The response of a phalaris-based pasture to nitrogen fertilisation

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Nitrogen (N) is a critical element in pasture production, composition and quality . The balance between clover, grass and weed components can be closely related to N status. Moreover, if pastures are starved of N they decline in quality and production. An investigation into the responsiveness of a phalaris-based pasture to additional N was initiated in 1995. Yield, botanical composition and crude protein (CP) data are presented here.

Methods

Near Cootamundra in southern NSW, 3 treatments (0, 100 and 200 kg/ha of N, as Nitram, NH_4No_3) were applied to a 3 year old phalaris (Sirosa) pasture , the main other components of which were white clover, subterranean clover, cluster clover annual ryegrass, sorrel and Paterson's curse. The experimental design was a randomised complete block with three replicates. Stock were excluded and treatments were applied on 29/9/95; harvests were taken every 6-7 days starting on 3/10/95. At each harvest samples were separated into two components phalaris and other, dried at 80° C for 48 hours and weighed. For the 16/11/95 harvest the herbage was sorted into phalaris, clover, annual grass and broadleaf weed components. The two harvests presented represent times at which silage (26/10/95) or hay (16/11/95) could be cut. Nitrogen content was measured on dried herbage using the Kjeldahl method. Data were analysed using analysis of variance in Genstat 5.3.

Results and Discussion

The effect of nitrogen application on the CP (% N x 6.25) concentration in phalaris was immediate (Figure 1) in that 14 days after the treatments were imposed levels were 47% and 67% higher than the controls in the 100 and 200 kg N/ha treatments, respectively. This was followed by a declining trend in all treatments as plants matured (Figure 1). By the 2/11 there were no differences in CP content between the control and 100 kg N/ha treatment whereas as at all times up to 7/12/95 the 200 kg N/ha treatment was significantly higher than the control. Dry matter yield (DM) differences between the treatments were not apparent at the time of the simulated silage cut (26/10/85) but large shifts in botanical composition had already occurred with phalaris becoming dominant in the 200 kg N/ha treatment (Table 1). Between this time and that of the simulated hay-cut (16/11/95) there was little change in the % contribution phalaris made to the stand but large differences in DM had become evident (Table 1).

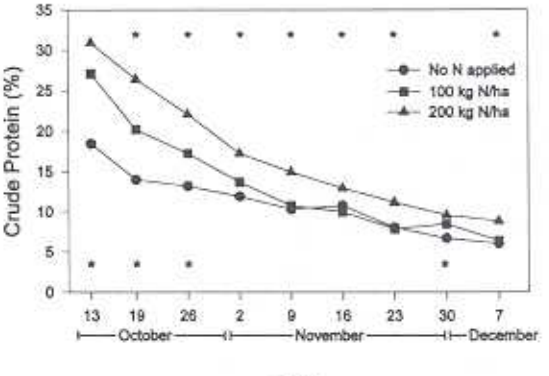

Figure 1. Phalaris protein content versus time. Asterisks represent significant differences (P<0.05) between 100 and 200 kg N/ha treatments (at top of graph) and between control and 100 kg N/ha treatments (at bottom). The control and 200 kg N/ha treatments significantly differ at all times.

Using the above results and assuming minimal direct transfer of fixed N from legume to non-legume components and 10% of plant N not harvested

Table 1. The effect of nitrogen application on yield and botanical composition of a phalaris-based pasture at two times during spring. Means followed by different letters represent significant differences across treatments at P 0.05.

Date	26/10/95		16/11/95				
Treatment (kg N/ha)	Phalaris (%)	Total DM (kg/ha)	Phalaris (%)	Clover (%)	Annual grasses (%)	Weeds (%)	Total DM (kg/ha)
0	18.4^{c}	2705	14.8^{c}	72.4^{b}	11.0	1.7	3887^{b}
100	38.4^{b}	3325	46.3^{b}	27.3^{a}	25.3	1.1	5966^{a}
200	61.5^{a}	3040	66.4^{a}	11.4^{a}	21.9	2.9	7020^{a}

(roots, corms etc.), N recovery rates (up until 16/11/95) varied from 74-99% and 61-67% for the 100 and 200 kg N/ha treatments, respectively. Note that the range in these recovery rates corresponds to assumptions of % N fixed by legumes ranging from 100-50%. The dramatic response of the pasture to N fertilisation, in terms of productivity and shift in botanical composition is not new but does point to low soil N availability at this site. Addition of N can be used to rapidly increase CP levels for silage cuts but apparently not yield whereas for later cuts yield is increased and CP increased only at high N application rates. The timing of N application may be critical in determining the level of DM and CP reponses. The effects of N addition on phalaris digestibility are currently being investigated.