SODIC SOIL SITE

Trial 36

Improving the Productivity Of Sodic Soils in the Wimmera And Southern Mallee

Influence of gypsum and stubble retention on canola and chickpeas grown on a sodic soil, Birchip 1996

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Aim:
Birchip sodic soils site is one of the four experimental sites established under the GRDC funded project, "Improving the productivity of sodic soils in the Wimmera and southern Mallee". The aim of the project is to develop productive and sustainable cropping systems for the alkaline sodic soils in this region.

Experimental site
The field experiment at BCDS sodic soils site was initiated in 1995 to study the effect of gypsum and stubble retention on different crops grown in rotation. The experimental site is located about 10 km west of Birchip on Keith Barber's property. The pH, electrical conductivity (EC) and exchangeable sodium percentage (ESP) of the soils at this site are given in Table 1.

Table 1. Electrical conductivity, pH and ESP of soil of the experimental site

Depth (cm)	pH (1:5)	EC (1:5), dSm^{-1}	ESP %
0-10	8.3	0.3	8
10-25	9.0	0.5	22
25-50	9.1	1.2	43
50-75	8.6	2.7	43
75-100	8.1	4.9	38

The EC and pH were determined in 1:5 soil water suspensions. The soil of the experimental plots is alkaline sodic with high amounts of salts from 25 cm downwards. At depth the sodicity level is extremely high.

Experimental details
The effects of gypsum (4 rates, 0, 2.5, 5 and 10 t/ha) and stubble retention (complete retention and burnt) are being examined on the productivity of crops in a 4-year rotation. Each year, starting from 1995, two different crops are being grown to follow a set rotation (wheat- chickpea-canola-pasture). The experiment was laid out, keeping in view the statistical principles, to follow a balanced incomplete block design. Within a particular crop stubble and gypsum treatment, plots were replicated three and six times, respectively.

Crops and crop husbandry
In 1996 chickpea and canola were grown; chickpea was grown after wheat and canola after chickpea. Grain legume super at the rate of 75 kg/ha, and PIVOT 15 @ 80 kg/ha and urea @ 100 kg/ha were applied to chickpea and canola, respectively at sowing time. A seed rate of 150 kg/ha for chickpea (Desavic) and 5 kg/ha for canola (Rainbow) was used. Gypsum was applied in 1995 only while stubble treatments were in

place during 1996. Horsham modified drill was used for planting at 25 cm row spacing. Appropriate herbicides were used to control weeds.

Results:

There was no effect of stubble retention on canola yield because it followed chickpea and there was very little, if any, stubble of chickpea. There was, however, a significant difference between chickpea yields obtained from stubble (wheat) retention and stubble burnt treatments. The overall yield level of chickpea was, however, very low (Table 2). The overall low yield levels of chickpea were due to severe frost damage during pod filling stage.

Table 2. Grain yield (t/ha) of canola and chickpea as influenced by stubble retention and gypsum application

Treatments		Canola	Chickpea
Stubble	Retained	1.03	0.42
	Burnt	1.00	0.17
	LSD*	NS	0.13
Gypsum	0 t/ha	0.98	0.23
	2.5 t/ha	0.93	0.28
	5t/ha	1.10	0.26
	10 t/ha	1.06	0.39
	LSD*	NS	NS

The data given are adjusted means.
NS - not significant
* Least significant difference at 5 % level of significance

There was no significant effect of gypsum application on the yield of both canola and chickpea. Any clear trend or positive response was absent. The differences between various gypsum treatments if any were not significant. This was probably due to high amount of salts present in the root zone. Salts prevent dispersion and maintain good soil structure as a result of the 'electrolyte effect' and hence overcome any effect gypsum has in correcting sodicity. Salts have to be leached for gypsum to have a positive effect. A catchment scale approach would be required to correct salinity problems.