SEEDING RATES AND WEEDKILLERS IN PASTURE WEED CONTROL

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SUMMARY

THIS paper presents details of an investigation into the effects of weeds on the establishment of pasture. The influence of varying seeding rates is given, as well as details of the effect of 2,4-DB on weed and sown species.

Weeds were kept in check by high seeding rates, but the slow-establishing grass species also suffered from the competition. Spraying was relatively ineffective in these treatments. Spraying was of considerable benefit on the light seeding rates and resulted in unexpectedly large increases in production for several months after spraying.

The spray treatment had very little effect on the sown species.

INTRODUCTION

It is surprising what little detailed information is available as to the effect of weeds on the establishing grass and clover species. Many authorities refer in a general way to the need for adequate weed control and cite various control practices. These include good seedbed preparation, the sowing of nurse crops, the use of quick growing competitive species, autumn sowing, early grazing and mowing, the use of high seeding rates, and in recent years the use of selective weedkillers.

It is with the last two, the question of seeding rates and the use of selective weedkillers, that this paper is primarily concerned.

The benefit of high rates of seeding as an aid to weed control is well known, while the discovery of the selectivity of the phenoxybutyrics has made possible the control of most annual weeds in newly established pasture (Wain 1955, Carpenter and Soundy 1954, Thompson 1959).

The economics of weed control practices, however, have not been clearly established. To enable recommendations to be made on the use of various methods of weed control it is necessary to know the effect of weeds on the establishment of the new pasture and also the effectiveness of the various weed control measures.

Just what are the effects of weeds? How persistent are they? Is spraying likely to be of much benefit? To what extent are weeds checked by ryegrass? These are but some of the questions which come to mind and which prompted this investigation.

EXPERIMENTAL METHOD

A randomised block trial which included both seed rate and spraying treatments was laid down on Taieri alluvial silt loam soil on 6 December 1957 to investigate the effectiveness of the above weed control practices and to study the effect of weeds on the establishment of pasture species. This soil was known to be badly infested with weeds including fathen (*Chenopodium album*), shepherd's purse (*Capsella bursa-pastoris*), chickweed (*Stellaria media*), fumitory (*Fumaria officinalis*), spurrey (*Spergula arvensis*), docks (*Rumex obtusifolius*), and several *Polygonaceae* species.

TREATMENTS

1. **High seeding rate:** Perennial ryegrass 20 lb, short-rotation ryegrass 10 lb, cocksfoot 5 lb, timothy 3 lb, Montgomery red clover 2 lb, cowgrass 2 lb, and N.Z. white clover 3 lb, making a total of 45 lb.

2. **Low rate ryegrass:** Perennial ryegrass 5 lb, short-rotation ryegrass 3 lb, cocksfoot 4 lb, timothy 2 lb, Montgomery red clover 2 lb, cowgrass 2 lb, and N.Z. white clover 2 lb, making a total of 20 lb.

TABLE 1—DRY MATTER PRODUCTION LB/AC GRASSES, CLOVERS AND WEEDS. CUT 18/2/58.

Treatment	Rye-grass	Cocks-foot	Timothy	Poa	Red clover	White clover	Total D.M. sown species	Weeds	%	Rel. 1a = 100
1a High ryegrass	1,580	20	60	30	60	50	2,080	280	13	100
1b " "	1,550	70	60	30	80	100	2,460	570	23	204
2a Low ryegrass	810	50	110	50	50	40	1,840	730	40	260
2b " "	540	50	80	50	30	20	2,880	2,110	74	754
3a Low ryegrass	900	40	30	60	—	30	1,430	370	26	132
3b " "	560	60	40	50	—	40	2,410	1,660	69	593
4a No ryegrass	50	150	140	90	100	20	1,320	770	58	275
4b " "	30	100	110	60	100	50	2,310	2,060	82	736

a = sprayed

b = unsprayed

TABLE 2—DRY MATTER PRODUCTION FOR PERIOD 27/3/58 TO 28/11/58

Date cut	High ryegrass			Low ryegrass			Low ryegrass			No ryegrass		
	Sprayed	Not sprayed	% increase	Sprayed	Not sprayed	% increase	Sprayed	Not sprayed	% increase	Sprayed	Not sprayed	% increase
27/3/58	1,380	1,310	5	1,320	820	60	1,260	940	35	1,130	620	80
11/6/58	900	800	10	1,200	820	45	960	810	20	920	680	35
1/10/58	1,440	1,420	0	1,500	1,430	5	1,220	1,240	0	1,460	1,320	10
28/11/58	2,810	2,950	-5	2,940	2,700	10	2,590	2,660	0	3,320	2,630	25
Total	6,530	6,480	0	6,960	5,770	20	6,030	5,650	7	6,830	5,250	30

