

Paper 6

USE AND MISUSE OF FERTILISERS ON PEAS

C.C. McLeod

Ministry of Agriculture & Fisheries
Timaru

INTRODUCTION

A search of the literature shows that, world-wide, the results of fertiliser pea trials have given very variable results. The general conclusion to be reached is that pea yields are affected more by climatic conditions than by fertiliser application.

NPK fertilisers

Although, internationally, NPK fertiliser responses in peas have been variable with many negative results, there have also been some positive responses, the reasons for these being unclear. In trials where phosphate responses have occurred, the placement of the fertiliser with or near the seed has been more effective in increasing crop yields than annual broadcast application. Other NPK fertiliser effects have included reduced disease incidence, maturity effects and improved seed nutrient levels. In one Asian trial, 60 kg/ha phosphate reduced the incidence of pea wilt and root rot. It has been widely recorded (including many New Zealand trials) that nitrogen can delay pea maturity while maturity can be advanced slightly by adding phosphate.

NPK fertilisers invariably increase the nutrient levels in the seed. In particular, nitrogen application increases seed protein — though it can also decrease seed size. Raising the nutrient content of pea seed by applying fertilisers could be of value if the grower received payment for the higher quality or higher feed value seed so produced.

It has been recorded, particularly under arid conditions, that NPK fertilisers can reduce zinc levels in pea seed and, without zinc application, pea yields can be severely reduced. This finding could be important in high pH, low zinc areas with occasional dry summer stress periods (as in Waitohi, South Canterbury).

Lime

In most countries, pea yields have been very inconsistently affected by lime, with any responses being attributed to pH changes and not to the added calcium. Where lime has been drilled with the seed (as in the Winchmore trials) it is likely that there has often been insufficient time for it to have any effect on the crop, as lime frequently needs 6 to 9 months to have any significant effects on soil structure or nutrient uptake.

Table 1. Seed yields of peas in fertiliser trials in South Canterbury (tonnes/ha). Unirrigated.

Fertiliser	1970	1971	1973	Year 1974	1976a	1976b	1978
Superphosphate (kg/ha)							
Nil	1.58	1.69			2.11	1.99	4.01
180-250	2.13	1.59	1.98	5.12	2.47	2.13	4.17
370-500	2.14	1.54	1.99	5.12			
Nitrolime (kg/ha)							
Nil			1.98	5.13	2.53	2.14	4.39
250			1.99	5.12 (180 kg)	2.26	2.26	3.97
Molybdenum							
Nil		1.62	1.97	5.09	2.18		4.39
Plus (MoO ₃ , 180 g/ha)		1.61	2.00	5.17	2.19		4.06
Nitrolime + Mo						2.01	3.94
Lime (t/ha)							
Nil	2.10	1.63					
1.25	1.89						
2.50	1.86	1.60	(2.0 t/ha)				

Molybdenum

Responses to molybdenum application are complicated by the large amount of molybdenum which can be present in the seed of plants grown in soils not deficient in this element. Such seed can afford protection from deficiency for one generation.

FERTILISER TRIALS IN CANTERBURY

Fertilisers on pea trials conducted in New Zealand have given rather variable results. In general, they have indicated that fertilisers stimulate vine development without giving any significant increase in pea yields (Table 1).

The major inferences that can be drawn from the series of trials summarised in Table 1 are that lime, nitrolime and molybdenum have little effect on pea yield, and a response to superphosphate occurred in only one of seven trials. The consistent nil or slight response to treatments throughout the trials supports the view that peas do not respond to applied fertiliser.

In a further three South Canterbury trials, 50 kg/ha of sulphate of ammonia was applied to peas sown after two crops of wheat and one of barley. Despite being sown after intensive cereal growing and probably nitrogen depletion, the peas showed little response to nitrogen application (Table 2).

Table 2. Yields of pea trials in South Canterbury, with and without sulphate of ammonia (tonnes/ha)

Nitrogen fertiliser	Year			
	1982	1983	1984	Average
Nil	2.15	5.83	4.14	4.04
Sulphate of ammonia 250 kg/ha	2.04	5.84	4.31	4.06

Trials comparing no fertiliser with 250 kg/ha superphosphate applied from one to four times over a period of four years similarly gave little increase in pea yields (Table 3).

At Winchmore Irrigation Research Station near Ashburton, similar small pea yield responses to applied nutrients were obtained under irrigation (Tables 4 and 5). Despite a low soil pH (5.4) there was no measurable

Table 3. Yields of pea trials in South Canterbury with different application rates of superphosphate (tonnes/ha).

Applications of superphosphate in 4 years (250 kg/ha/application)	Year			
	1982	1983	1984	Average
0	3.87	6.52	3.70	4.70
1	3.89	6.11	3.72	4.57
2	4.02	6.13	3.70	4.62
3	4.20	6.24	3.68	4.71
4	4.08	6.08	3.61	4.59

response to lime, molybdenum, superphosphate or potash.

The results of investigations carried out in mid and south Canterbury under both irrigated and dryland conditions, suggest that peas can be grown quite satisfactorily without the application of any fertiliser. The trials covered a number of different seasons, previous crops, soil types and fertility conditions, however, fertiliser responses were rare. This indicates that much of the fertiliser applied to peas, probably as an insurance against any possible nutrient deficiencies, is wasted. It is likely that such fertiliser would be better held over for use on crops more fertiliser responsive than peas, and for pasture.

Table 4. Lime and molybdenum trials under irrigation at Winchmore Research Station, Canterbury (trial sown 1978 with 250 kg/ha superphosphate basal to all treatments).

Treatment (per ha)	Yield (t/ha)
No fertiliser	4.66
250 kg lime with seed	4.03
180 g molybdenum with seed	4.63
Lime plus molybdenum with seed	4.96
2.5 t lime broadcast	4.35

Table 5. Superphosphate and potash trials at Winchmore Station, Canterbury (yields in tonnes/ha). Irrigated.

Treatment (kg/ha)	Year			
	1976	1977	1978	Average
No fertiliser	2.70	2.26	0.14	1.70
300 superphosphate	2.33	2.21	0.20	1.55
100 potassium chloride	2.59	2.40	0.16	1.72
Super plus potash	2.66	2.50	0.29	1.82
Quick test phosphate (0-150 mm)	21	13	22	19
Quick test potassium (0-150 mm)	12	7	10	10

FERTILISER EFFECT ON FOLIAGE GROWTH

For many New Zealand pea growers who use molybdenic and nitrogenous fertilisers, crop appearance can often be deceptive because these two fertilisers can cause darker, leafier, more bulky crops. The majority of New Zealand trials, however, have shown that, despite visible differences, such crops do not usually give increased yields. This has been borne out by fertiliser trials on peas in North America, where fertilisers increased vine length but not the pea to vine ratio (by weight) and therefore had no effect on pea yields.

CONCLUSION

The present study of fertiliser responses in New Zealand pea crops supports the conclusions reached

following the Lincoln College Pea Agronomy Workshop in 1979 — that is “there is a large amount of evidence that optimum pea yields can be obtained at lower cost by using less seed and fertiliser than current practices suggest, provided that the seed is healthy and weeds are controlled.”

Thus, the following recommendations can be made to growers:

- Obtain a soil test.
- Under high fertility no fertiliser application is necessary.
- Where soil fertility has been depleted, e.g. after cereals, apply 150 kg/ha superphosphate.
- Use of fertiliser as insurance should be kept to a minimum.