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# MILK YIELD AND COMPOSITION FROM COWS GRAZING LUCERNE

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## SUMMARY

The performance of cows grazing either lucerne or pasture was compared in three trials at different stages of lactation. In two of the trials the effects of different daily allowances of lucerne were also compared. Lucerne resulted in lower yields of milk, fat, lactose and protein than pasture in early lactation. It resulted in less fat in mid-lactation but higher yields of protein and lactose and higher liveweight gains in late lactation than did pasture. Compared with pasture, lucerne reduced fat content of the milk in two trials, and in all three trials lactose content was higher for lucerne whereas protein content was similar.

## INTRODUCTION

New Zealand work on the performance of cows grazing lucerne is limited to two reports. Percival (1954) compared lucerne and pasture silage as supplements to cows grazing pasture. Joyce and Brunswick (1975) established that sodium supplementation improved the milk and fat yields of cows grazing lucerne-dominant pastures grown on volcanic soils.

Need for additional information on its value as a feedstuff for dairy cattle arises from recognition by farmers in the central North Island that lucerne can make a major contribution to summer feed supplies. This paper summarizes some data from three experiments at Ruakura. Each experiment was designed to allow comparison of the yield and composition of milk from cows leniently grazed on either lucerne or pasture. These data are the first presented. Subsequently, information obtained in two of the trials on the effects on the cow of severity of grazing the lucerne is given.

## METHODS

Two trials were of similar design with one (Trial E, Nov., 1976) in early lactation, the other (Trial M, Feb., 1977) in mid-lactation. Each was of three weeks' duration and involved four groups of 9 cows grazed on a fresh area each day. One group (P) was leniently grazed on pasture while another (L100) was

leniently grazed on lucerne. The two other groups were grazed on lucerne with the area offered each day being 75% (L75) and 50% (L50) of the area offered to L100. The third trial was in late lactation (Trial L, April, 1976) and involved 13 sets of identical twins. Sets were split to form two groups and for four weeks one group was grazed on pasture and the other on lucerne. The aim was to fully feed both groups and a fresh area was grazed each day.

All cows used were August and September calvers and average liveweight at the start of the trials was 396, 422, and 423 kg for Trials E, M, and L, respectively. Liveweight change was assessed in each trial as the difference between weights at the end and one week after the start of the trial. In each case weighings were before the morning milking on three consecutive days. The yield and composition of milk was measured as described by Bryant and Cook (1977a).

For each group, the amount of dry matter (DM) present before and after grazing was measured on three occasions each week (Bryant and Cook, 1977a). The lucerne was grazed at the crown bud-early flowering stage. The previous harvest had either been by mowing or by severe grazing. Salt lick was available to all cows.

Effects of treatments on the cows were assessed by covariance analysis. Milk yield and composition during the 14 days preceding each trial were used as covariates.

## RESULTS

### PASTURE-LUCERNE COMPARISON

In each trial there were differences between lucerne and pasture in cow performance but the effects were not consistent over the three trials.

Milk yield was significantly higher for pasture than lucerne in Trial E but was similar in the other two trials (Table 1).

Percentage of fat in the milk was similar in Trial E but was higher for pasture in Trials M and L. In all three trials protein content was similar, whereas lucerne resulted in a higher milk lactose content.

The combined effects of these differences in the yield and composition of milk were that, compared with pasture, the grazing of lucerne resulted in significantly lower yields of fat, protein and lactose in Trial E, less fat in Trial M, but higher yields of protein and lactose in Trial L.

TABLE 1: EFFECT OF GRAZING PASTURE (P) OR LUCERNE (L) ON COW PERFORMANCE

	Milk (kg/day)	Milk Composition (%)			LW Change (kg/day)
		Fat	Protein	Lactose	
Trial E:					
Pasture	20.80	4.72	3.74	4.88	0.67
Diff. (P-L)	1.65	-0.03	0.11	-0.17	0.26
SE (d)	0.52	0.11	0.09	0.08	0.29
	**	NS	NS	*	NS
Trial M:					
Pasture	12.93	4.98	3.53	4.80	0.26
Diff. (P-L)	0.12	0.36	-0.05	-0.06	-0.25
SE (d)	0.42	0.11	0.50	-0.03	0.16
	NS	**	NS	*	NS
Trial L:					
Pasture	9.30	4.77	3.45	4.67	0.01
Diff. (P-L)	-0.37	0.18	0.01	-0.13	-0.22
SE (d)	0.22	0.04	0.03	0.03	0.03
	NS	***	NS	**	***

Significant differences in liveweight change occurred only in Trial L where gain was higher for lucerne than pasture (Table 1).

Severity of grazing is indicated in Table 2. In general, the daily DM allowance was less and the percentage of the DM removed at each grazing was higher for lucerne than pasture. Differences in utilization were most marked for Trial L where, with the exception of the effects on milk fat content, lucerne was superior to pasture.

TABLE 2: DRY MATTER YIELD BEFORE GRAZING, OFFERED PER COW AND PERCENTAGE UTILIZED

	Yield (kg/ha)	Offered (kg/cow/day)	Utilized (%)
Trial E:			
Pasture	3393	48	27
Lucerne	4275	38	42
S $\bar{x}$	154	1	3
Trial M:			
Pasture	4371	61	28
Lucerne	4678	42	34
S $\bar{x}$	155	2	1
Trial L:			
Pasture	3316	38	29
Lucerne	2751	26	52
S $\bar{x}$	95	5	2

## EFFECTS OF AREA OF LUCERNE OFFERED

The design of Trials E and M also provided information on the effects on cow performance of different allowances of lucerne DM.

