

3. The canola plant and how it grows

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All canola grown commercially in Australia is the Swede rape type *Brassica napus*. *Brassica juncea* (brown or Indian mustard), which has the same quality as canola, is also grown, but in much smaller quantities.

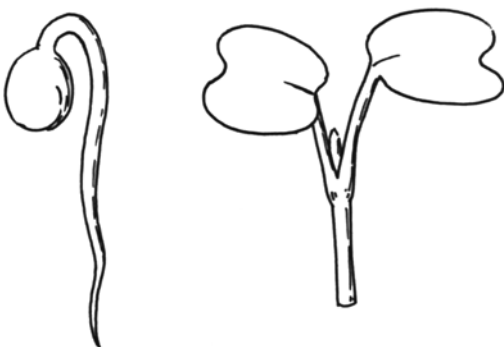
The 10 oilseed rape types grown throughout the world are mainly annual and biennial variants of *B. napus* and *B. campestris*. In Canada, both species are of considerable importance; *B. napus* is the dominant species in Europe and the Indian subcontinent. Each species has an optimum set of environmental and growing conditions.

The life cycle of the canola plant is divided into seven principal stages. By recognising the beginning of each stage growers can make more accurate management decisions on timing of weed control operations, introduction and removal of grazing livestock in crops managed as dual-purpose, timing of fertiliser applications, timing of irrigation, and timing of pest control measures. Each growth stage covers the development of a stage of the plant. However, the beginning of each stage is not dependent on the preceding stage being finished (that is, growth stages overlap). The beginning of each growth stage from budding is determined by looking at the main (terminal) stem. In the literature it is referred to as a decimal code, similar to Zadoks code for wheat growth stages.

Germination and emergence (stage 0 [0.0–0.8])

Emergence occurs after the seed absorbs moisture and the root (radicle) splits the seed coat and the shoot (hypocotyl) pushes through the soil pulling the cotyledon leaves upward, in the process shedding the seed coat. When exposed to light, the cotyledons part and become green.

Figure 3.1 Canola germination and emergence, stage 0–0.8



Leaf production (stage 1 [1.00–1.20])

A well-grown canola plant normally produces 10–15 leaves. Each leaf is counted when most of its surface is exposed to light. Early leaves may drop from the base of the stem before leaf production is complete.

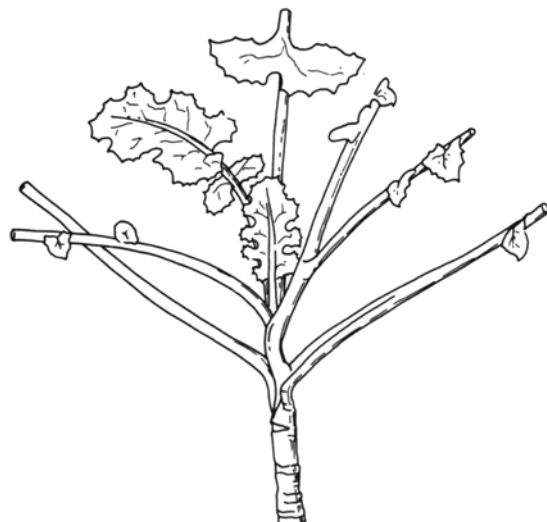
Figure 3.2 Canola leaf production, stage 1



Stem elongation (stage 2 [2.00–2.20])

Stages of stem elongation are defined according to how many detectable internodes (minimum length 5–10 mm) are found on the stem. A leaf is attached to the stem at each node. Each internode is counted. A well grown canola plant normally produces 15–20 internodes.

Figure 3.3 Stem elongation, stage 2



Flower bud development (stage 3 [3.0–3.9])

Initially flower buds remain enclosed during early stem elongation and can only be seen by peeling back young leaves. As the stem emerges they can be easily seen from above but are still not free of the leaves; this is described as the green bud stage. As the stem grows, the buds become free of leaves and the lowest flower stalks extend so that the buds assume a flattened shape. The lower flower buds are the first to become yellow, signalling the yellowing bud stage.

Figure 3.4 Canola flower bud development, stage 3



Flowering (stage 4 [4.1–4.9])

Flowering starts when one flower has opened on the main stem and finishes when no viable buds are left to flower.

