LIVEWEIGHT GAINS OF YOUNG SHEEP GRAZING CHEMICALLY TREATED PASTURES

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Summary

The bipyridyl herbicide paraquat has been applied to perennial ryegrass (*Lolium perenne*) white clover (*Trifolium repens*) pastures at 2 to 3 oz per acre during spring, to produce white clover dominance.

The liveweight gain of young sheep grazing these sprayed pastures has been studied. A significant (at the 1% level) increase in liveweight gain of 3 lb per lamb over a three-week period, was obtained at Reporoa. This result was supported by half-paddock trials. Herbage production was measured using cages and pasture composition changes followed by point analysis.

INTRODUCTION

ONE of the factors contributing to increases in liveweight growth of young sheep grazing perennial 'Grasslands Ruanui' ryegrass (*Lolium perenne*) and white clover (*Trifolium repens*) or short-rotation 'Grasslands Manawa' ryegrass (*L. hybridum* var.) and white clover pastures, compared with pure stands of the grasses alone, has been attributed by Rae *et al.* (1963) to the presence of white clover.

McLean *et al.* (1965a, b) and Hight and Sinclair (1965) demonstrated that young sheep grazing white clover grow rapidly and large differences in animal growth rate can be attributed to pasture species, with legumes being superior to grasses.

Field trials have confirmed the ability of the bipyridyl herbicide paraquat to swing perennial ryegrass/white clover pastures toward white clover dominance, when applied at light rates of 1 to 3 oz (all rates in a.i. per acre) during mid to late spring.

The possibility of using this chemical to assist with the preparation of pastures for young grazing sheep, both lambs and ewe hoggets, was suggested. This paper reports interim results from trials studying the use of paraquat to prepare pasture for young sheep.

EXPERIMENTAL

The trials were divided into three sections:

- (1) Replicated stocking trial.
- (2) Half-paddock trials.
- (3) Time of application trial.

REPLICATED STOCKING TRIAL

This trial was laid down at Reporoa as a randomized block design involving four replications with plots each of $\frac{1}{4}$ acre and 5 lambs per plot. The treatments applied were as follows:

- 1: Control unsprayed pasture.
- 2: 3 oz paraquat applied October 25, 1966.

The control unsprayed pasture was hard grazed in late November/early December, to bring it into suitable condition for lamb grazing—i.e., a pasture up to 2 in. to 3 in. high, after a two weeks' spell from grazing.

The paraquat treatment received one grazing between spraying and the start of lamb grazing.

On December 13, 1966, 20 lambs per acre were set-stocked on all the plots and remained until January 5, 1967.

From January 5 to 7, 1967, dry ewes hard grazed all the plots. This grazing was manipulated to suit the growth of individual plots, bringing all to the same condition. After a short spell, the trial area was set-stocked from January 24 to February 16 with a new group of lambs at 20 per acre.

Lambs were sorted into groups on a restricted liveweight basis at the start of each trial.

Tetramisole ("Nilverm") was used to drench each lamb at the commencement of each trial.

Dry-matter production was measured and pasture composition assessed using the point analysis technique.

HALF-PADDOCK TRIALS

Four uniform paddocks were chosen, one in the Waikato and three in the Manawatu-Rangitikei district. Paddocks chosen were high in fertility and situated on flat to easy rolling ground.

The paddocks were divided temporarily into two halves; one was sprayed with paraquat during spring at 2 to 3 oz and, after recovery, each was set-stocked with lambs selected at random from weaned lambs on the properties.

Though full herbage utilization was the aim, the early draft of lambs at 7 per acre in the Manawatu was not sufficient and the level of stocking was increased to 15 to 20 per acre. Individual liveweights were recorded at the start, at 3-to 4-weekly intervals and immediately before slaughter. Carcass weights and gradings were recorded for some drafts.

Liveweight records of the final group of lambs were taken until May, 1967.

All lambs were drenched at 3-weekly intervals with tetramisole.

Dry-matter production of each paddock was recorded, using cages, four to each side, using the method described by Lynch (1960).

Visual estimations of pasture composition were made as each lot of lambs were started on the trial.

