Main Factors Determining the Dry Matter Production of Dryland Lucerne

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Pastures in the Overberg area of the Western Cape are mainly legume based. Lucerne has a dual role in the Overberg and serves not only as a pasture, but also as a rotation crop for grain (barley and wheat) production. Lucerne is usually planted after five cropping years and then grazed, mainly with sheep, for five years or longer. Frequent cropping prohibits the division of land into small paddocks and the lucerne pastures are, therefore, often submitted to continuous heavy grazing. Grazing resistant and persistent lucerne cultivars must therefore be identified for this region in grazed trials using Merino type sheep, the main grazing animal in this area.

Studies in Australia clearly showed that, although winter activity was positively related to yield, it was negatively related to persistence when a diverse set of natural germplasm was evaluated. Due to the continuous input of new commercial cultivars in South Africa for both hay and grazing purposes, the evaluation of new cultivars is an ongoing process. Two trials have now been concluded and will be reported. Research was conducted consecutively over eight years and involved the evaluation of two sets of lucerne cultivars for yield and persistence in the Overberg under local grazing conditions.

The data was used to determine which of the relative yield of a range of cultivars.

In Trial 1 eleven lucerne cultivars were evaluated (Table 1) and in Trial 2 twenty three cultivars/lines (Table 2). The cultivars were compared to SA Standard under dryland conditions and heavy continuous grazing with Merino sheep at the Roodebloem experiment farm of Overberg Agri in the Caledon district of the Overberg. Trial 1 was conducted from 2001/2002 to 2005/2006 and Trial 2 from 2005/2006 to 2008/2009.The cultivars, which were evaluated, varied in winter dormancy (Tables 1 and 2).

PAN 4956, which is a class nine and hay only cultivar and very sensitive for grazing, was included as one of the controls in both trials.

PAN 4956, not recommended for grazing under these conditions, was used as a control to measure the severity of the grazing treatment. The third cultivar of special interest, SA Select, is a local cultivar and was included in Trial 2. SA Select was selected from SA Standard. The other cultivars/lines in both trials are imported and intended for grazing and/or hay production by farmers in the area.

The trials were fenced off in areas of approximately two hectares and continuously grazed at a stocking rate of 10 Merino sheep.ha-1. Grazing of the two trials started during October 2001 (Trial 1) and October 2005 (Trial 2) respectively. The sheep were removed when serious feed shortages occurred, but were placed back on the trials as soon as sufficient grazing was available. The cover or stand density of each lucerne cultivar was determined at regular intervals. Yield was determined by cutting samples with sheep shears to ground level every six to eight weeks in- and outside round randomly placed welded galvanised wire mesh exclosure cages.

A relationship between lucerne cover and annual lucerne yield was developed over all the data of the two trials. The relationship between annual lucerne yield and lucerne cover (%) is shown in Figure 1

The yield in the two trials differed and the yield in Trial 1 was much higher than in Trial 2 probably mainly due to the poor and waterlogged soil of Trial 2. The important positive relationship between lucerne cover and yield in both Trials 1 and 2 respectively is obvious. Differences in the yield of the cultivars within a particular trial were clearly mainly attributable to differences in lucerne stand between the cultivars and years.

The relative lucerne cover was also related to lucerne dormancy class (Figure2). The lower relative lucerne cover in Trial 2 than Trial 1 and the decline in lucerne cover with increased winter activity beyond class six are obvious. The lower lucerne cover in Trial 2 than Trial 1 may again be attributed to the poor site of Trial 2. Within the two sites and between the respective cultivars differences in lucerne cover were negatively related to dormancy class. Dormancy class, due to its influence on lucerne cover, is therefore the most important factor determining lucerne yield (Figure 1) at a particular site. The influence of trial site and trial age on the average yield of lucerne in Trials 1 and 2 is shown in Figure 3.