Figure 3.5 Flowering, stage 4



Pod development (stage 5 [5.1–5.9])

Podding development starts on the lowest one third of the branches on the main stem and is defined by the proportion of potential pods which have extended to more than 2 cm long.

Figure 3.6 Pod development, stage 5



Seed development (stage 6 [6.1–6.9])

Seed development is also seen on the lowest one third of branches on the main stem. The stages are assessed by seed colour as follows:

- 6.1. seeds present
- 6.2. most seeds translucent but full size
- 6.3. most seeds green
- 6.4. most seeds green/brown mottled
- 6.5. most seeds brown
- 6.6. most seeds dark brown
- 6.7. most seeds black but soft
- 6.8. most seeds black but hard
- 6.9. all seeds black and hard

Figure 3.7 Seed development, stage 6



Figure 3.8 Seed pods

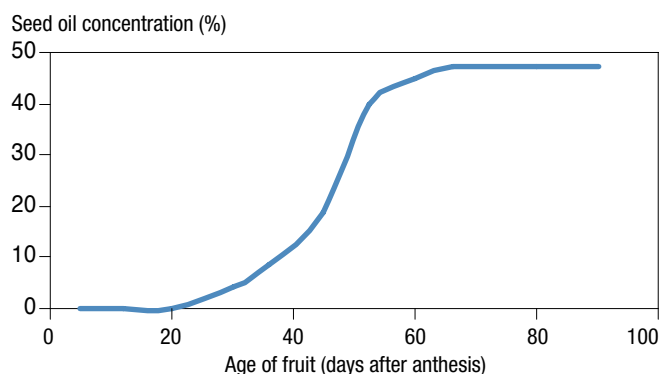


Seed oil concentration in Australian crops increases through seed development following an 'S' curve pattern, which starts 20 days after flowering and reaches a plateau about 60 days after flowering, the time when seed dry weight is about 70 per cent of its final value (Figure 3.9). Final seed oil concentrations usually vary between 30 and 50 per cent (as received). In general, high temperatures during grain filling, terminal water stress, and high nitrogen supply depress final seed oil concentration. Variety has a significant impact, with triazine tolerant varieties typically having lower oil concentrations than conventional varieties, due to their less efficient photosynthetic system.

The growth stage when the crop is physiologically mature is important and one that growers should learn to recognise. It is the stage when the seeds have reached their maximum dry weight and the crop can be windrowed. At this time 40–60 per cent of seeds have started to change from green to their mature colour (growth stage 6.4 to 6.5). At this time, seed moisture content is 35–40 per cent and most seeds are firm enough to roll between the thumb and forefinger without being squashed. It is a period of rapid change as all seeds can develop from translucent to black over a 12 day period. It is important not to windrow too early; windrowing before physiological maturity will reduce yields by 3–4 per cent for each day too early, due to incomplete seed development. Oil content will also be reduced.

Canola can be harvested when the moisture content of mature seed is eight per cent.

Figure 3.9 Seed oil concentration in Australian crops increases through seed development and reaches a plateau about 60 days after flowering



SOURCE: P. Hocking and L. Mason

ENVIRONMENTAL STRESSES IMPACTING YIELD AND OIL CONTENT

Frost, moisture stress and heat stress can all have an impact on grain yield, oil content and oil quality. Frost can occur at any time during the growth of the canola plant but the most damaging frosts occur when pods are small. Pods affected at this time have a green to yellowish discoloration, then shrivel and eventually drop off. Pods affected later may appear blistered on the outside of the pod and usually have missing seeds (see photo).

Frost damage before the watery seed stage results in either missing seeds or very shrivelled seeds. Frost damage at this time may or may not affect oil content.

PHOTO: T. POTTER, SARDI



Moisture and heat stress are linked; the plant will suffer heat stress at a lower temperature if it is also under moisture stress. Flower abortion, shorter flowering period, fewer pods, fewer seeds per pod and lighter seed weight are the main effects, occurring either independently or in combination.

Severe moisture stress during pod filling results in seeds being underdeveloped and small.

PHOTO: D. McCAFFERY, NSW DPI



Hail damage may penetrate through the pod wall and affect seed development.

PHOTO: D. McCAFFERY, NSW DPI

