YIELD AND NUTRITIVE QUALITY OF WINTER REGROWTH OF NUI AND MATUA/WHITE CLOVER SWARDS

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ABSTRACT

Pasture yield and *in vitro* digestibilities (IVD) were measured for Matua/white clover and Nui/white clover swards growing in Canterbury. Samples were collected over a period of regrowth from defoliation in May until September, 1981.

Overall total herbage accumulation did not differ significantly between the two swards. However there were big differences between the proportions of green grass, clover and dead material at all cutting times. Two weeks after defoliation to 1.5 cm, Nui was contributing 31.4% of the total herbage mass while Matua contributed only 3.8%. These proportions increased to 65.1% and 64.1% respectively at week 20. Clover proportion in the Nui sward was higher than in the Matua sward throughout the collection period.

Mean *in vitro* digestibility (IVD) values for the samples collected during the period of regrowth were 60.9% for the Nui sward but were significantly ($P < 0.01$) lower for the Matua pasture (39.5%). Total volatile fatty acids from the *in vitro* fermentation of each sample were significantly correlated with IVD of each sward (Matua sward $r^2 = 0.99$; Nui sward $r^2 = 0.87$).

Additional Key Words: *in vitro digestibility, volatile fatty acids.*

INTRODUCTION

Prairie grass 'Grasslands Matua' (*Bromus willdenowii* Kunth) was released in 1973 while the ryegrass, 'Grasslands Nui' (*Lolium perenne* L.) was released in 1974. Although mowing trials have been carried out by Rys *et al.* (1977) and Baars and Cranston (1977) little information is available on the dry matter production and the nutritive quality of swards containing these grasses.

This study was conducted to investigate the winter regrowth characteristics of a Matua/white clover sward compared to a Nui/white clover sward and the digestibility of the herbage produced.

MATERIALS AND METHODS

The swards were sown in adjacent areas on a Wakanui silt loam at Lincoln College in 1977. These swards were used for animal grazing trials until early 1981. At the start of the experiment in May 1981, the two main plots were trimmed to 1.5 cm. The experimental design consisted of randomized treatments replicated six times within two swards. Each plot was 1 m x 0.33 m and was surrounded by a 0.5 metre border mown to ground level.

Samples were collected at two weekly intervals during the regrowth period. At each cutting, samples were taken from the plots which had had a progressively two week longer spell than the areas previously sampled. Samples were washed to remove soil.

The herbage sample from each plot was then divided into two representative parts. One sample was dissected into grass, clover and dead matter. These were dried to constant weight at 100°C. The remaining sward samples were spread thinly in mesh bottomed trays and dried at 100°C for 1 hour to deactivate enzymes which can cause loss of soluble carbohydrates by respiration, then at 60°C to constant weight. The dried samples were ground through a 1 mm sieve and analysed by the Moore (1970) modification of the Tilley and Terry (1963) method for *in vitro* digestibility (IVD).

Each batch of samples were checked by the inclusion of two reference samples of known *in vivo* digestibility. The *in vitro* liquor was sampled after 48 hours fermentation and the volatile fatty acid (VFA) (C_2 to C_5) composition was determined using a 2400 mm by 3 mm glass column filled with Tenax GC (80/100 mesh) coated with 6% FAL-M in a Varian 2800 Gas Liquid Chromatograph (Joe, 1985).

RESULTS

Dry matter yield

The Nui sward produced considerably more dry matter than the Matua sward from weeks 10 to 18 (Figure 1), although the difference was only significant ($P < 0.01$) at week 16. The considerably higher proportion of Nui in the herbage means that in absolute terms the production for the Nui was considerably higher than the Matua at all times.

Sward composition

At the start of the experiment, Nui ryegrass comprised 31% of the sward while Matua prairie grass was only 4% of the total sward (Table 1). During the 20 week sampling period both grasses increased their proportion in the sward reaching a total of 65% in the Nui sward and 64% in the Matua sward by week 20. Nui showed an initial rapid regrowth while Matua as a proportion of the sward changed more slowly in the initial period but rapidly increased from week 14 onwards.

TABLE 1: Sward composition.