Kairanga

The pasture at spraying was damp, 4 in. to 6 in. long, patchy and not as short as desired. Three ounces of paraquat was applied on November 15, 1966, under conditions of 70% R.H., 64°F and with a cloud cover varying from complete to clearing. The soil at this site was a recent alluvial silt-loam with an annual rainfall of 45 in.

Halcombe

Two ounces of paraquat was applied on November 15, 1966, to a 2 in. to 3 in. pasture recovered from hard grazing, but tending toward

stalkiness. At spraying the pasture was dry, the temperature 68°F, the R.H. 70% and the sky clear.

Marton

The pasture at spraying was short, 1 in. to 2 in. high freshened up after hard grazing. Paraquat was applied at 2 oz on November 23, 1966, under conditions of temperature 58°F, 90% R.H. and with complete cloud cover.

Hodderville

Two ounces of paraquat was applied to this trial during the first week of November, 1966.

One hundred ewe lambs were set-stocked on each half, bringing the stocking rate for lambs alone to approximately 7 per acre. Cattle were used to maintain the pasture at a suitable grazing height.

TIME OF APPLICATION TRIAL—HODDERVILLE

This trial was designed to study the effects of application of 2 oz paraquat at different times within the period November to February. A randomized block layout was used, involving 5 replications each with a plot size of 200 ft × 16 ft. Point analysis was used to assess pasture composition. Dry-matter production was measured using cages.

The treatments were:

- 1: 2 oz paraquat applied on November 9, 1966.
- 2: 2 oz paraquat applied on January 9, 1967.
- 3: 2 oz paraquat applied on February 21, 1967.
- 4: Unsprayed control.

RESULTS

LAMB PERFORMANCE

(1) *Replicated Stocking Trial*

The lamb weight gains are shown in Table 1.

TABLE 1: REPLICATED STOCKING TRIAL—MEAN LIVEWEIGHT
(20 Lambs per Treatment)

				<i>Treatment 1</i> <i>(Unsprayed)</i> <i>lb</i>	<i>Treatment 2</i> <i>(3 oz paraquat)</i> <i>lb</i>
FIRST GRAZING					
Initial liveweight	Dec. 13, 1966	....	47.9		47.8
Final liveweight	Jan. 5, 1967	....	55.3		59.2
Gain	....	....	8.4aA		11.4bB
SECOND GRAZING					
Initial liveweight	Jan. 24, 1967	....	52.8		52.8
Final liveweight	Feb. 16, 1967	....	65.5		65.8
Gain	....	....	12.7		13.0

Statistical analysis for the first grazing period showed that the difference between Treatment 1 and Treatment 2 was highly significant. At the second grazing the difference between the two treatments was not significant.

(2) Half-Paddock Trials

Kairanga

In order to obtain a measure of the loss of stock production resulting from spraying, 21 weighed lambs grazed the unsprayed treatment from November 23, 1966, to January 4, 1967. A mean liveweight gain of 22.7 lb per lamb was recorded over the period.

On January 4, 1967, both the sprayed and unsprayed areas were set-stocked with lambs at 15 and 13 per acre, respectively. After weighing on February 15, 1967, these lambs were slaughtered on February 16, 1967, and no difference in carcass grading between groups was recorded. Those from the sprayed area averaged 36.73 lb and those from the unsprayed 41.71 lb per carcass.

The trial area was kept tidy with cattle until restocked with lambs at 15 per acre on March 12, 1967. These lambs were slaughtered on May 6, 1967. Average carcass weights at this time were 40.00 lb from the sprayed and 38.75 lb from the unsprayed areas, respectively.

Table 2 summarizes the mean liveweight gain per lamb and the liveweight gain per acre over the period of the trial, November 23, 1966, to May 6, 1967.