From Figure 3 it is again clear that the average lucerne yield was higher in Trial 1 than Trial 2. At both sites the lucerne yield, however, declined over time, resulting in the yield being much lower in the last than the first year. The results confirmed the impact of lucerne stand density on lucerne yield and that stand density declined with pasture age. The decline in lucerne yield, due to a decline in lucerne cover, is strongly modulated by the winter dormancy of the cultivar. More dormant cultivars displayed a more stable lucerne cover and long term yield. In both Trials 1 and 2 the persistence of the class two to six cultivars therefore tended to be highest. The persistence of class seven and eight cultivars varied, while the class nine cultivars were not persistent. Although the more dormant cultivars are slower to establish, they should generally be used in systems with longer pasture phases (>3 years). Most of the more winter active cultivars in the two trials are clearly better suited for systems with shorter pasture phases.

The more winter dormant cultivars also tended to be relatively more productive during the drier and warmer seasons, while the more winter active cultivars were more productive during the cool and moist seasons. The yield of all the cultivars was lower in Trial 2 than Trial 1, due to the poor lucerne stands in Trial 2.

In both trials the average lucerne yield declined over time, which is common to all lucerne stands and was related to the decline in lucerne stands over time. Lucerne cultivars should be able to adapt to as wide a range of sites as possible, as large variations occur in soil conditions even within a particular paddock. The results of both trials are, therefore, relevant and highly applicable.

Table 1. Eleven lucerne cultivars evaluated in Trial 1 under dryland at Roodebloem, Caledon

Cultivar	Dormancy Class
PAN4956	9
Aquarius	8
Aurora	7
Genesis	7
PAN4764	7
WL414	7
SA Standard	6
PAN4546	5
WL320	5
Alfagraze	2
Meteor	2

Table 2. Twenty three lucerne cultivars in Trial 2 evaluated under dryland at Roodebloem, Caledon

Cultivar	Dormancy Class
PAN 4956	9
Super Cuf	9
Hallmark	8
Super Siriver	8
KKS 9595	7 or 8
Venus	7
WL 414	7
Aurora	7
KKS 3864	7
PAN 4764	7
Sardie 7	7
Magna 601	6
SA Select	6
SA Standard	6
Super Aurora	6
WL357	5
WL 320	5
PAN 4546	5
Alfagraze	2
Meteor	2
AC Grazeland	2
CW 86085	?
CW 5557	?

