Pasture composition and timing of removal – effects on wheat yield and protein level.

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Abstract

Perennial pasture species are increasingly being used in phase farming. The performance of wheat crops (sown in 1997) following lucerne, phalaris (both sown with sub clover) and sub clover (sown alone) at Ardlethan (430 mm AAR) and Junee (550 mm AAR) is reported. In addition, timing of pasture removal (either early September or early November) was varied at both sites. At Junee, there was no significant difference in yield for the three pasture types but protein levels were much lower in crops following phalaris-based pasture compared to the lucerne and sub clover pastures. Early removal of the pasture at Junee significantly increased yield but only by 0.14 $t.ha^{-1}$. At Ardlethan, early removal of pasture increased wheat grain yield by 0.44 $t.ha^{-1}$ and yield was significantly lower after a lucerne pasture. Grain protein content significantly varied between each of the pasture treatments (sub clover>lucerne>phalaris) but was unaffected by time of removal.

Key Words

Wheat, Yield, Protein, Sub Clover, Phalaris, Lucerne

Introduction

The management of the pasture phase in rotations may have a considerable impact on crop performance. The trend toward perennial pasture species, in particular, has implications for water and nitrogen availability to the crops that follow (1,2,3). Likewise, the timing and completeness of removal of the perennial pastures can have a major influence on crop performance (4). Much of this data comes from either single sites or includes only one perennial species (usually lucerne). There is a need to expand the data on the impact of pasture species and management on crop performance. For two sites in southern NSW, the effect of three pasture types on grain yield and protein level of wheat is presented.

Methods

The experiments were located in southern NSW near Ardlethan (average annual rainfall, AAR 430 mm) and Junee (AAR 525 mm) representing low and medium rainfall, respectively. Soils at both sites were red earths but the Junee site has a sandier A horizon and was freer draining. Details of pasture treatments are available in Dear *et al.* (5). In brief, plots were sown to either *lucerne* (*Medicago sativa* L. cv. Aquarius) with subclover (*Trifolium subterraneum* L.), *phalaris* (*Phalaris aquatica* L. cv. Sirolan) with subclover or *subclover* alone in Autumn 1994. At the Ardlethan site the plots were re-sown in 1995 due to poor establishment in the 1994/5 drought. The sub clover in all treatments consisted of a mixture of 3 cultivars, Dalkeith, Seaton Park and Goulburn, sown in equal proportion by weight. The *subclover* treatment was kept as weed free as possible by the use of herbicides throughout the pasture phase. The plots were arranged in a randomised complete block design with 4 replicates. Each main plot was 18 m long x 10 m wide.

In the last year of pasture, the *sub clover* and *lucerne* treatments were sprayed to control grass weeds. All treatments were split in the final year of pasture for two times of removal, Junee ("early" 3/9/1997 - or "late" 7/11/1997) and Ardlethan ("early" 28/8/1997 - or "late" 6/11/1997).

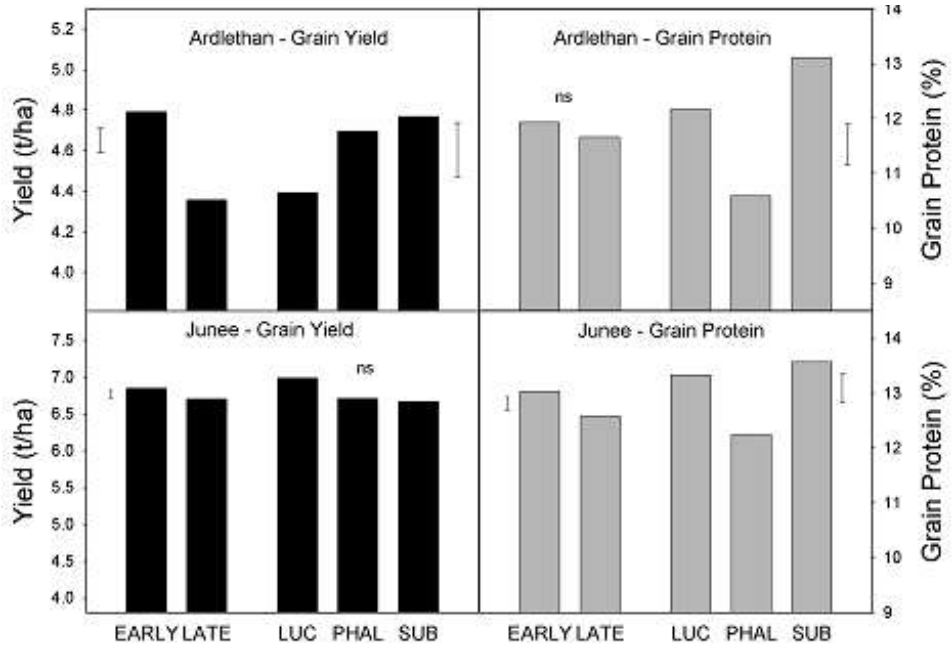
Wheat (cv. Janz) was sown on 15th May at both Ardlethan (sowing rate 62 kg/ha with 150 kg/ha of MAP) and Junee (sowing rate, 78 kg/ha with 188 kg/ha MAP). Wheat was harvested on 26th November at Ardlethan and 13 December at Junee using a small plot header, the grain weighed and a sample of grain taken for protein analysis. The experiment was analysed with pasture treatments as main plots split for time of removal using Genstat Version 4.1.

Results

Results are presented in Figure 1. At the Junee site, there was no significant difference in wheat yield after the three pasture types. In contrast, protein levels were much lower in crops following *phalaris* treatment compared to the *lucerne* and *sub clover* treatments. Early removal of the pasture at Junee significantly increased yield but by only 0.14 $t.ha^{-1}$.

At the drier Ardlethan site, early removal of pasture increased wheat grain yield by 0.44 t/ha averaged over all pasture treatments and yield was significantly lower after a lucerne pasture. Protein levels significantly varied between each of the pasture treatments (*sub clover>lucerne>phalaris*) but was unaffected by time of removal. For both sites and for yield and protein, there were no significant interactions between pasture type and time of removal.

Figure 1: Effect pasture type and time of removal on wheat grain yield and protein content at Ardlethan and Junee in 1998. Bars represent least significant differences for time of removal (left) or pasture type (right) at P=0.05.



Conclusion

- Early removal of pasture whether annual (*sub clover*) or perennial (*lucerne* or *phalaris*) may increase yield and protein content but responses are site dependent.
- While wheat yield after *phalaris* was not significantly lower than for the *sub clover* treatment at both sites, protein content was. Wheat protein levels after phalaris were lower at both sites than after lucerne. This may reflect the lower levels of N fixation in the *phalaris* plots over the life of the pasture phase, resulting in a lower soil N concentration.
- The lucerne treatment depressed grain yield and protein content at the drier site only. This indicates the overriding effect of lucerne on soil moisture independent of time of removal.

Acknowledgement

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