



Scheduling canola irrigation with G Bugs

Dale Boyd

Agronomist, DPI Victoria, Kerang

in a nutshell

- Stem elongation and flowering are the two most critical stages for moisture stress in canola
- With the aid of moisture monitoring devices the amount of moisture in the soil can be measured to assist in irrigation scheduling to ensure maximum crop yields
- In 2006, in a canola variety trial, the use of G Bugs at estimated rooting depths was essential to accurately match up crop water requirements with critical growth stages

The irrigation of canola provides adequate soil moisture for the crop to use at critical growth stages. A trial in 2006 at the Victorian DPI Kerang research site showed that moisture monitoring devices can be used to avoid moisture stress at these critical times.

For canola crops, adequate soil moisture at stem elongation and flowering promotes:

- root growth
- large leaf area and assists the plants to retain their leaves longer, thereby lengthening the flowering period
- the number of branches per plant, the number of flowers forming pods, the number of seeds per pod, seed weight and ultimately, yield.

Effect of moisture stress

Canola plants under early season moisture stress may recover to near normal growth with rainfall or irrigation. Stressed plants have the ability to partially recover leaf area, form flowers, set pods and fill seeds with the availability of water. However, canola crops generally cannot fully compensate for early moisture stress as the hastened development and earlier maturity leads to lower yields.

The worst times for canola to experience moisture stress are during stem elongation and flowering, so the use of moisture monitoring devices at the estimated rooting depths of the crop has been essential to match up irrigation timing and plant moisture needs.

Grain filling will continue for about 25 days after flowering (the end of flowering is defined as the stage when only 10% of plants have flowers). With flowering extending up to 30 days, there is easily over two months where in theory, moisture should be readily available and maintained in the soil.

Canola doesn't tolerate waterlogging, especially during flowering, but in a flood irrigated environment is it almost

impossible to avoid the occasional excess water stress where the water holding capacity of the soil is exceeded through irrigation.

Waterlogging for three days or more during flowering reduces the number of pods per branch as well as seeds per pod. It is critical to have good drainage and slopes on the layout and use reliable weather-predicting tools to lessen the chances/impact of waterlogging.

Soil moisture measurements with G Bugs

In 2006, the use of G Bugs for moisture monitoring in canola crops was investigated at the Kerang research site.

The G Bug is a mini data logger to which up to four gypsum blocks at different rooting depths can be attached. The G Bug logs the sensor readings every two hours so everything is measured (rainfall, irrigation, hot weather and peak plant water use demand times) and up to 20 days worth of readings can be stored at one time. The data stored in the G Bug is then collected using a wireless connection. Readings can be reviewed on the MEARetriever or downloaded into the supplied software for analysis.

G Bugs were selected for the trial because once installed they are easy to use and determine soil moisture. It is critical that installation is done correctly to ensure accurate readings. Once installed, the logger connected to the G Bug will record valuable information of moisture through the soil profile. A portable retriever is used to transfer data from the logger in the field to a computer. Costs are \$80 for each GBLite block, a G Bug data logger is \$1000 and the portable retriever is \$550.

Two different moisture monitoring devices (a 'GBHeavy' and a 'GBLite') were installed at the site at a depth of 15 cm. Two GBLites blocks were installed at 30 cm and 45 cm. The GBLite blocks can be used in most soil types if the root zone of the crop is going to be in the 'readily available water' zone and operates over a tension range of 10 to 200 kPa.



If the crop is going to be pushed into water deficit in clay soils, the GBHeavy should be used as they operate over a tension range of 60 to 600 kPa.

Decisions to irrigate in 2006

Figure 1 shows the soil moisture levels and critical growth stages of canola in the variety trial site at Kerang, in 2006. At this stage we estimate that the refill point on the Kerang heavy clay vertosols is around the 80–95 soil tension kPa at a rooting depth of 30–40 cm.

First irrigation

In 2006, the first irrigation took place in late August near the end of stem elongation, just before flowering commenced. The canola roots at 30 cm depth had begun to rapidly deplete the soil moisture levels, and soil moisture levels had reached the soil refill point (dotted horizontal red line on Figure 1). This line could be further refined with field observations and ground-truthing the soil. Each soil type and crop type will have slightly different refill lines and at different root depths but ground-truthing can be performed to determine this.

The decision to irrigate at this time was based on both the patchy emergence from lack of rainfall in May and June, and the crop growth stage. The aim was to promote the opportunity for the crop to compensate for the low plant density by increasing branching.

In addition, this irrigation event was going to be the first opportunity since sowing to topdress nitrogen. It provided the ideal situation for the nitrogen to be applied to the crop. Only starter fertiliser had been applied at sowing, as it was preferred to apply nitrogen through topdressing when significant rainfall or an irrigation event is able to wash the nitrogen into the soil.

Second irrigation

Despite 22 mm of rainfall during mid September, the

moisture levels did not change at the rooting depth of 30 cm. At the end of September the canola had finished flowering but moisture levels were critically low with the canola roots estimated to be 45 cm deep. Soil moisture depletion was the same at 30 cm and 45 cm.

The grain filling period for canola is around 25 days from the end of flowering. With the plant still being able to utilise moisture for a further 25 days to contribute to yield and oil content, combined with a forecast of well-below average October rainfall, the second irrigation was applied.

Trial yields

Variety yields varied considerably and ranged from 1.5 to 3.0 t/ha on the trial site in 2006. Lower yields could be attributed to the low plant densities at establishment, the moisture stress through the winter period and lack of spring rain where the irrigation events attempted to compensate the deficit. There were also incidents of wind, hot weather that blew petals off the canola and limited flowering.

Conclusion

GBugs are another tool to investigate soil moisture levels at depth so that irrigation events can be better planned and matched to critical growth stages of canola. The experience at the Kerang trial site shows that soil moisture monitoring can help to make more timely decisions about irrigating canola. ☀️

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Further information

Dale Boyd

M: 0417 339 804

E: Dale.Boyd@dpi.vic.gov.au

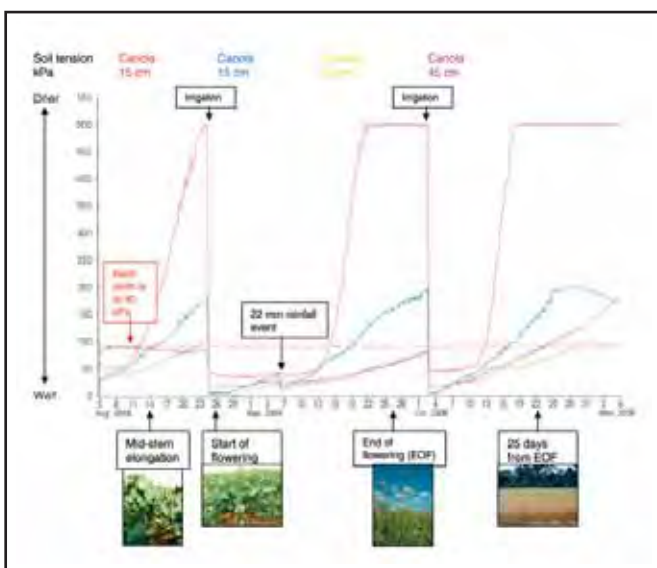


Figure 1: GBug graph of soil moisture under the 2006 DPI irrigated canola trial. The red line is the soil tension at 15 cm measured by the GBLite; the blue line represents the soil tension with the GBHeavy at 15 cm, the brown line at 30 cm and the pink line at 45 cm depth. The dashed red line indicates the suggested refill point.



Figure 2: A GBug data logger and wireless retriever (in a maize crop).