Northern NSW pulse agronomy project – nutrition in chickpea 2015

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Key findings

Phosphorus (P) was a limiting factor to chickpea yield at four of the seven trial sites in 2015.

Zinc (Zn) limited chickpea yield in three trial locations in 2015.

Waterlogged induced iron (Fe) deficiency was a limiting factor to chickpea yield on a grey–brown vertosol with a 50 year cropping history.

Introduction

The 2015 season was characterised by episodic cold weather events during flowering and terminal drought during grain filling. These seasonal conditions had considerable impact, reducing the potential yield of chickpeas across most areas of the northern NSW cropping zone.

The Northern Pulse Agronomy Initiative project had a range of experiments covering a number of agronomic themes in 2015. This paper reports on the outcomes of the nutrition experiments conducted across northern NSW in 2015.

Site details

This experiment was conducted at seven experimental locations; North Star, Moree, Rowena, Edgeroi, Coonamble, Nowley and Trangie. Soil chemistry parameters for a selection of sites, is contained in Table 1.

Treatments

Nutrients were applied in a nutrient omission format. In nutrient omission trials, one nutrient is deliberately omitted in each treatment, while all other nutrients are applied at rates considered as non-limiting. It is therefore not possible to determine optimum nutrient application rates directly from the results of these experiments.

The 12 treatments were:

1. zero nutrients
2. all nutrients
3. –N
4. –P
5. –K
6. –Ca
7. –B
8. –Cu
9. –Zn
10. –Mn
11. –Mg
12. –Fe

The application method varied between nutrients. Both phosphorus (P) and nitrogen (N) were applied at sowing, at 10 kg P/ha as Trifos and 10 kg N/ha as urea, respectively. Calcium (Ca), magnesium (Mg), zinc (Zn), manganese (Mn), copper (Cu) and iron (Fe) were applied as chelates in a foliar spray. Potassium (K) was applied as potassium citrate and boron (B) as boron ethanolamine as foliar sprays. Besides N and P (applied at sowing), all other nutrients were sprayed on the crop at the mid-vegetative period.

PBA HatTrick(ɒ) was used as the chickpea variety for all trial sites and sown at a target plant population of 30 plants/m^2. There were three replicates of each treatment at each site.

Table 1. *Selected soil chemistry parameters for four experimental sites in northern NSW in 2015*

Parameter	Units	North Star		Moree		Edgeroi		Nowley	
		0–10 cm	10–30 cm	0–10 cm	10–30 cm	0–10 cm	10–30 cm	0–10 cm	10–30 cm
pH (1:5 in CaCl2)	pH	7.69	7.98	5.76	7.56	7.40	7.82	7.28	7.67
Organic carbon	%	0.57	0.44	0.50	0.38	0.60	0.39	1.47	1.10
Phosphorus (Colwell)	mg/kg	15.4	10.6	19.9	11.0	18.8	9.66	28.5	9.88
Ext. phosphorus(BSES)	mg/kg	42.1	26.7	38.0	29.9	202	187	271	240
Extractable zinc	mg/kg	1.02	1.04	0.81	0.68	0.69	1.14	1.46	1.25
Extractable iron	mg/kg	10.6	11.6	30.2	17.9	22.0	24.3	19.5	29.5

Results

The Trangie, Edgeroi and Coonamble sites showed yield responses to applied Zn of 28%, 18% and 7%, respectively. Coonamble, Nowley, Moree and North Star had responses to applied P of 4%, 15%, 15% and 11%, respectively (Table 2). The trial at Rowena showed no significant grain yield responses to any of the applied nutrients.

The Coonamble site, which has a grey–brown vertosol that has been cropped since the early 1960s, also showed an 8% yield response to applied Fe, likely due to Fe deficiency induced by early waterlogging.

None of the seven sites had a significant yield response to K, Ca, B, Cu, Mn or Mg (data not presented).

Table 2. *Effect of selected nutrient omission treatments on grain yield (kg/ha) in chickpea at seven sites in northern NSW in 2015*

Treatment	Grain yield (kg/ha)						
	Trangie	Rowena	Edgeroi	Coonamble	Nowley	Moree	North Star
Minus Zn	559 b	788 a	1498 b	1816 b	1619 a	1928 a	2129 a
Minus P	626 ab	986 a	1613 ab	1864 b	1425 b	1697 b	2005 b
Minus Fe	678 a	852 a	1600 ab	1804 b	1588 ab	1891 a	2112 ab
All	714 a	1019 a	1772 a	1947 a	1643 a	1956 a	2226 a
Values with the same letter are not significantly different at P <0.05							

- Frosts and cold periods during flowering at sites led to floral abortion and a reduced yield.
- Extended dry periods at sites during September and October led to pod and seed abortion.
- Older cropping country generally appeared to show responses to applied P as well as Zn.
- Waterlogging might induce Fe deficiency on vertosols.

Summary

Responses to phosphorus application in chickpeas have been evident in trial sites located on older cropped country for the past two years. Responses to Zn were evident at trial sites in 2015 which were located in paddocks with a longer history of crop production. If growers are unsure of whether their paddocks will respond to applied fertiliser they should conduct soil tests and are also advised to establish a simple test strip and monitor crop response.

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