Waterlogging in lentils

Lower EP 2022

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Key messages

- Waterlogging of lentil crops across many of the 'traditional' lentil growing areas of Lower Eyre Peninsula severely damaged yields in 2022. Investigation across six paddocks found that sodicity levels were high where crop damage was at its worst.

Why do the work?

Waterlogging was experienced by many lentil growers on Lower Eyre Peninsula (EP) in 2022, particularly those on heavier loamy soils. Patterns of waterlogging did not match topography, where apparent waterlogging damage occurred in a mosaic across the landscape, rather than just in the low-lying areas. To investigate this further soil samples were collected across six paddocks on Lower EP between August and early October, once waterlogging damage was visually apparent. Soil and plant samples were collected from zones with good, moderate and poor growth.

The hypothesis was that the soils would have adverse properties for plant growth driven either by acidity or sodicity. Lentil is very intolerant to sodicity and boron toxicity. Excessive boron or sodic subsoil within the crop root zone can cause plant death and severely limit lentil yields. Sodic soils are those with a sodium adsorption ratio (SAR) greater than 15. Less than 1% exchangeable sodium percentage (ESP) on the surface and less than 5% ESP in subsoil will also affect lentil growth (GRDC GrowNotes™).

What happened?

Rainfall (Cummins)
Av. Annual: 424 mm
Av. GSR: 342 mm
2022 Total: 596 mm
2022 GSR: 395 mm

Table 1: Soil and plant sampling from lentil paddocks across Lower EP August-October 2022.

Location	Crop condition	Depth (cm)	pH ($CaCl_2$)	SAR	ESP (%)	K% of CEC	Spring dry matter (t/ha)	Nodule score
Yeelanna 1	Good	0-10	7.66	2.2	1.4	3.3	3.7	2.8
	Good	10-30	7.84	1.5	1.0	2.5		
	Good	30-60	8.09	4.1	2.9	8.4		
	Medium	0-10	7.22	1.0	0.8	2.8	2.8	2.5
	Medium	10-30	7.63	1.8	1.2	2.8		
	Medium	30-60	8.08	5.1	3.6	10.5		
	Poor	0-10	7.33	7.4	6.1	26.7	0.16	-
	Poor	10-30	8.09	16.8	10.3	26.5		
	Poor	30-60	8.33	28.5	16.7	42.8		

Location	Crop condition	Depth (cm)	pH ($CaCl_2$)	SAR	ESP (%)	K% of CEC	Spring dry matter (t/ha)	Nodule score
Yeelanna 2	Good	0-10	7.53	0.6	0.4	1.1	2.56	2.2
	Good	10-30	7.78	1.5	1.0	2.5		
	Good	30-60	8.13	12.3	7.4	18.1		
	Medium	0-10	7.59	1.0	0.7	1.9	0.98	2.6
	Medium	10-30	7.81	1.8	1.1	2.5		
	Medium	30-60	8.03	7.2	4.4	10.8		
	Poor	0-10	7.11	2.6	2.2	9.5	0.35	-
	Poor	10-30	7.62	3.6	2.2	5.2		
	Poor	30-60	8.06	8.0	4.9	11.9		

Location	Crop condition	Depth (cm)	pH ($CaCl_2$)	SAR	ESP (%)	K% of CEC	Spring dry matter (t/ha)	Nodule score
Cummins	Good	0-10	7.52	0.6	0.4	1.4	3.29	2.4
	Good	10-30	7.7	3.1	2.1	6.1		
	Good	30-60	8.07	13.2	7.5	16.7		
	Medium	0-10	6.4	0.9	0.9	5.0	1.92	1.2
	Medium	10-30	7.19	2.6	2.0	6.9		
	Medium	30-60	7.79	5.0	3.1	7.1		
	Poor	0-10	7.5	0.5	0.4	1.3	0	-
	Poor	10-30	7.74	1.6	1.1	3.3		
	Poor	30-60	7.82	4.8	3.5	11.6		

Location	Crop condition	Depth (cm)	pH ($CaCl_2$)	SAR	ESP (%)	K% of CEC	Spring dry matter (t/ha)	Nodule score
Karkoo	Good	0-10	7.51	0.4	0.3	1.3	2.40	1.50
	Good	10-30	7.71	0.9	0.6	1.8		
	Good	30-60	7.85	2.6	1.9	5.7		
	Medium	0-10	7.15	0.7	0.8	5.3	2.41	0.8
	Medium	10-30	7.76	2.6	1.7	4.6		
	Medium	30-60	7.99	9.2	6.3	17.9		
	Poor	0-10	6.54	3.3	4.2	45.1	0	-
	Poor	10-30	8.04	20.5	12.0	28.5		
	Poor	30-60	8.24	31.6	17.7	42.2		

Location	Crop condition	Depth (cm)	pH ($CaCl_2$)	SAR	ESP (%)	K% of CEC	Spring dry matter (t/ha)	Nodule score
Tumby Bay	Good	0-10	7.56	1.7	1.1	3.2	3.12	4.9
	Good	10-30	8.06	11.7	6.8	15.5		
	Good	30-60	8.41	32.8	18.0	42.9		
	Medium	0-10	7.09	0.8	0.8	4.2	2.19	5.9
	Medium	10-30	7.85	4.1	2.7	6.9		
	Medium	30-60	-	-	-	-		
	Poor	0-10	7.18	3.2	2.8	14.0	0	-
	Poor	10-30	8.24	32.6	18.2	44.5		
	Poor	30-60	8.51	50.5	24.6	51.2		

Location	Crop condition	Depth (cm)	pH ($CaCl_2$)	SAR	ESP (%)	K% of CEC	Spring dry matter (t/ha)	Nodule score
Ungarra	Good	0-10	7.33	0.7	0.7	29.6	2.25	5.1
	Good	10-30	7.70	8.8	5.6	16.3		
	Good	30-60	7.60	11.2	7.3	34.9		
	Poor	0-10	6.14	6.9	7.9	62.8	0	1.4*
	Poor	10-30	8.17	28.7	15.5	36.0		
	Poor	30-60	8.51	47.4	23.2	49.1		

*The plants established and grew for a couple of months prior to waterlogging, it was possible to see where the plants were and dig up the remaining root systems to check nodules, despite the lack of biomass.

What does this mean?

The grey shaded numbers in Table 1 indicate where the sampled soil tested higher than the critical value for lentil. The % K of CEC is another measure of poor drainage as potassium, like sodium, is a monovalent cation, and doesn't have the ability to bind two soil molecules together as calcium (found in gypsum) does.

The areas that had experienced poor crop growth generally had higher levels of one of the measures for sodicity or potassium, except for the Cummins paddock, which was a heavier textured soil. The heavy textured soil would have slowed the ability of the soil to drain under large and frequent rainfall events that were experienced during August/September, leading to waterlogging.

Patch point soil testing of these poorly performing areas allowed for the identification of the sodicity issue, as the affected area was incredibly localised, confined to areas around 20-30m^2. Multiple samples across a zone may have diluted the sample and not been able to correctly identify the issue.

To remedy the sodicity issue gypsum application is required, with some areas requiring multiple applications over a significant timeframe. Please seek specific soils advice to assist in developing a gypsum application strategy.

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