Weeks from initial defoliation	Mean grass %		Mean clover %		Mean dead matter %	
	Matua	Nui	Matua	Nui	Matua	Nui
2	4	31	2	26	93	38
4	16	42	1	26	82	29
6	16	36	2	31	80	30
8	25	99	5	30	66	16
10	19	63	2	25	72	7
12	28	66	1	19	60	9
14	34	69	2	21	55	5
16	46	69	2	22	40	4
18	63	68	2	19	23	3
20	64	65	0	23	33	8
$S\bar{x}$	8.1		6.9		8.2	
Significance	***		***		***	
Significant interaction between cultivar and week	***		NS		***	

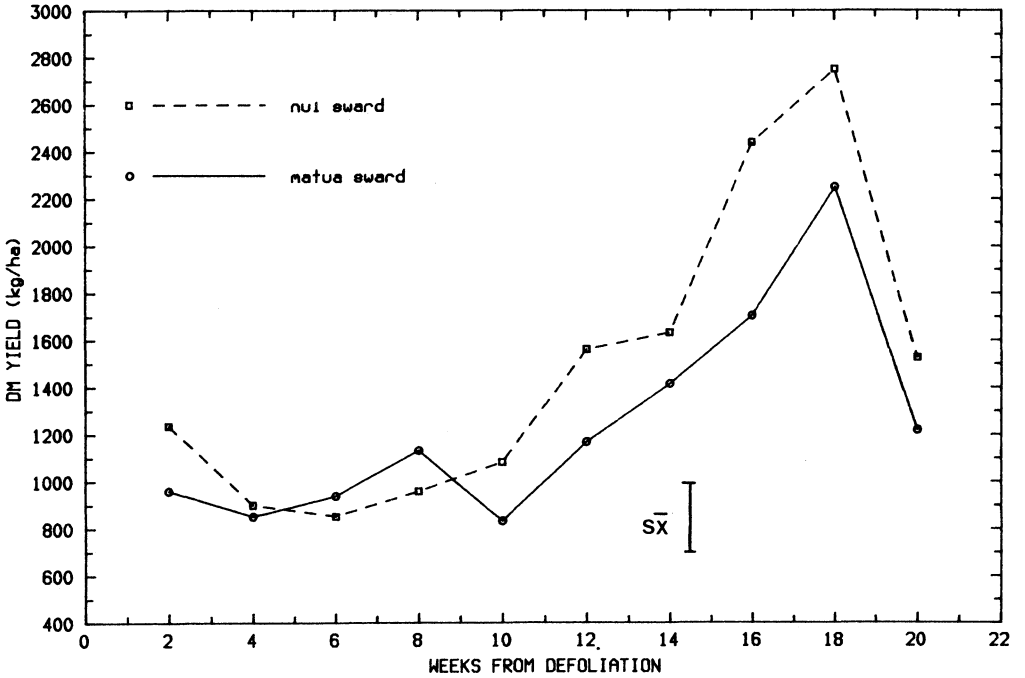

Figure 1: DM yield and Nui and Matua sward.

White clover in the Nui sward was always a significantly higher proportion ($P < 0.01$) than in the Matua sward.

The Matua sward always contained very much more dead material than the Nui sward. The proportion of dead matter in the two swards decreased throughout the experiment.

***In Vitro* Digestibility**

The overall *in vitro* digestibility of the Nui sward was significantly ($P < 0.01$) higher than the Matua sward

throughout the experiment (Table 2). The digestibility of both swards fell to the lowest level at six weeks after initial cutting, then increased steadily to reach maximum values at 16 weeks for the Nui and 18 weeks for the Matua sward.

TABLE 2: Influence of factors on *in vitro* digestibility and total volatile fatty acids of Matua and Nui swards.

Weeks from initial defoliation	IVD %		Total VFA (mg/100 ml)	
	Matua	Nui	Matua	Nui
2	30	52	161	301
4	27	53	155	293
6	15	38	163	252
8	22	51	147	257
10	28	62	159	323
12	39	62	197	318
14	44	68	213	321
16	52	74	261	377
18	69	74	313	367
20	70	74	355	401
$S\bar{x}$	6.0		53.3	
Significance	***		***	
Significant interaction between cultivar and week	***		***	

Total volatile fatty acids

The Nui sward yielded significantly higher amounts of total VFA than the Matua sward at each sampling date (Table 2). For both swards total VFA yield decreased until weeks 6 and 8 from initial defoliation; then increased steadily to a maximum at 20 weeks.

There was a significant relationship between the total VFA yielded in the fermentations and the *in vitro* digestibility of the two swards.