TABLE 2: KAIRANGA TRIAL—MEAN LIVEWEIGHT GAIN

Period	Per Lamb		Per Acre	
	Sprayed lb	Unsprayed lb	Sprayed lb	Unsprayed lb
Nov. 23 1966—Jan. 4 1967	—	22.7	—	136
Jan. 4 1967—Jan. 27 1967	10.6	11.6	145	123
Jan. 27 1967—Feb. 15 1967	4.5	3.4	61	36
Mar. 12 1967—Apr. 4 1967	6.9	6.2	103	85
Apr. 4 1967—May 6 1967	8.9	2.7	121	37
Total: Nov. 23 1966—May 6 1967			430	417

Halcombe

After the application of spray to the pasture on November 15, 1966, the unsprayed area was kept grazed with lambs and cattle until it was closed on December 8, 1966. On December 20, 1966, the sprayed and unsprayed treatments were set stocked at 7.5 lambs per acre. Liveweights were recorded at this stage and again on January 16, 1967, when the animals were sent to slaughter.

A further group of lambs was grazed at 10 per acre from January 16, 1967, to February 12, 1967.

The trial was spelled for three days, then each treatment was stocked at 20 lambs per acre until March 15, 1967.

No difference was recorded in carcass grade between the lambs from the two treatments.

Table 3 is a summary of the mean liveweight gain per lamb and the liveweight gain per acre over the period of the trial.

TABLE 3: HALCOMBE TRIAL—MEAN LIVEWEIGHT GAIN

Period	Per Lamb		Per Acre	
	Sprayed lb	Unsprayed lb	Sprayed lb	Unsprayed lb
Dec. 20 1966—Jan. 16 1967	10.3	8.3	77	62
Jan. 16 1967—Feb. 12 1967	9.2	9.4	92	94
Feb. 15 1967—Mar. 15 1967	13.4	10.0	268	200
Total: Dec. 20 1966—Mar. 15 1967			437	356

Marton

Each half was set-stocked at 14 lambs per acre on December 19, 1966. By January 9, 1967, *Bromus mollis* and docks (*Rumex* spp.) started to invade both the sprayed and unsprayed areas, but appearing more prominently on the sprayed.

The presence of *Bromus mollis* suggested that to continue the trial might result in restricted lamb weight gains. As the lambs used were part of the farmer's flock, it was decided to conclude the trial.

Hodderville

Table 4 is a summary of the mean liveweight gain per lamb over the period of the trial.

TABLE 4: HODDERVILLE TRIAL—MEAN LIVEWEIGHT GAIN PER LAMB

Period		Sprayed lb	Unsprayed lb
Jan. 16 1967—Feb. 13 1967	....	15.5	12.6
Feb. 13 1967—Apr. 8 1967	....	13.3	10.3
Apr. 8 1967—May 4 1967	....	5.1	4.0

The liveweight gains per acre over the period January 16, 1967, to May 4, 1967, for Treatment 1 and Treatment 2 were 188.3 lb and 237.3 lb, respectively.

PASTURE PRODUCTION

REPLICATED STOCK TRIAL

The dry-matter production over the duration of the trial is shown in Table 5.

TABLE 5: DRY MATTER PRODUCTION FROM TWO PASTURE TREATMENTS AT REPOROA

<i>Period</i>	<i>Treatment 2 (3 oz paraquat) lb</i>	<i>Treatment 1 (Unsprayed) lb</i>
Oct. 25 1966—Nov. 17 1966	 Assumed zero production	700
Nov. 17 1966—Dec. 13 1966	 560	920
Dec. 13 1966—Jan. 5 1967	 510	730
Jan. 5 1967—Feb. 17 1967	 1,770	1,980

These results have not yet been analysed statistically.

HALF-Paddock TRIALS

Pasture production was also recorded on the half-paddock trials as shown in Table 6.

TABLE 6: PASTURE PRODUCTION, HALCOMBE

<i>Period</i>	<i>Dry-Matter lb/acre Sprayed</i>	<i>Unsprayed</i>
Dec. 20 1966—Jan. 16 1967	 1,952	1,436
Jan. 16 1967—Feb. 21 1967	 1,974	1,334
Feb. 21 1967—Mar. 23 1967	 1,029	651

Although in the case of the trials at Reporoa and Kairanga the application of a light rate of paraquat caused an almost complete swing to clover dominance, in the case of the half-paddock trial at Halcombe the swing was only partial. The perennial ryegrass in the sprayed plot at Halcombe developed only a few seed-heads compared with the unsprayed, where it became stalky during the latter part of December.

