

A COMPARISON OF THREE PERENNIAL RYEGRASS CULTIVARS UNDER CATTLE GRAZING IN THE WAIKATO

G. J. GOOLD

Ruakura Soil and Plant Research Centre, Hamilton

Abstract

Three perennial ryegrass cultivars (*Lolium perenne* L.), Grasslands 'Ruanui', Grasslands 'Nui' and Yates 'Ellett' were sown in two experiments on different peat soils at Moanatuatua. Both experiments were alternately mown and grazed with Friesian cattle after an establishment period on each soil.

Ruanui swards, grown with white clover (*Trifolium repens* L.) were the least productive on both a partially-developed and a well-developed peat. 'Ellett' and 'Nui' swards produced 28% and 20% more total DM than 'Ruanui' on a well-developed peat and 16% and 5%, respectively, on a partially-developed peat, over a 21 cut period from September 1976-September 1979.

Pasture growth rates were generally lower on the partially-developed peat and cultivar differences were minimized in this experiment. Peak sward growth rates occurred in December-January on both peat soils. Whereas all three ryegrass cultivar swards reached a peak growth rate of approximately 70 kg DM/ha/day on the partially-developed peat, and Ruanui and Nui reached similar levels on the developed peat, Ellett swards attained higher growth rates (90 kg DM/ha/day) on the more fertile peat.

Sward growth rates of Ellett and Nui pastures were consistently higher than those of Ruanui in the autumn.

Ellett pastures contained more ryegrass and less white clover than Ruanui swards with Nui being intermediate in grass and clover composition.

The value of Ellett and Nui on fertile, organic soils in the Waikato is emphasised.

INTRODUCTION

Perennial ryegrass (*Lolium perenne* L.) is the most important grass species sown in New Zealand. At the present time there are four perennial ryegrass cultivars on the New Zealand List of Acceptable Herbage Cultivars and two of these, Grasslands 'Nui' and Yates 'Ellett' are selections of the same ecotype from the Auckland region. Grasslands 'Ruanui' represents the original selection of southern Hawkes Bay and Poverty Bay ecotypes which formed the basis of NZ Certified Perennial ryegrass (Corkill *et al.* 1981).

Several reports have compared the relative merits of Nui and Ruanui swards and highlight the greater autumn recovery growth of Nui and its superior persistence (Baars *et al.*, 1976, Lancashire *et al.* 1979).

Few data have been presented comparing the performance of Nui and Ellett swards although farmer acceptance of Ellett within the warm zone area of New Zealand is strong (Brown, 1980, Duder pers. comm.). Further, Ruanui swards were considered to lack the required degree of persistence expected from perennial species on Waikato peat soils (Hupkens Van der Elst pers. comm.).

This paper reports the results of two experiments, laid down on peat soils near Hamilton, comparing Ruanui, Nui and Ellett ryegrass swards, grown with white clover (*Trifolium repens* L.) and grazed by Friesian cattle from 1976-79.

EXPERIMENTAL

The experiments were conducted at Moanatuatua Peat Research Area, south of Hamilton on contrasting peat soils.

EXPERIMENT 1

This experiment was conducted on a partially-developed peat in dominant white clover following a clover sowing in 1974. The three ryegrass cultivars were undersown at 20 kg/ ha, into 15 x 38 m plots, in April 1975. The treatments were replicated three times in randomised blocks, and were uniformly grazed throughout the first year of establishment. Ryegrass plant numbers in the drill-rows were assessed after 12 months prior to the commencement of production cuts.

EXPERIMENT 2

This experiment was conducted on a well-developed peat which had been cultivated following a summer maize crop. The ryegrass cultivars were roller-drilled at 20 kg/ ha plus 3 kg/ ha Grasslands 'Huia' white clover in 13 x 65 m plots, in May 1976. The treatments were replicated three times in randomised blocks and pasture production measurements commenced in spring 1976.

MANAGEMENT

After establishment, plots in both experiments were divided to allow half the area to be grazed while the other half was closed for a production cut. After grazing the plots were pretrimmed to mower height and closed until sufficient growth permitted a mower-strip yield cut. The closing period was generally about 30 days during periods of active growth but extended to 80 days during winter and autumn drought, periods. The plots received normal farm topdressing rates of 2-300 kg/ ha potassic superphosphate in autumn and spring.

Production measurements commenced in spring 1976, in both experiments, and were terminated in spring 1979. Green yields were determined in the field and DM content in the laboratory. Occasional spring and autumn yields cuts were dissected into ryegrass and clover yield components.

RESULTS

DM YIELD

EXPERIMENT 1

The numbers of ryegrass plants surviving in the undersown drill-rows after 12 months were 5, 16 and 25 per m for Ruanui, Nui and Ellett respectively, indicating a significant decline in Ruanui plant numbers had occurred following initial seed establishment which was reported to be good, (all cultivars had an initial laboratory germination test greater than 90%).

