Performance of different lucerne dormancy classes under dry-land conditions

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Abstract. *Preliminary results from a Tamworth dry-land field trial evaluating 21 lucerne cultivars over two years indicates that dormancy class 5 (semi-winter dormant) cultivars have the highest herbage yield and best economic performance. However, additional measurements (for herbage yield and final statistical analysis) in the coming years may change this result, dependent on climatic conditions.*

Introduction

Lucerne is an important part of farming systems on the Northern Slopes of New South Wales (NSW) in that it provides a 'disease-break' and improvement of soil fertility after a cropping phase, and provides quality grazing for livestock in the mixed farming systems typical of the region (Crocker and Collett 2003; Collett and McGufficke 2005; Blair *et al.* 2006). Highly winter-active lines (dormancy classes 8 or above) have been previously shown to perform well under dry-land short-term rotation conditions in southern Queensland (Lloyd *et al.* 2001). A trial was established near Tamworth in June 2006 to investigate cultivar performance under dry-land conditions in northern NSW; this work is expected to continue for four years. This paper includes preliminary data of herbage yield (kg dry matter (DM)/ha) and economic performance on the data to date.

Methods

Agronomy methods

A dry-land lucerne trial comprised of 21 cultivars (20 commercially available, one experimental line) was sown at Loomberah (south-east of Tamworth) in northern NSW.

The soil type is a red Chromosol. The trial was sown at a seeding rate of 4 kg/ha of each variety in plot sizes 2 m x 5 m. The trial was randomised with three replicates. Fertiliser was pre-applied at the rate of 70 kg/ha of anhydrous ammonia (due to barley being undersown with lucerne in the rest of the paddock in 2006), however, no additional fertiliser was applied at sowing. Other inputs were pre-sowing herbicides (glyphosate 0.5 L/ha and trifluralin 0.8 L/ha), plus post-emergent herbicides (2,4-DB 2.5 L/ha, haloxyfop-R 100 ml/ha with uptake oil 0.5 L/ha) and an insecticide (omethoate 100 ml/ha). Since establishment, herbage dry matter (DM) cuts have been taken on five occasions; 16 January 2007, 30 March 2007, 13 September 2007, 4 January 2008 and 19 February 2008. One record of basal frequency to determine the number of lucerne plant crowns in each plot was also taken on 16 January 2007. The trial has been monitored for two years and data recorded to date are included in this paper. However, this is only an interim report. The trial will be continued to obtain more conclusive results. The data presented in this paper are the arithmetic means (DM) of three replicates for all cuts, except the third and fifth cuts where only one replicate was cut. On completion of the trial, the data will be statistically analysed and until such time, no firm conclusions can be drawn, merely suggestions on cultivar performance. To evaluate performance differences, the dormancy scale was used to group cultivars. This system describes cultivars in the following manner: class 4 is winter-dormant, class 5 is semi-winter dormant, classes 6 and 7 are winter-active and classes 8, 9 and 10 are highly winter-active.

Economic analysis methods

Gross margins (income less variable costs) are used to evaluate dormancy class performance differences by monitoring costs and returns on a per hectare basis. Given the preliminary nature of the data from the Loomberah trial data, the economic comparisons in this case are made between dormancy classes, rather than particular cultivars.

Income was calculated using cumulative DM data over the two year period. Income was valued as hay, so measured DM weights were used to estimate hay production. Hay was assumed to be valued at $9.00 per 25 kg bale. Contract haymaking rates were assumed, which included mowing at $90/hour, raking at $30/hour/raking (three rakings were assumed for each cut) and baling at $1.30/bale. One variety was excluded from the economic results (LIP06/0005) since it is an experimental line and its dormancy rating has not been finalised.

Fertiliser and herbicide applications were costed at commercial rates; all costs and prices used were GST-exclusive. Establishment costs were $168.57/ha excluding the price of seed. The seed for each variety was priced at commercial rates.

Results and discussion

There was a high degree of variability in DM performance across harvest occasions. Comparison of DM cuts suggests a different lucerne cultivar as highest yielding on each occasion; over the five cuts this varied from L90, UQL-1, PL56, WL342HQMF and SARDI 7. For example, one cultivar was the lowest yielding at the first two occasions only to become the highest yielding at the third occasion. Overall, DM production was closely clustered in all occasions except the third occasion (September 2007) when large differences were evident in cultivar performance. The cumulative results (Table 1) of the five DM occasions showed the highest DM production was recorded from the cultivar PL56 at 4,875 kg DM/ha, followed by L90 at 4,569 kg DM/ha. In comparison, the lowest total DM was recorded from 57Q75 at 3,579 kg DM/ha or 73 per cent of PL56.