TIME OF APPLICATION TRIAL

It was noticeable that the January treatment recovered much faster than the November one.

Pasture composition changes two months after each treatment are shown in Table 7.

TABLE 7: PASTURE COMPOSITION TWO MONTHS AFTER TREATMENT

(Cover Hits per 50 Points—Mean of 5 Reps.)

<i>Treatment and Date Assessed</i>	<i>Lolium spp.</i>	<i>Trifolium repens</i>	<i>Holcus lanatus</i>
PARAQUAT 2 oz			
Nov 9, 1966	16	21	14
Jan. 9, 1967	14	41	8
Jan 9, 1967	15	32	22
Mar. 11, 1967	17	42	4
Feb. 21, 1967	23	23	19
Apr. 21, 1967	15	33	5
UNSPRAYED			
Nov. 9, 1966	14	21	16
Jan. 9, 1967	14	32	17
Feb. 21, 1967	18	24	16
Mar. 11, 1967	14	27	21
Apr. 21, 1967	13	16	23

Other grasses present in trace amounts were browntop (*Agrostis tenuis*), sweet vernal (*Anthoxanthum odoratum*), *Bromus mollis*, *Poa* species, crested dogstail (*Cynosurus cristatus*), and cocksfoot (*Dactylis glomerata*). Flat weeds included *Hydrocotyle* species, yarrow (*Achillea millefolium*), chickweed (*Stellaria media*) and Californian thistle (*Cirsium arvense*).

DISCUSSION

On the Reporoa trial at the first weighing, a 3 lb increase in live-weight gain per lamb was obtained on the sprayed treatment (significant at 1% level). The second weighing on this trial gave a non-significant difference between treatments of 0.3 lb. Reference to the dry-matter figures in Table 5 shows that, over the latter period of the trial, the pasture production was much higher than it was when the first lot of lambs was grazing.

For instance, from December 13, 1966, to January 5, 1967, the dry-matter production from Treatment 1 and Treatment 2 was 730 lb and 510 lb, respectively, while during the period January 5, 1967, to February 17, 1967, Treatment 1 produced 1,980 lb and Treatment 2 1,770 lb. No change was made to the stocking rate and it is possible, therefore, that liveweight differences would have been recorded if the stocking rate had increased over the latter period.

The half-paddock trials support the data obtained from the Reporoa work. At Kairanga a swing to almost complete white clover dominance was obtained, and this situation remained until the late summer/early autumn period, when the unsprayed area was becoming rank and apparently unpalatable. Some difficulty was experienced in getting the unsprayed area hard grazed before closing for lambs. This inability to prepare the pasture may have favoured the sprayed treatment. Although on the other hand the loss due to spraying was rather exaggerated as the clover pasture was ready before January 4, 1967.

The decision to carry 13 lambs on the unsprayed and 15 lambs on the sprayed treatments at Kairanga was made with the aim of stocking each to capacity and a subjective assessment of stocking rate was made on January 4, 1967. Allowance is needed for this difference when interpreting the early results given in Table 2. The liveweight gain per acre figures are high for the sprayed treatment.

Although at Halcombe, only a partial swing to clover was obtained, higher liveweight gains were recorded on the sprayed treatment as shown in Table 3.

The susceptibility of *Bromus mollis* to light rates of paraquat, particularly in relation to its stage of growth, will need investigation.

With regard to the time of application trial, results are not yet complete. However, the apparent greater susceptibility of Yorkshire fog (*Holcus lanatus*) to 2 oz paraquat when applied in January, compared with the same rate applied in November, is worth noting.

Direct-drilling trials have been laid down during February to April, 1967, to study the subsequent management of these clover pastures. The build up of nitrogen over the clover dominant period could provide very suitable conditions for direct seeding of grasses during the following autumn. Perennial Ruanui ryegrass, the tetraploid Western Wolths (*Lolium westerwoldicum*) ryegrass and Manawa ryegrass are under study.

The possibility of using chemicals to assist with the preparation of pasture for young grazing sheep has been encouraged by the interim results reported here. Further detailed stock work is planned for the spring of 1967, to confirm in the lower half of the North Island the Reporoa work and to evaluate more critically the guidelines provided by the half-paddock trials.

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