TABLE 1: THE TOTAL DM YIELDS OF RYEGRASS SWARDS ON TWO PEAT SOILS IN FOUR ANNUAL PERIODS. (kg DM/ha)

Cultivar	Part Year 1976-77	Year 1977-78	Year 1978-79	Part Year 1979
<i>Experiment 1</i>	<i>Partially-developed peat</i>			
Ruanui	5470	6730	4650	940
Nui	6210	6980	4370	1170
Ellett	5880	8370	4970	1470
LSD 5%	1290	2070	2710	920
<i>Experiment 2</i>	<i>Well-developed peat</i>			
Ruanui	6840	11010	6580	2870
Nui	8160	12300	8560	3390
Ellett	8160	13610	9180	3330
LSD 5%	1290	2480	2710	1470

Pasture yields were generally lower and more variable in this experiment reflecting the lower degree of peat development. The total yields over a 2 I cut period from September 1976-September 1979 are shown in Table 1. Ellett swards were 16% higher yielding than Ruanui and the superiority was consistent over the last 14 cuts. Nui pastures were only 5% higher yielding than Ruanui in total DM over the 21 cut period.

EXPERIMENT 2

Establishment of ryegrass swards was better at this site and production cuts commenced in the spring 1976 following autumn sowing. Both Nui and Ellett swards were significantly higher yielding over the first spring-summer-autumn period than Ruanui although thereafter only Ellett pastures were statistically superior to Ruanui (Table 1). Nui swards were 20% higher than Ruanui at this site:

SEASONAL GROWTH RATES

EXPERIMENT 1

Daily herbage growth rates were more constricted on the partially-developed peat although peak growth rates reached similar values on both peat soils (Fig. 1). Ellett and Nui swards grew at a faster rate than Ruanui in this experiment over the autumn-winter-early spring months.

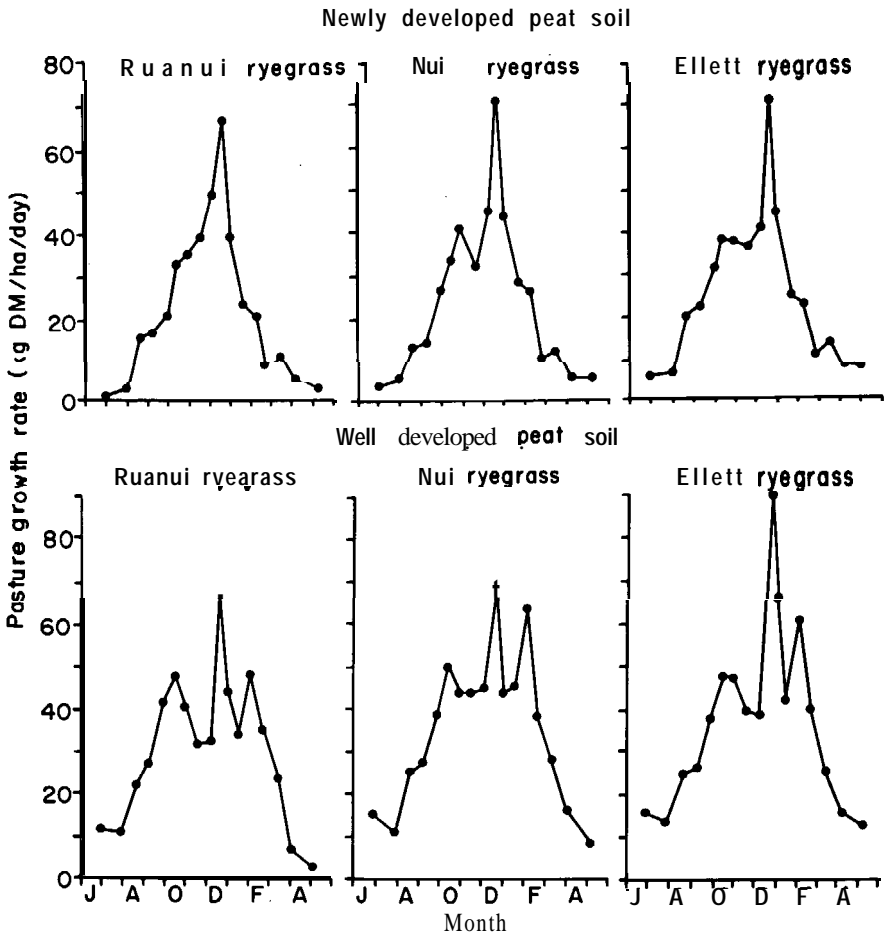


FIG. 1: The seasonal growth rates of three ryegrass cultivar swards at Moanatuatua (mean of three years).

