DEFERRED GRAZING DURING SUMMER INCREASES WHITE CLOVER CONTENT IN NEW ZEALAND DAIRY PASTURES

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ABSTRACT
NZ dairy pastures under rotational grazing (grazing interval 25 to 30 days) are often grazed down to low residual herbage masses (<1000 kg DM/ha) over summer resulting in white clover death. Deferred grazing, the practice of holding over pasture in situ over summer, was shown to promote survival of clover growing points and increase clover seedling density in mixed perennial ryegrass / white clover dairy pastures. As a result clover content (% of total dry matter (DM)) was increased, particularly in the first year of the trial when summer climatic conditions were unfavourable for clover growth. Additional pasture cover built up in plots deferred for 100 days from late November to March resulted in significantly higher soil moistures and lower soil surface temperatures so providing more favourable growing conditions for clover. Deferred grazing also resulted in small increases in total herbage accumulation but had little effect on ryegrass tiller density.

KEYWORDS
Dairy pasture, deferred gazing, white clover, growing point, seedling density

INTRODUCTION

White clover persists in NZ dairy pastures mainly through vegetative growth of stolons (Hay, 1983). However stolon growth and survival may be limited by low soil moisture and high soil temperatures (Archer and Robinson, 1989). This may be a problem particularly in intensive dairying systems where the high demand for feed combined with lower pasture growth rates over summer often results in pastures being grazed down to low residual herbage masses (< 1000 kg DM/ha), thus exposing the stolon growing points. Baars and Waller (1979) suggested “allowing pasture to become reasonably long in combination with a lax defoliation assists in reducing the detrimental effect of high soil temperatures on pasture production.” The aim of this trial was to determine what effect deferred grazing and the consequent build up of herbage mass had on soil moisture and temperature and therefore on survival of white clover over summer. Deferring selected paddocks from grazing for up to 120 days over summer (December to March) is already used by some dairy farmers to promote clover survival in coastal regions of NZ. The trial was scheduled to run over three dairy seasons (1994/95 to 1996/97) with this paper reporting results from the first two seasons

MATERIALS AND METHODS

Plots (5 x 5 m) were established within a paddock which was divided into quarters at DRC, Hamilton, New Zealand in November 1994. Four plots were grazed at “normal” intervals (25 days), four plots were deferred for 50 days from late November and then grazed every 25 days, four plots were deferred for 75 days and four plots deferred for 100 days. From March to November all plots were grazed together following the standard grazing interval at DRC. In November 1995 the plots were reestablished in a new paddock and the trial repeated.

Soil temperature was monitored daily using dataloggers (Escort Monitoring System) and soil moisture measured weekly using a Time Domain Reflectometer (TRASE system 1) in the 25 and 100 day areas from November to May. Pre- and post-grazing herbage mass was measured in all plots by cutting 0.25m2 quadrats to ground level, washing, oven drying (100°C 24 h) and weighing the herbage. Botanical composition was determined in all plots before each grazing by cutting herbage samples to ground level and sorting, drying and weighing a subsample of herbage. Pre-grazing counts (three 5 x 20 cm frames per plot) of clover growing point density, clover seedling density and perennial ryegrass tiller density were also made. During December to April tagged clover stolons (25 per plot) were examined weekly for death of the growing points.

RESULTS AND DISCUSSION

Deferring pasture for 100 days over summer resulted in lower soil temperatures and higher soil moistures than under normally grazed pasture (Table 1), and maintained daily maximum soil temperature under 30°C (the critical level for stolon death at low soil moisture), particularly in 1994/95 when air temperatures were higher and rainfall lower than in 1995/96. Deferring pasture increased clover content in both seasons (Fig. 1) although overall clover content was higher during 1995/96 due to more favourable climatic conditions. By February 1995 clover content in the 100 day deferred pasture was double that in the 25 day pasture while clover contents in the 50 and 75 day deferred pastures were also slightly higher. From March 1995 onward all pastures were on the same grazing interval but differences in clover content were still evident until late September 1995. During 1995/96 the increase in clover content as a result of deferred grazing was not as great as during the previous season. The greater impact of deferred grazing on clover content in 1994/95 was probably due to the less favourable growing conditions in that season. Throughout most of the 1995/96 season there was no significant difference in clover content between the 50 day deferred and 25 day pastures with only the 75 and 100 day deferred pastures having significantly greater clover contents (Fig. 1). In late September 1996 however all three deferred treatments had significantly higher clover contents than the 25 day grazed pastures which was due to a combination of the higher proportion of clover stolon growing tips surviving the summer (Table 1) and a higher clover seedling density under the deferred treatments in March and April.

Differences in clover content were reflected by clover growing point densities which were at least 45% higher in 100 day deferred plots than the 25 day plots (Table 1). The higher clover contents in the deferred pastures were due to improved survival of growing points over the summer months and the increase in clover seedling density as a result of clover plants being ungrazed during the main flowering period (December) presumably giving rise to a greater yield of mature seed (Table 1). There were no consistent differences in perennial ryegrass tiller density between any of the treatments.

