Lucerne persistence in Central New South Wales

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Abstract. *Field experiments were carried out at two sites in Central-West New South Wales between 2002 and 2008 to measure changes in lucerne plant density. A comparison of the mortality of individual varieties as well the mortality rates of dormancy class groups was made. Previous studies have shown that dormant and semi-dormant varieties have improved persistence over winter-active and highly-winter active varieties. However, results from both sites did not reflect this. The figures show that there was no discernable difference in plant persistence as a result of varying dormancy. The results reflect the over-riding dominance of dry seasonal conditions during the trial period (and associated intensive grazing pressure) on the persistence of lucerne.*

Introduction

In the Central-West region of New South Wales (NSW), the incorporation of lucerne-based pastures into local crop systems has met with mixed success. Farmers are generally aware of the potential role of lucerne in building nitrogen (N) fertility, reducing the weed seed-bank, reducing cereal disease inoculum levels (particularly *Fusarium* crown rot), and the high quality of lucerne forage for livestock (particularly in the warmer months when quality green feed is normally in short supply). Promotion of rotational grazing systems to reduce the rate of decline of lucerne stands has generally been adopted.

However, recent successive years of drought and below average rainfall have resulted in prolonged periods of plant-stress combined with intensive grazing pressure. Differences between lucerne varieties in persistence have been tested over several years under commercial paddock conditions; data from these trials are reported here.

Methods

The site at 'Normandee' Tomingley was sown as a randomised complete block with three reps and analysed using spatial analysis. The lucerne experiment located at 'Back Chippendale' Gilgandra was sown as a row-column design with three reps. Plot dimensions were 12 x 1.8 m with consequent plot areas trimming to 18 m^2 per plot. There were eight rows spaced 22.5 cm apart. Additional site details are shown in Table 1.

Climate

Annual rainfall during the trial period was highly variable at both sites. Crucial growth months of August, September, October and November at both sites frequently recorded nil rainfall during the trial period. During the period of the trials: i) 80 per cent of the months were below long term average monthly rainfall (ie. 28 of the 35 months) at Tomingley, and ii) 69 per cent of the months were below long term average monthly rainfall (ie. 11 of the last 35 months) at the Gilgandra site.

Table 1. Characteristics of the trial sites

	'Normandee' Tomingley	'Back Chippendale' Gilgandra
Date sown	7 July 2002	23 June 2005
Sowing rate (kg/ha)	3	4
Soil type	sandy clay loam	clay loam
Depth of subsoil moisture at sowing (cm)	95	105
Fertiliser and rate	Starterphos 75 kg/ha	Single super 150 kg/ha
Herbicide	Treflan® (PE)	1.7 L/ha Triflur® X (PE)
Insecticide	Apron® treated seed	Apron® treated seed 28 July – 50 mL/ha Fastac® 100

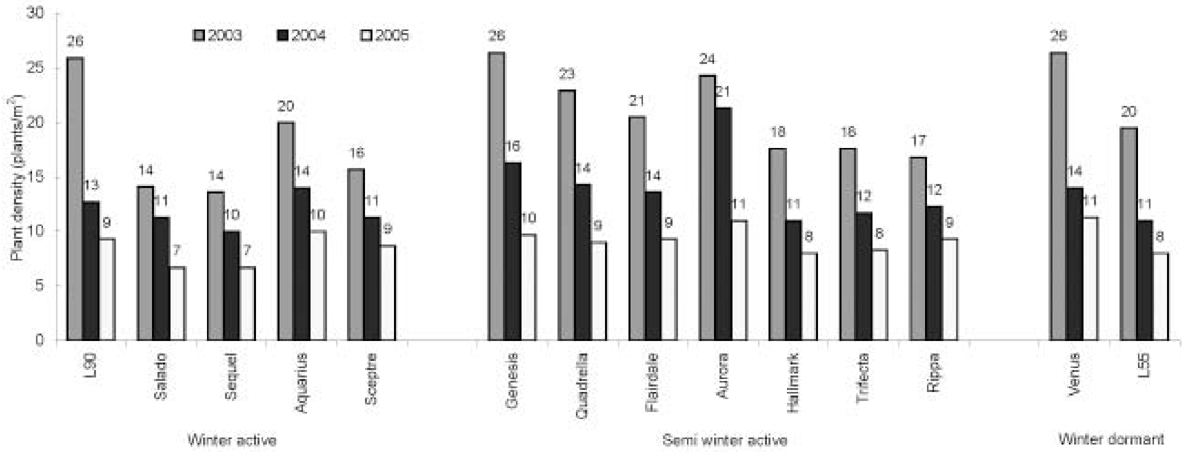

Figure 1. Change in lucerne density at Normandee', Tomingley (2003–2005).