EXPERIMENT 2

Daily herbage growth rates were generally higher for all the ryegrass swards in this experiment. Whereas Nui and Ruanui swards reached similar peak growth rates at 70 kg DM/ ha/day, Ellett swards in this experiment attained peak growth rates nearer 90 kg DM/ ha/day. Again Ellett and Nui pastures grew at a higher rate in autumn than did those of Ruanui.

HERBAGE COMPOSITION

The botanical composition of the swards in each experiment is shown in Table 2.

TABLE 2: THE % RYEGRASS-CLOVER IN SEASONAL YIELD CUTS.

Cultivar	Feb 1977		May 1977		Oct 1977		May 1978		Nov 1978		May 1979	
	Rye	Clover	Rye	Clover	Rye	Clover	Rye	Clover	Rye	Clover	Rye	Clover
<i>Experiment 1</i>												
	<i>Partially-developed peat</i>											
Ruanui	31	57	61	37	53	40	82	8	59	15	49	8
Nui	39	55	75	21	63	34	93	5	80	9	91	3
Ellett	50	44	75	23	72	26	97	2	86	7	94	1
LSD 5%	23	21	12	19	18	14	9	6	28	15	9	8
<i>Experiment 2</i>												
	<i>Well-developed peat</i>											
Ruanui	24	65	61	38	45	50	87	48	80	11	37	52
Nui	45	50	71	28	56	42	94	12	87	9	72	28
Ellett	47	52	75	23	63	95	6	98	2	88	10	
LSD 5%	8	14	16	13	11	18	13	11	7	9	14	14

The percentage ryegrass in Ellett swards was generally higher than in those of Nui and markedly more so, than in those of Ruanui in both experiments. By late spring 1978, three years after sowing, the relative % ryegrass content of Ellett, Nui and Ruanui swards on the well-developed peat of Experiment 2 were 88, 72 and 37% respectively.

The white clover content of the swards followed a reverse pattern with highest content occurring in Ruanui swards and lowest contents in those of Ellett ryegrass.

The trends in these components were consistent in both experiments and highlights some basic agronomic differences between the ryegrass cultivars. Clover content of autumn pastures in Experiment 1 appeared to decline in all swards in response to the dry summers of 1977-78 and 1978-79.

DISCUSSION

Insufficient treatment replication and relatively high data variability often made statistical significance difficult to establish, although there were consistent trends apparent in each experiment.

After 12 months, from sowing, Ruanui ryegrass swards had become inferior (in plant numbers in Experiment 1 and DM production in Experiment 2) to Nui and Ellett. The superiority of Nui and Ellett was largely achieved through greater total productivity of pastures in the autumn months of March, April and May, with Ellett pastures exhibiting exceptional growth rates in December-January under higher fertility conditions. The superior autumn performance of Nui is a characteristic reported by previous workers (Baars *et al.*, 1976, Lancashire *et al.*, 1979).

Associated with the greater grass persistence and yield of Ellett and Nui swards on the peat soils has been a reduction in the white clover content of the pastures and this effect appears more pronounced in Ellett pastures than in Nui. The lower clover content may result in lower animal performance from Ellett swards unless management practices are adopted to ensure this component is kept vigorous e.g. full utilization of spring pasture.

The experiments have confirmed that Ellett and Nui offer large production increases on Waikato peat soils especially under higher fertility conditions. Where conditions are less favourable for plant growth the expression of cultivar merit can be expected to be diminished.

Interim grazing studies have suggested that Ellett pastures on Waikato peat soils are more productive than Nui and that with intensive grazing management there is little problem in holding the clover content (Goold unpublished data). Under similar high producing farm systems on peat soils in the Waikato, Ellett is probably the recommended perennial ryegrass cultivar although under less intensive management and fertility conditions there is likely to be little difference between Ellett and Nui pastures.

Both cultivars are a marked improvement over Ruanui in this environment and the continued sowing of Ruanui on Waikato peat soils cannot be recommended.

ACKNOWLEDGEMENTS

The author acknowledges Messrs F. Hupkens Van der Elst for instigating the research programme, J. Corby and W. Hamilton for technical assistance and C. Dyson for statistical analysis of the data.

REFERENCES

- Baars, J. A.; Douglas, J. A.; Thomsen, E. J., 1976. *Proc. Ruakura Fmrs' Conf.* 28: 62-8.
Brown, G. A., 1980. *Proc. N.Z. Grassld Ass.* 41: 56-62.
Corkill, L.; Williams, W.; Lancashire, J. A., 1981. *Ibid* 42: 100-22.
Lancashire, J. A.; Harris, A. J.; Armstrong, C. S.; Ryan, D. L., 1979. *Ibid.* 40: 114-24.