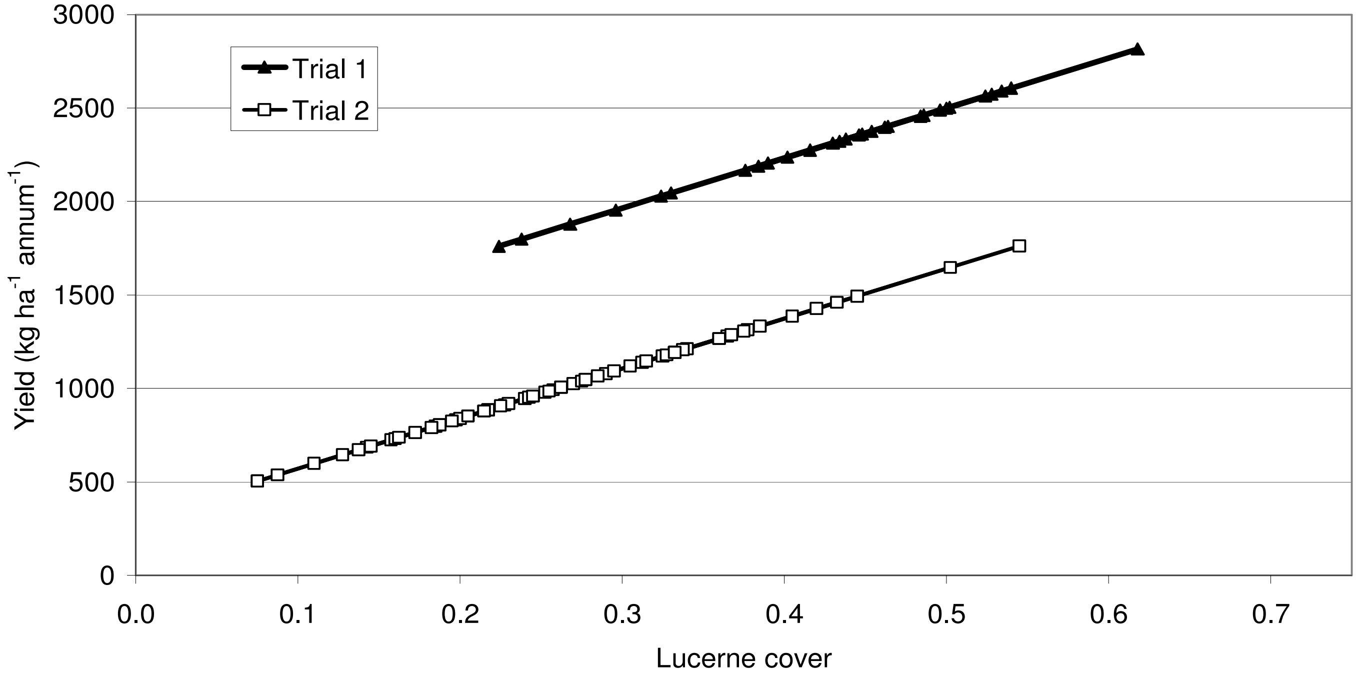

Figure 1. Influence of lucerne cover on the average annual lucerne yield in two trials.

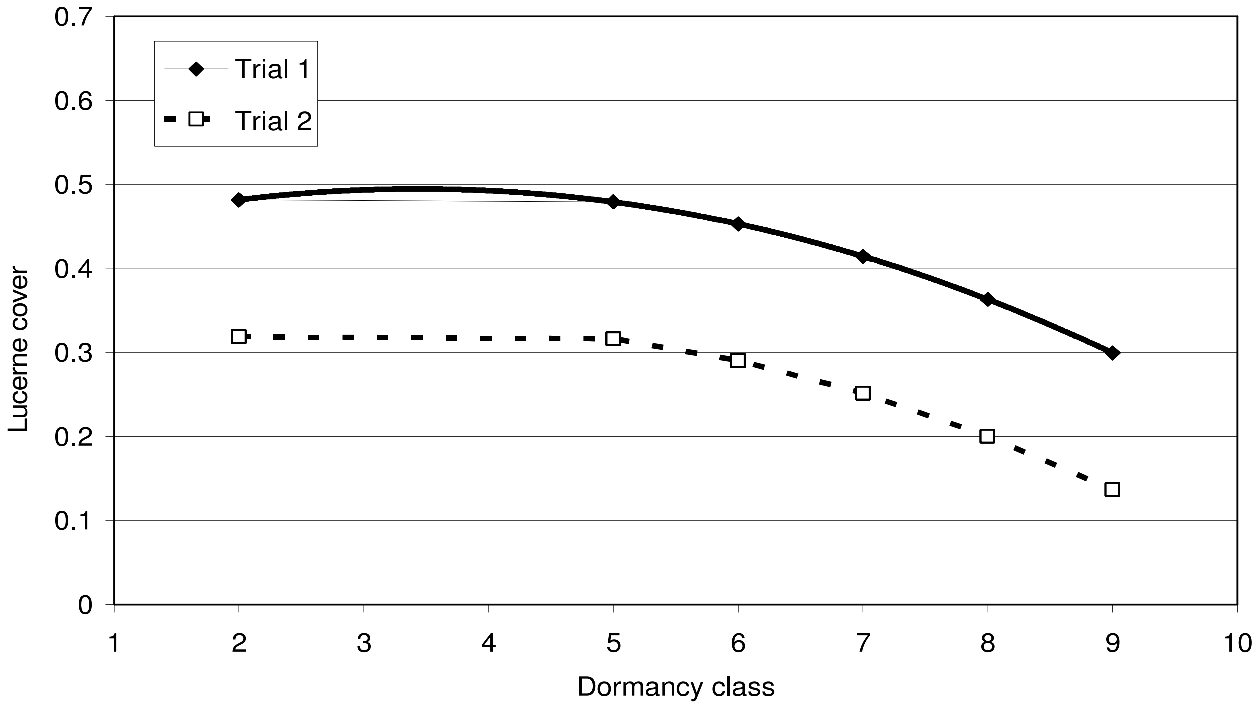

Figure 2. Influence of lucerne winter dormancy on the average lucerne cover in two trials.