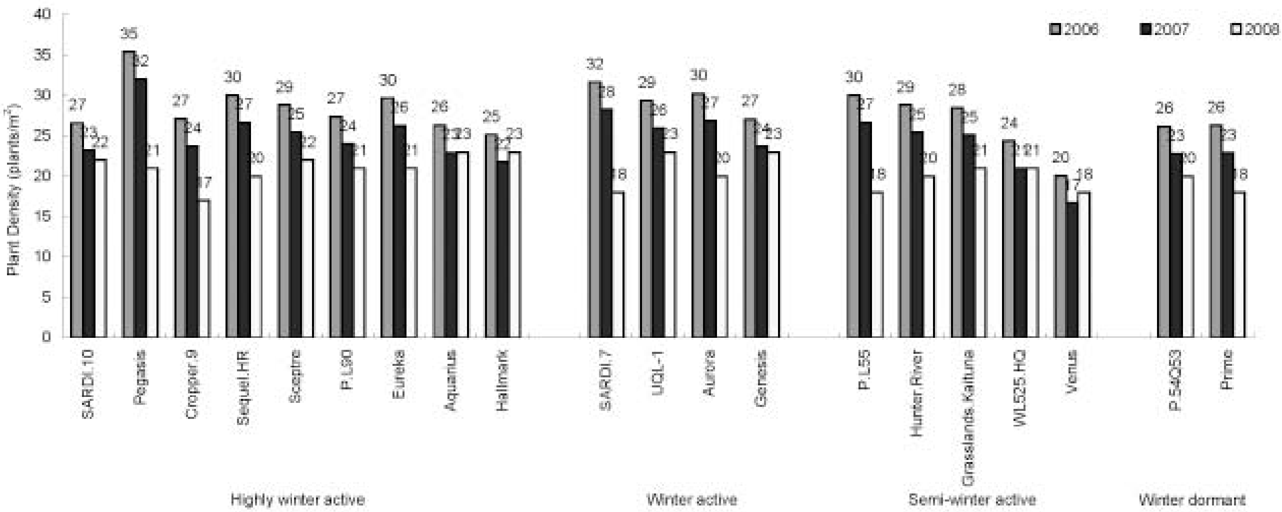

Figure 2. Change in lucerne density 'Back Chippendale', Gilgandra (2006–2008)

Agronomic management

The sites were located in commercial lucerne paddocks. Both sites were fallowed after cereal crops were harvested in the previous year. Weed control was undertaken with the use of herbicides. At 'Normandee', a single cultivation was carried out prior to planting. After planting, no livestock grazed the sites before the initial assessment; the sites were grazed under grazing regimes typical of each property. In general, at both sites the grazing management adopted was based on a rotational grazing.

Sampling procedures

Plant density counts were made in February/March of each year by placing a 40 x 40 cm quadrat at right angles to the drill rows, excluding the outside rows. Quadrats were placed in a zig-zag pattern across the plot at six positions and the plants within the quadrat were counted. These were converted to numbers of plants per square metre for each plot.

Results and discussion

In the analysis, lucerne varieties are grouped according to dormancy class. Figures 1 and 2 illustrate the changes in lucerne density over three successive seasons at the two sites.

The data show no obvious difference in lucerne persistence between any of the dormancy classes in any one year. Lucerne plant density declined at both sites over time, and this appeared to be associated with seasonal conditions and associated grazing pressure. Seasonal conditions throughout both experiments were characterised by extended periods of below average rainfall. As the duration of below average rainfall continued, there was an increase in livestock feed demand, grazing intensity and duration of grazing.

The rate of decline in plant density (grouped in dormancy classes) is shown in Figure 3. Note that only the 'Back Chippendale' site included winter-dormant varieties.

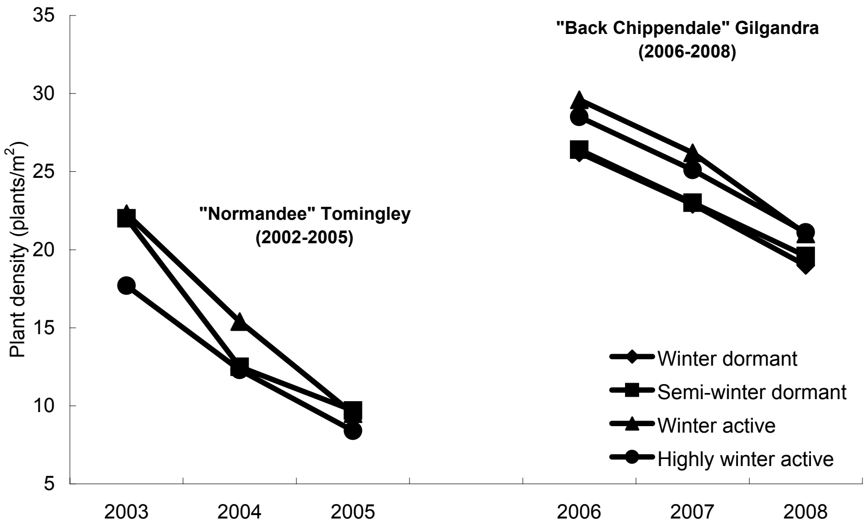

Figure 3. Winter activity and change in lucerne density

At both Tomingley and Gilgandra sites the winter-active and highly winter-active varieties declined at similar rates with average populations gradually becoming similar by the end of the third summer.

Conclusions

As a general 'rule of thumb', dormant and semi-dormant varieties have better persistence compared with winter and highly winter-active varieties. However, in contrast to previous studies (Smith *et al.* 1989; Brummer and Bouton 1991), the present trials showed no differences in persistence between dormancy groups. Lucerne persistence is generally influenced by the complex interactions between seasonal conditions, management, pests and diseases. The former two factors were the most obvious contributing factors in the present trials, and may be responsible for the lack of apparent trends between dormancy groups. If climate change means similar seasonal conditions become more frequent, these factors will be more critical.

The present data show there was no disadvantage to persistence in selecting varieties with greater winter-activity. This supports the local district practice of sowing mainly winter-active and highly winter-active varieties. How different the persistence between different dormancy classes would be under better seasonal conditions is unknown. These data support the need for ongoing work; future research will include measuring population dynamics and consequent effects on dry matter production.

Acknowledgements

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