate remained fairly constant. Occasionally seed which was fine one year had low germination rates (<70%) the following year. This occurred more often with seed that had been treated with fungicides and/or insecticides. However, the optimum seed storage for canola seed whether treated or untreated is in cool rooms at 10-15 degrees at less than 45% humidity. Germination is only one component of seed quality, with seed vigour being more responsive to long term storage conditions.

Keeping the same OP variety grown out on your farm for many years is OK

We have grown out ATR Bonito at Grass Patch for a number of years and compared it to the original seed at a few sites. There was no difference in plant density in the experiments once we adjusted seeding rates for seed size and laboratory germination rates. We observed no consistent visual difference (or NDVI) between the generations of ATR Bonito in our plots, and no difference in flowering time.

Figure 3 Retained ATR Bonito seed (Generation 2-4) yields the same as commercially purchased new seed (Generation 1) at three WA sites in 2016 and 2017. Vertical bars indicate LSD.
Figure 4 Seed yield (t/ha) of open pollinated (OP), newly purchased hybrid seed (Generation 1, CB Junee HT in 2013, Hyola® 450TT or Hyola® 559TT in 2015 and 2016) and retained hybrid seed (Generations 2 or 3) at eight locations in Western Australia. Vertical bars indicate LSD.

Figure 5 Gross margin ($/ha) of open pollinated (OP), newly purchased hybrid seed (Generation 1, CB Junee HT in 2013, Hyola® 450TT or Hyola® 559TT in 2015 and 2016) and retained hybrid seed (Generations 2 or 3) at eight locations in Western Australia. Vertical bars indicate LSD.
% of flowers with sterile anthers. (all nil) or maturity. Consequently we found the different generations of ATR Bonito produced similar seed yield and oil percentage to each other and to newly purchased commercial seed.

Keeping seed from a hybrid TT crop will reduce crop performance, but the financial effect will depend on your canola yield – we suggest you keep growing OP canola

Previous work has shown that keeping seed from hybrid canola can lead to variability in flowering, increase in the number of flowers with anther sterility, reduced disease resistance, reduced vigour and reduced yield of 25-30% (Potter et. al. 2009, Kudnig et. al 2010).

The majority of the previous experiences were in high yielding situations (>1.8t/ha) or comparisons kept the seed rates of F1 hybrids and retained hybrid seed (called here Generation 2) the same. Whereas in WA canola is widely grown in areas with lower yield potential and farmers are likely to grade Generation 2 hybrid seed and sow it at a similar rate to OP varieties. In this series at eight sites over three years, yields ranged from 0.9-1.8t/ha (mean = 1.3t/ha) and when we compared graded Generation 2 or 3 hybrid seed at a target density of 40 plants/m² to commercial hybrid seed sown at 20-25 plants/m² we found that 80% of the time seed yields were either statistically the same or higher. Seed yields of Generation 2 hybrids were on average 50kg/ha (4%) lower yielding than commercial hybrid seed treatments. These are lower losses than that found by previous researchers in higher rainfall environments. 86% of the time gross margins from plots sown to graded Generation 2 or 3 hybrid seed sown at a target of 40 plants/m² were equal to or higher than commercial first Generation hybrid seed sown at 20-25 plants/m².

Generation 2 and 3 hybrid plants produced male sterile flowers (up to 9%) resulting in some pod gaps on the main flowering raceme – however podding commenced further up the raceme and the plants sometimes compensated with larger seeds. We also noticed Generation 2 and 3 hybrids sometimes produced earlier flowering individual plants. There was very low disease pressure in our low rainfall experiments – therefore we cannot comment on the disease resistance of Generation 2 or 3 hybrids.

In all of our experiments we compared commercial and retained generation hybrids to OP varieties. In the majority of experiments choosing to grow an OP variety and sowing at a target of 40 plants/m² produced higher yields and returns than any of the hybrid treatments. Our conclusion is that farmers should keep growing OP varieties in lower rainfall areas.