Previous trials showed increased ryegrass tiller density in deferred pasture due to increased reseeding (McCallum et al., 1991) since in these trials deferred pasture was removed from the grazing rotation during the ryegrass reproductive phase (mid-October to mid-November) and not grazed until after the seed was mature (mid-January). McCallum et al. (1991), however reported no effect of deferred grazing on the clover component although Watson et al., (1996) reported 49% increases in clover growing point density in late summer in pastures which had been deferred from October to mid-February.

Results from the 1994/95 season showed increases in total herbage accumulation under deferred grazing both during (late November to March) and after (March to late September) the deferred period (Table

1). This was due to greater growth of pasture over summer on deferred plots in contrast to the slower regrowth of pasture in the 25 day plots which were regularly grazed down to low residuals (1000 kg DM/ha) and the increased clover yield. There was only a small non-significant increase in herbage accumulation under deferred grazing during 1995/96 (late November to March), probably due to climatic conditions being more favourable for pasture growth resulting in higher pre-grazing and residual herbage mass on all treatments. However, after the deferred period herbage accumulation was significantly higher in all the deferred treatments than in the 25 day plots. McCallum et al., (1991) also reported increased growth on the deferred treatment over the first winter, spring and summer after deferred grazing and much larger increases in the subsequent autumn and winter due mainly to increased ryegrass tiller density.

Deferring pasture over summer resulted in increased clover content and total herbage accumulation both of which have potential benefit to NZ farmers for increasing milk production in late lactation. In addition deferred grazing eliminates the cost of having to make pasture silage or hay and offers farmers the flexibility of being able to break-feed part or all of a deferred paddock at any time when feed becomes limited on the farm (Mountfort, 1996).

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Table 1

Effect of deferred grazing on soil moisture and temperature, clover growing points, and herbage accumulation.

Deferred treatment	25 day	50 day	75 day	100 day	SEM
1994/95					
Pasture cover at grazing (kg DM/ha)	2150	3380	5600	7050	445[a]
Mean soil moisture (Dec to Apr) (%)	17.3	ND	ND	21.6	0.9[b]
Mean 2cm soil temp. (Dec to Apr) (°C)	22.6	ND	ND	20.7	0.6[b]
Max 2cm soil temp. (Dec to Apr) (°C)	36.6	ND	ND	28.8	1.6[b]
Clover growing point density (Mar) (per m2)	690	1030	1425	1730	135[a]
% survival stolon growing tips (Apr)	48	63	72	78	4[a]
Herbage accumulation during deferred period (kg DM/ha)	5180	5490	5740	6080	410[a]
Herbage accumulation after deferred period (kg DM/ha)	4330	4720	5110	5240	320[a]
1995/96					
Pasture cover at grazing (kg DM/ha)	2690	3855	6200	6940	385[a]
Mean soil moisture (Dec to Apr) (%)	21.4	ND	ND	22.1	0.7[b]
Mean 2cm soil temp. (Dec to Apr) (°C)	21.8	ND	ND	20.6	0.5[b]
Max 2cm soil temp. (Dec to Apr) (°C)	35.1	ND	ND	29.2	1.8[b]
Clover growing point density (Mar) (per m^2)	1050	1140	1625	2015	160[a]
% survival stolon growing tips (Apr)	66	73	84	85	4a
Herbage accumulation during deferred period (kg DM/ha)	5990	6070	6040	6180	440[a]
Herbage accumulation after deferred period (kg DM/ha)	4240	4960	5340	4980	450[a]

a Standard error of the mean (4 observations per mean) ND Not determined
b Standard error of the mean (121 observations per mean)

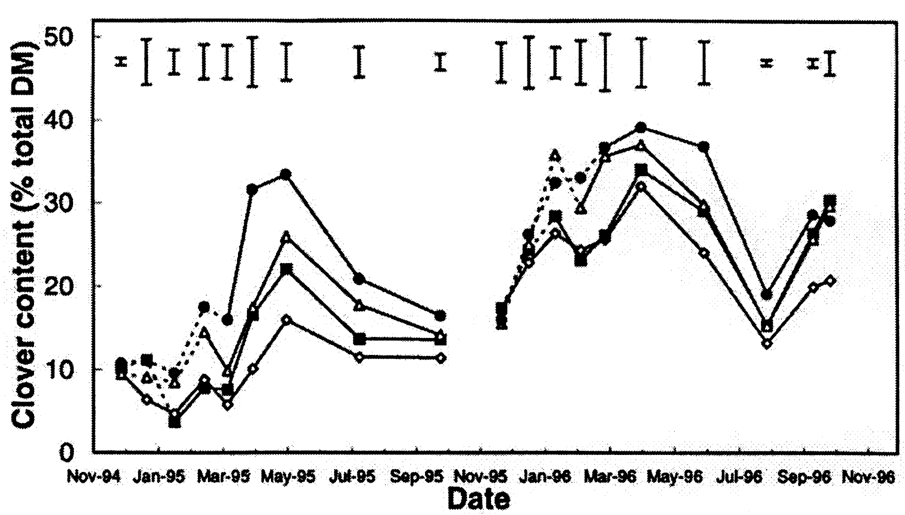

Figure 1
Clover content (% total dry matter) in pastures grazed every 25 days ( ) or deferred for 50 ( ), 75 (D) or 100 ( ) days over summer 1994-95 and 1995-96. Following the deferred period (- - -) pastures were grazed following the normal farm rotation ( ). Error bars show two SEDs.