3. As above but with red clover omitted, a total of 16 lb.
4. No ryegrass: Cocksfoot 4 lb, timothy 2 lb, Montgomery red clover 2 lb, cowgrass, 2 lb, and N.Z. white clover 2 lb, making a total of 12 lb.

SUB-TREATMENTS

- (a) Control.
 - (b) Sodium salt of 2,4-DB at 1 lb acid equivalent per acre.
- Half of each plot was sprayed, the sprayed half being selected at random. The spray treatment was applied on 27/1/58.

RESULTS

Weather during the months after sowing proved favourable for the establishment of sown species and weeds.

Counts taken a month after sowing showed that a high population of weeds and annual poa (*Poa annua*) was present in all plots. In the no-ryegrass plots the numbers were significantly higher than in the high-ryegrass treatment. The number of weeds per square foot averaged about 40 in the no-ryegrass treatment compared to about 30 in the high-ryegrass treatment. In addition more than twice as many annual poa plants were recorded in the no-ryegrass plots.

At this time fewer plants of cocksfoot and timothy were recorded in the high-ryegrass treatment, suggesting that these slow-establishing species were already suffering from ryegrass competition.

In the high seed rate treatment ryegrass formed a dense sward which suppressed most of the weeds. In the light rates the weeds were suppressed less and contributed an appreciable amount of herbage, while in the plots sown without ryegrass, weeds contributed the bulk of the herbage and hence were serious competitors with the slow-establishing timothy, cocksfoot, and clovers.

The spray treatment was applied on 27/1/58, seven weeks after sowing. At that time the young pasture species were 5 to 6 in. in height while the weeds were various heights up to 7 in. Good weed control was obtained and grass and clover growth showed improvement especially in the lighter seeding rate treatments. In the weedy no-ryegrass plots spraying was of obvious benefit, despite only partial control of some weeds, notably shepherd's purse and spurrey.

Weeds, though present, were of little consequence in the high-ryegrass treatment and here spraying was relatively ineffective.

At the first cut taken ten weeks after sowing (three weeks after spraying) the differences in the weed content of the various treatments was very noticeable. This can be seen from Table 1.

As a result of cutting the majority of the weeds were killed and hence competition from weeds ceased to be of importance after the first cut.

Immediately after cutting little difference could be seen between sprayed and unsprayed plots, though in the low rates the sward in the unsprayed plots was somewhat more open. In consequence it was expected that with the exception of the no-ryegrass treatment differences between the sprayed and unsprayed treatments would be small at subsequent cuts.

However, at the second cut all three light rates showed unexpectedly large yield increases in the sprayed treatments and even the high-ryegrass treatment gave a slight response. Yields from the sprayed plots in the light-ryegrass treatments were approximately 50 per cent better than from unsprayed, while in the no-ryegrass treatment yields were nearly double. The sprayed plots generally showed superior growth, vigour, and colour and could be picked out by eye before cutting.

At subsequent cuts the spray treatments continued to prove superior, especially in the plots which initially contained the most weeds. The margin in favour of the sprayed treatments tended to lessen at each cut, but was still considerable in the no-ryegrass treatment ten months after spraying.

It is obvious as a result of these cuts that the effect of weeds, even where these are removed comparatively early, can be considerable and

may persist for some time. Thus where competition from weeds is serious, spraying is likely to result in higher dry matter production over a period of several months and be fully justified on a cost basis.

EFFECT OF WEEDKILLERS ON THE PASTURE SPECIES AND COMPOSITION CHANGES

Spraying caused negligible damage to the pasture species and consisted chiefly of some distortion and disfiguration to the red clover leaves. The yield of red clover was not lowered significantly, however. Sward composition measurements taken seven months after spraying using a point analyser indicated that the amount of red clover was significantly less in the sprayed treatments, while that of white clover was slightly greater.

