CHAPTER TEN

GENERAL DISCUSSION AND CONCLUSIONS

In Experiment I, both wheat and peas responded to P application in shoot and root DW, P uptake and concentration in shoot tissue in both crops, and in the number of tillers and nodes for wheat and peas, respectively. Peas responded only to high rates (20 and 40 kg/ha) of P. The effect of P on plant height and growth rate was stronger in pea plants than in wheat. The P40 treatment did not significantly increase shoot and root DM over the P20 treatment, and this may indicate that a plateau in response to P had been reached by P40. P concentrations were lower than published critical or adequate levels for both crops. The difference was greater for pea and it is possible that the demand for P by peas is greater than by wheat. There was no response in Zn concentration to P application in either crop, but P application increased Zn uptake by pea.

Plant height and node number were increased by Zn application for pea but there was no effect for wheat. Zn application increased Zn concentration in both crops.

Although no significant difference in growth of both crops was found between P20 and P40, higher application rates of P were recommended to determine the optimum rate of P application. It was also recommended that plants should be allowed to grow to maturity to determine the effect of P fertilisation on grain yield.

In Experiment III where the rate of P fertiliser ranged from 0 to 320 kg/ha maximum responses were obtained; the highest rates resulted in toxicity effects. P application increased plant growth, P and N uptake and the concentration of P in the plants. Yield increments above P40 were small and variable. These results were similar to those found

in Experiment I where a plateau in response to P application was reached at P40. The slightly higher optimum rates obtained in Experiment III would be expected using the Warialda red-brown earth compared to a grey clay soil. Two different pea varieties were used in these experiments which may have altered the relative response to P.

In Experiment IV, though the results were variable, application of P at 40 kg P/ha produced the greatest yield. Regression analysis showed no correlation between the dry matter yield and the rate of P application as was found in Experiment III. However, significant P effects were obtained by analysis of variance between the treatments.

There was no effect of P application on N uptake or concentration in the seed in the field. However, P increased the uptake of P and its concentration in the plants but unlike the glasshouse experiment, a maximum value association with a quadratic relationship was not found. The relationship between tissue P concentration and dry matter yield were linear. As a result, tissue critical P concentration corresponding to field conditions could not be estimated.

It was concluded that drought, extreme temperatures (high average daily temperature and frosts) during the growing season and possibly other factors which were not identified disrupted the response of peas to the applied P under field conditions. Under field and glasshouse conditions for a relatively P responsive soil (13 µg/g available P), 40kg P/ha appeared to give adequate rates of P uptake and yield. The P content of YL during growth was close to double that of TYL and WP; when the field crop was sampled at either 57 or 79 days after sowing a P content of 0.5 to 0.65% appears adequate for a non P limiting condition.

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APPENDIX A

Description of the grey clay soil (by Gi lson Isl and Laboratory).

Soil name	Grey Clay
Soil colour (Munsell)	Grey Black
Soil texture	clay
pH (1:5 water)	8.2
Organic carbon (% C)	0.9
Total nitrogen (%)	0.08
Nitrate nitrogen (mg/kg)	8.4
Sulfur (mg/kg)	13
Phosphorus (Colwell; mg/kg)	8
Potassium (meq/100 g)	1.45
Calcium (meq/100 g)	33.01
Magnesium (meq/100 g)	11.25
Sodium (meq/100 g)	0.77
Chloride (mg/kg)	30
Copper (mg/kg)	1.2
Zinc (mg/kg)	0.5
Manganese (mg/kg)	5
Iron (mg/kg)	19
Boron (mg/kg)	1.00
Cation exchange capacity (meq/10() g)	46.39
Calcium / magnesium ratio	2.93
Exchangeable sodium percentage	1.66
Electrical conductivity (ds/m)	0.6

APPENDIX B

Description of the red-brown earth soil (by Port Kembla Laboratory).

Soil name	Red brown earth
Soil colour (Munsell)	Red brown
Soil texture	???
pH (1:5 water)	5.6
Organic carbon (% C)	0.7
Nitrate nitrogen (mg/kg)	6
Sulfate sulfur (mg/kg)	1
Phosphorus (Colwell; mg/kg)	13
Potassium (meq/100 g)	0.5
Calcium (meq/100 g)	3.0
Magnesium (meq/100 g)	1.2
Aluminium (meq/100 g)	0.11
Sodium (meq/100 g)	< 0.05
Chloride (mg/kg)	11
Copper (mg/kg)	0.6
Zinc (mg/kg)	0.2
Manganese (mg/kg)	69
Iron (mg/kg)	60
Boron (mg/kg)	0.5
Cation exchange capacity (meq/100 g)	4.9
Calcium / magnesium ratio	2.5
Aluminium saturation (%)	2.2
Electrical conductivity (ds/m)	0.04

APPENDIX C

Climatic data of the experimental area during the period of the experiment