When the cultivars were grouped according to their dormancy class (Figure 1), it became apparent that cultivars with a dormancy rating of 5 may have produced more DM at this site over the first two years of the trial. However, this is likely to have been influenced by adverse climatic conditions experienced during this period, and in particular, limited rainfall over the winter of 2007 that precluded a DM cut during the winter months.

Gross margin results were summarised by dormancy class (Figure 2). Dormancy class 5 returned the highest cumulative gross margin as of February 2008. However, for all dormancy classes, this included 2 occasions (in September 2007 and February 2008) which had only one replicate of three cut. Additional measurements (for herbage yield) in the coming years, climatic conditions and final statistical analysis may change this interpretation.

Conclusions

Cultivars with a dormancy rating of 5 appear to have

Table 1. The herbage yield performance (kg DM/ha) of lucerne cultivars under dry-land conditions at Loomberah, Tamworth during 2006–2008. Data are the mean yield of three replicates (except for cuts taken on 13 September 2007 and 19 February 2008 for which only one replicate was cut) and have not been statistically analysed

Cultivar	Date of dry matter cut					Total
	16/01/2007	30/03/2007	13/09/2007	4/01/2008	19/02/2008	
57Q75	491	704	914	722	748	3,579
Aquarius	492	770	1,193	836	1,016	4,307
Aurora	527	763	773	847	728	3,638
Cropper Nine	614	773	1,278	941	824	4,430
Genesis	499	698	964	875	628	3,665
Icon	485	798	1,496	801	692	4,272
Kaituna	494	729	1,191	1,040	992	4,446
L90	632	858	1,222	973	884	4,569
LIP06/0005	495	754	1,016	861	832	3,958
MultiFoli8	593	869	1,112	998	904	4,476
Pegasis	552	759	1,022	1,016	864	4,213
PL56	504	748	1,596	979	1,048	4,875
SARDI-10	537	790	978	939	912	4,157
SARDI-7	560	855	782	939	1,140	4,276
Sequel HR	472	716	1,153	796	908	4,045
Silverado	548	816	1,023	904	612	3,903
Stamina GT6	434	810	881	897	908	3,929
UQL-1	501	889	1,018	979	904	4,291
Venus	481	770	897	876	1,064	4,088
WL342HQMF	374	565	845	1,061	952	3,797
WL525HQ	526	792	928	919	744	3,909

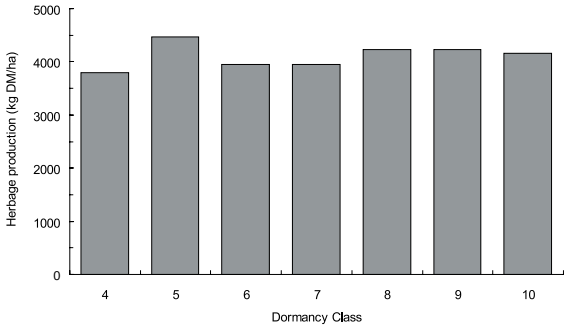

Figure 1. Average herbage DM production (kg/ha) of lucerne cultivars grouped into dormancy classes.

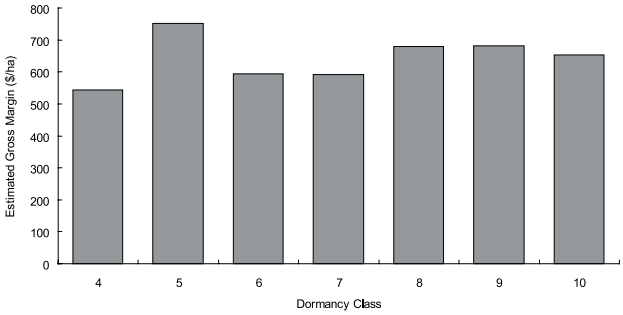

Figure 2. Average gross margins of dormancy classes of lucerne varieties from preliminary field data from Loomberah, Tamworth.

been the most productive over the first two years of the trial; this implies higher gross margins for the cultivars in this group. However, the performance of dormancy class 5 was unexpectedly high, dormancy classes 8 and 9 would be expected to produce higher yields in the first years of stand life. As indicated previously, this is likely to have been influenced by the dry winter conditions experienced during 2007 which did not allow sufficient growth for a DM cut to be taken. Given the early stage of this trial, recommendations cannot be made from the data collected so far, and further measurements of yield and persistence are required before any firm conclusions can be drawn.

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