Average lucerne yield at the time of grazing was 4170 and 4440 kg DM/ha for Trials E and M, respectively. The progressive reduction in the area of lucerne grazed is indicated by the DM offered shown in Table 3.

TABLE 3: EFFECT OF RESTRICTION ON DM OFFERED AND UTILIZED

	<i>Treatment</i>			<i>S<math>\bar{x}</math></i>
	<i>L100</i>	<i>L75</i>	<i>L50</i>	
Trial E:				
DM offered (kg/day)	38	28	18	1.4
Utilized (%)	42	57	67	3.0
Trial M:				
DM offered (kg/day)	42	28	20	2.2
Utilized (%)	34	45	64	3.6

As DM offered declined, percentage utilization increased to a maximum of about 65%.

With the exception of fat yield in Trial E, yields of milk, fat, protein and lactose declined as DM allowance decreased (Table 4). The effects were small, however, for in no instance did the L75 treatment result in a significantly lower yield than L100. Further, the decrease between extremes in the total yield of the three components was only 7% in Trial E and 10% in Trial M and significant trends in liveweight change were not observed.

TABLE 4: EFFECT OF ALLOWANCE OF LUCERNE ON YIELD OF MILK, MILK COMPONENTS AND LIVELWEIGHT CHANGE (kg/day)

	<i>L100</i>	<i>Treatment</i>		<i>SE (d)</i>	<i>Significance of Linear Change</i>
		<i>L75</i>	<i>L50</i>		
Trial E:					
Milk	19.15	19.01	18.06	0.520	*
Fat	0.87	0.85	0.85	0.029	NS
Protein	0.68	0.66	0.61	0.016	***
Lactose	0.96	0.94	0.88	0.026	**
LW change	0.41	0.48	0.12	0.285	NS
Trial M:					
Milk	12.79	12.57	11.50	0.417	**
Fat	0.58	0.58	0.54	0.018	*
Protein	0.45	0.44	0.40	0.016	**
Lactose	0.62	0.61	0.55	0.025	**
LW change	-0.01	-0.21	-0.10	0.164	NS

In both experiments protein content of the milk declined significantly with decreasing DM offered. Lactose content declined ( $P < 0.10$ ) in Trial E, whereas fat content was not affected in either trial.

#### DISCUSSION

With the lenient grazing used in the pasture-lucerne comparisons, it is clear that in early lactation pasture was superior to lucerne. Even so, the daily fat yield from the cows grazing lucerne (0.87 kg/cow) was high and would satisfy most farmers. The grazing of lucerne did not affect the fat content of milk in the early lactation trial but caused a reduction in subsequent trials. Further investigation of this effect is indicated since nutritional factors affecting the composition of milk from cows fed roughage diets has not been extensively studied.

By late lactation this initial superiority of pasture disappeared. With the exception of the effects on fat content, lucerne was at least equal and, for some parameters, superior to pasture. This was clearly evident in liveweight gain, indicating that lucerne was the better ration for replacing liveweight lost earlier in lactation.

Figure 1 provides a comparison of the rate of decline in fat yield with decreasing DM allowance observed here with that ob-

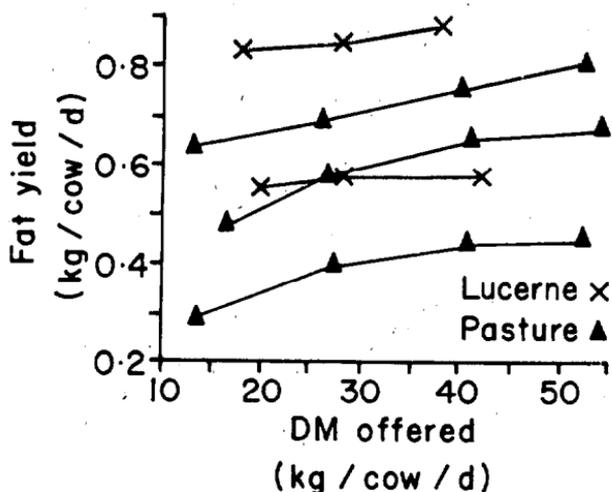


FIG. 1: Effect of DM allowance on daily fat yields from cows grazing pasture or lucerne at different stages of lactation. Lines join observations within trials.

served in similar trials with pasture (Bryant and Cook, 1977b; A. M. Bryant, unpublished). Contrary to the views expressed by some, the rate of decline is no greater for lucerne than for pasture and may be less. This suggests the possibility that the decline in production occasioned by utilization of 50 to 60% may be more than offset by any advantages arising from not having a long stubble present at the subsequent grazing.

A further implication of this work is that, provided sodium supplementation is practised (Joyce and Brunswick, 1975), the feeding value of lucerne is not an important limitation to its use with dairy cows. Both research and farmer practices with lucerne should therefore be concentrated on those factors affecting the yield, persistence, and contribution to total feed supply on the farm.

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