The regression equations are:

Matua sward over 20 weeks regrowth —

Total VFA = 4.24 + 44.1 IVD

(r^2 = 0.99***)

Nui sward over 20 week regrowth —

Total VFA = 4.18 + 63.6 IVF

(r^2 = 0.87***)

DISCUSSION

The total herbage accumulation did not differ significantly between the two swards except at the 16 week cut. However the Nui ryegrass sward was much superior to the Matua sward in its ability to regrow green grass and clover material following defoliation to 1.5 cm especially over the initial period of 6 to 8 weeks after cutting. This supports the conclusion of Baars and Granston (1977) that close defoliation severely slows Matua regrowth.

The close cutting of the upright growing Matua left no leaf and very little green sheath area to assist with recovery unlike the Nui which had a more prostrate habit of growth

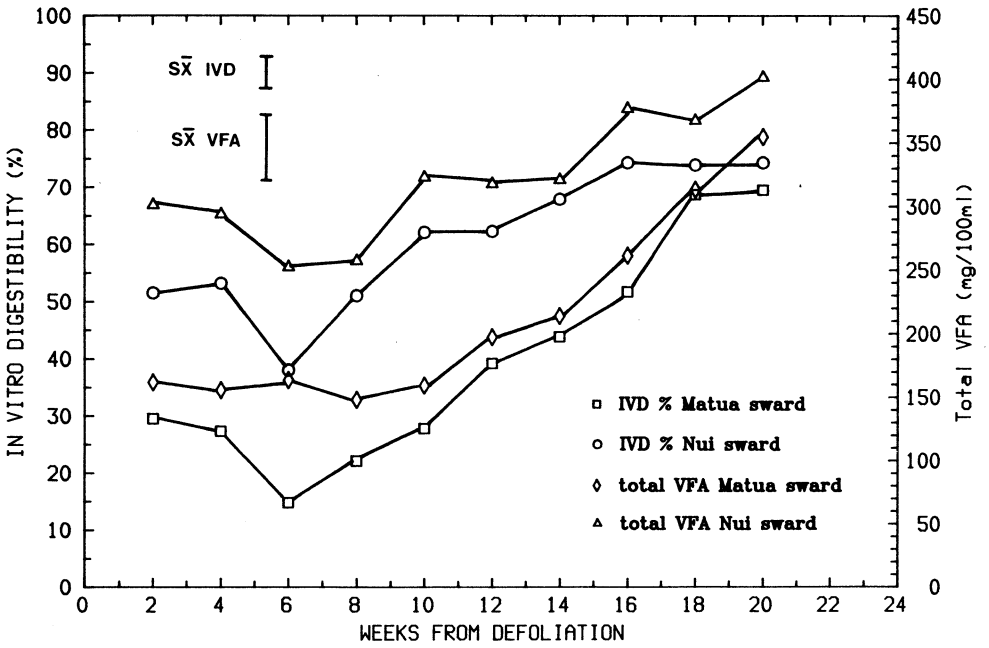

Figure 2: Relationship between IVD and total VFA.

and had almost four times as many tillers per unit area. The herbage mass present did not change greatly over the first 10-12 weeks after cutting. However a considerable change in the proportions of green material, clover and dead herbage occurred over this period, especially in the Nui sward.

The green leaf production (Table 1) from the Nui sward was always well ahead of that from Matua and this continued to week 16. This was almost certainly because of the relatively low population of Matua plants and the acknowledged slow rate of tillering of prairie grass. From 12 weeks onward there was a considerable yield increase on both swards.

The *in vitro* digestibility of the two swards was significantly different ($P < 0.01$) throughout the experimental period (Figure 2). This was undoubtedly due to the much higher proportion of both green grass and of clover in the Nui sward, and the lower level of dead material (Table 1) than in the Matua sward.

The proportion of clover in the Nui sward was much higher than in the Matua sward throughout the experimental period, probably due to the much thinner tillers and narrow leaves of the former allowing better light penetration through the canopy. The clover proportion in both swards fell towards the end of the experimental period due to a combination of grass competition and the relatively slow growth of clover at low temperatures.

The initial drop of digestibility to the cut of week 6 reflects the accelerated senescence of cut leaf and leaf sheath material which increased the absolute amount of dead material harvested from both swards. In addition observation indicated that the proportion of green grass stem, of relatively low digestibility, exceeded that of the higher quality leaf regrowth.

The total VFA found in the *in vitro* fermentations closely follow the trends shown by the *in vitro* digestibility values. This confirms that the digestibility of the sward did in fact rise over the experimental period.

The results of this experiment suggest that following close defoliation in late autumn, the highest yield and quality is obtained after a 16 to 18 week spell.

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