The importance of summer weed control

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Take home messages

- *Summer weeds use significant amounts of stored soil water.*
- *The long term impact of summer weeds amounts to a loss in production of 1t/ha in cereal yield in the southern Mallee.*
- *In a changed climate scenario, where our region is likely to receive more summer rain at the expense of spring rain, the impact of summer weeds on potential crop yield is likely to increase.*

Background

Summer weeds use valuable stored water and nutrients in the soil that could otherwise be used by ensuing crops. In the future, the negative effect of summer weeds will increase, as climate change scenarios foresee a greater proportion of annual rain falling during summer. BCG is developing the tools necessary for quantifying the costs and benefits of summer weed control, both for the current climate and under changed climatic conditions.

Aim

To measure the loss of soil water attributed to summer weeds and to quantify the impact of summer weeds on lost production.

Method

A replicated trial investigating water use by heliotrope or potato weed (*Heliotropium europaeum*), was set up at Jil Jil (32km north of Birchip) over the summer of 2009–2010. Three replicated plots with four densities of heliotrope (0, 10, 20 and 55 plants/m^2) were established in November 2009. The densities were maintained through hand-weeding. No other weed species was present in the trial.

The site had a sandy topsoil (to 20cm depth) overlying a light medium clay in the subsoil. Soil water content was monitored fortnightly using a neutron probe. Soil cores for soil water content in each plot were taken at the start, in the middle and at the end of the trial. Growth characteristics of heliotrope (biomass, plant height and flowering) were also regularly assessed.

The information collected was used to develop a summer weeds module for the crop model APSIM. The impact of summer weeds was modelled on the following wheat crop using both historical rainfall and projected changes in rainfall patterns due to climate change.

Results

Summer rainfall: Ninety millimeters of rain fell just before the trial was established in November 2009. The 2009 – 2010 summer was relatively dry with little rain until a 38mm rain event on 8 March 2010. The trial was completed on 27 March 2010.

Soil water: The data on soil water depletion were used to calculate how much soil water was used by the heliotrope treatments of different densities. Over the summer of 2009 – 2010 the control plots lost 19mm of soil water (soil depth 20 to 100cm). The amount of soil water depleted in the control plot (zero heliotrope) was subtracted from each of the different density treatments. The lowest density heliotrope (10 plants/m^2) used 19mm of soil water the medium density (20 plants/m^2) used 32mm and the high density (55 plants/m^2) used 51mm of soil water (Figure 1).

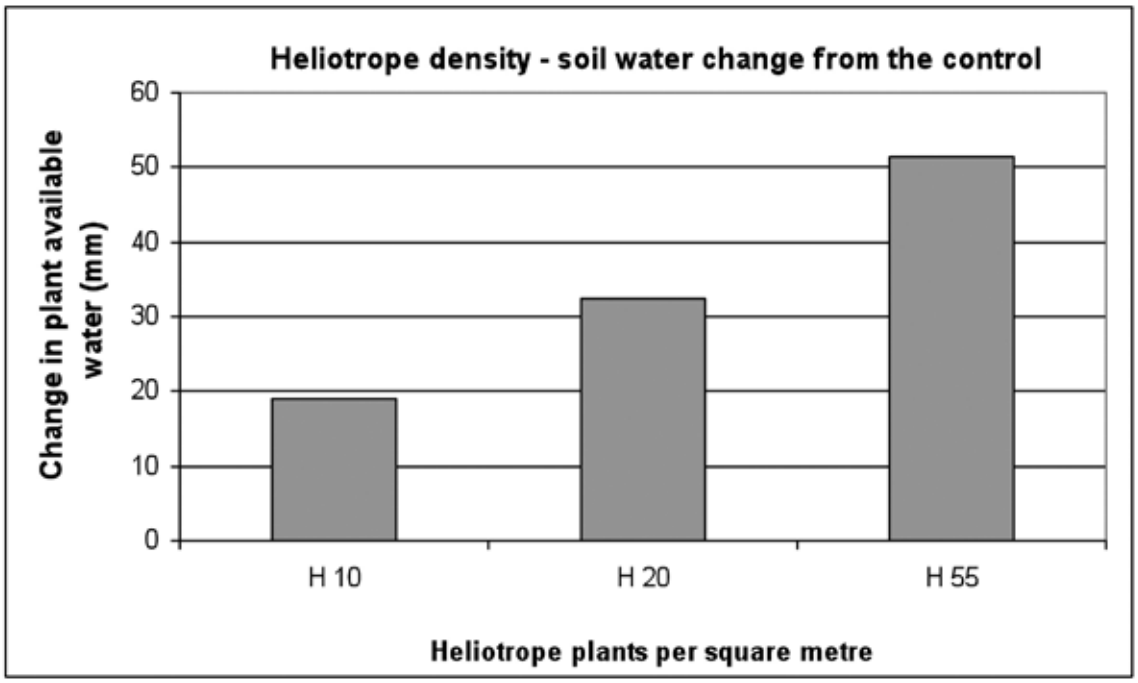

Figure 1. Change from the control in plant available water attributed to three densities of heliotrope: summer of 2009–2010.

Modelled impact of summer weeds on soil water: Using the information collected in this trial on soil water depletion and the growth characteristics of heliotrope, a summer weeds module was developed for the crop model, APSIM. The model was run for plant available soil water using Berriwillock meteorological data from 1960 to 2009. The scenarios began in 1960 and the soil water content in subsequent years was modelled. There were two scenarios: a no-weed situation (heliotrope was controlled) and a situation in which heliotrope had germinated in response to 25mm rain over three days and was not controlled. The average amount of extra stored water available on 1 April when summer weeds were controlled was 30mm. In wet summers such as 2005 – 2006 the modelled plant available soil water was 120mm higher where summer weeds were controlled compared with not controlled.

Modelled impact of summer weeds on crop yield: Using the same time period as above, the 50 year gain in modelled crop yield when weeds were controlled, was on average 1t/ha. In the wet summer of 2005 – 2006 when 120mm of extra soil water was stored when summer weeds were controlled, the modelled gain in crop yield was 2.5t/ha.