

CONSTRAINTS ON WODJIL SOILS AND CROPPING OPTIONS

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The following article was written as a follow on from the Soil Pit for Profit held on the 26th of September at Cail's property east of Wubin.

Key notes:

- Wodjil soils have low pH and high Aluminium.
- This restricts root growth to depth.
- Choose the most tolerant species and the most tolerant varieties within the species.

Acid Wodjil soils

These soils are naturally highly acidic, with acidity and exchangeable aluminium (Al) levels increasing with depth to levels that restrict root growth of all but the most tolerant crop and pasture species.

Acacia 'Wodjil species' are a feature of these soils, along with tamma (*Allocasuarina* species), proteaceous heath and sandplain mallee. This original vegetation is a guide, but in the absence of this there is no observable difference between very acidic and less acidic soil. Soil testing is the only reliable way of identifying these soils, and they show the following features:

- pH declines with depth, often down to pH 3.5 in calcium chloride at 20 - 30 cm.
- Subsoil levels of available aluminium (calcium chloride extract) over 5ppm.

A true Wodjil soil is acid to depth and should not be confused with 'pan acidity' that is sometimes mistakenly referred to as Wodjil.

Acidity and high aluminium levels make growing crops challenging when the critical levels are considered.

Critical pH levels for different species:

Crop	pH
Cereal rye	3.9 - 4.2
Triticale, Oats, Serradella	4.0 - 4.3
Tolerant wheat	4.1 - 4.4
Sub clover	4.2 - 4.4
Barley, non tolerant wheat	4.2 - 4.5
Canola	4.2 - 4.6

*Lowest end of range is growth related - Top end of range is critical level. (Soil Acidity A reference manual).

Aluminium varies through the soil and is not correlated to parts of the landscape or other features.



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Aluminium increases with decreasing pH (increases below 5.1 and is more available below pH 4.7) Critical levels of Aluminium by species are:

Crop	Aluminium (ppm)
Lupin, triticale, Oats	1.7 - 2.7
Wheat	0.9 - 1.6
Non tolerant what, Canola	0.5 - 0.8
Barley	<0.4
(Potentially higher for wheat in WA - 2ppm)	

Root channels from old roots, white ant trails etc, do allow roots to go deep but these roots cannot easily extract water given the pH and Al levels.

Roots are thick and have less root hairs in the presence of Aluminium. Aluminium toxicity symptoms above ground are similar to Phosphorous deficiency symptoms where there is low vigour, reduced biomass and purpling.

Work by Mohammad Amjad (DAFWA) has classified the following varieties according to their tolerance to Aluminium.

Tolerant - Westonia, Emu Rock, Magenta, Justica and Estoc.

Intermediate - Corack, Mace, Wyalkatchem and Grenade.

Intolerant - Calingiri, Eagle Rock and Zippy.

The varieties with aluminium tolerance have the ALMT1 gene which enables the root to exude citrate/maleate which decreases the Al levels in the soil around the root. WA varieties have excellent tolerance to acid as all WA varieties that perform will carry this gene.

Varieties with good acid tolerance, but poor Al tolerance are Wyalkatchem, Yitpi, Zippy, Grenade and Correll.

Litmus barley bred by Chengdao Li has this gene and is the first barley to be able to do this.

Choosing crops for Wodjil soils is a matter of choosing the most tolerant species first and then the most tolerant variety.