In these treatments the ratio of red clover to white clover was 1:1, while in the unsprayed treatments the ratio was 2:1.

With the grass species, cocksfoot and annual poa were similar in sprayed and unsprayed treatments. Slightly less ryegrass was recorded in the sprayed plots (significant at 5 per cent level) while hits on timothy were appreciably lower in two of the treatments.

Spraying may have decreased the density of these species slightly, perhaps as a result of competition from the other sown species, but plant counts indicated no increased plant mortality.

Plant counts did not indicate any significant differences between clovers in the sprayed and unsprayed treatments and it is apparent that while the vigour of red clover may have been reduced by spraying the effects were not sufficiently great to cause the death of the plants.

The counts taken at that time, however, indicated some significant differences in plant numbers between the rates of seeding. In both sprayed and unsprayed treatments significantly less (5 per cent level) cocksfoot and timothy were recorded in the high-ryegrass treatment than in the no-ryegrass, indicating that some suppression of these species had taken place. This trend was apparent at the earlier counts, but was not significant.

DISCUSSION

The above work was done in one trial only so the results should be accepted with caution.

However, some of the data proved of considerable interest, particularly the effects of weeds on pasture production several months after the weeds were destroyed by cutting and the very strong competitive effects of high rates of ryegrass.

It is probably not generally realised how great the suppression effects of ryegrass can be, both on weeds and slow-establishing sown species. This has been clearly shown in the above trial and has been previously demonstrated in several trials at Invermay and elsewhere (Cullen 1958, Davies 1952, Brougham 1954).

In this trial the weed population was high, yet in the high seed rate mixture weeds were of little importance. In the low rate mixture, however, only a slightly greater population of weeds provided serious competition.

Generally the use of high rates of ryegrass gave good weed control but at the expense of the slow-establishing grass species, which also suffered from ryegrass competition. Where these species are of importance the use of high rates of ryegrass is not satisfactory and with low-ryegrass seedings, weed control is likely to be a problem.

Under such conditions the use of weedkillers is likely to be of considerable benefit.

Where simple ryegrass clover mixtures are sown under weedy soil conditions the typical high-ryegrass mixture has the merit of giving good weed control in the early stages of establishment and only in special circumstances would the use of light rates of seeding be recommended. For example, where perennial weeds such as docks are a problem spraying at the time of establishment may be the best means of control.

Where the weed problem is very bad it may be necessary to spray despite the use of high-seeding rates, especially if drought or other cause

results in unfavourable conditions for establishment. Where spraying is accepted as a normal part of management lighter seed rates can be sown. The use of light rates of seeding in conjunction with weedkillers may even prove more economic than sowing more expensive high rate mixtures.

CONCLUSION

The results of this trial indicate the necessity for a rapid establishment of sown species to control weeds in the early stages. Where weeds are known to be serious it is essential that conditions for pasture establishment be as good as possible and every endeavour be made to keep the weeds in check. Sowing light seed rates under such conditions would be unwise. However if special-purpose pastures or low rate ryegrass mixtures are desired the use of the phenoxybutyrics makes the control of weeds in young pasture a practical and economic proposition.

Results to date have shown the importance of both seed rates and selective weedkillers for the control of weeds in establishing pasture. Further investigations which include grazing trials are in progress and it is hoped results from these will add to our knowledge on this important subject.

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DISCUSSION

Comment: Consolidation appears vitally important, particularly with low seeding rates.

Q.—Were the plots broadcast or drilled?

A.—Broadcast. This has the advantage of better weed control due to the elimination of the bare ground that occurs between drills.

Q.—Was the weed population abnormally high?

A.—The weed population was more varied than normal, but the intensity was of the order expected in fertile plains areas which have been under cropping.

Comment: The speaker knows of one farmer using low rates of seeding plus weedkillers under very weedy conditions.

Comment: The lower seeding rates in the Tauranga area used in conjunction with heavier rates of fertiliser have given as good results as heavier seed rates.

Comment: High ryegrass rates give high initial production.

Q.—What would have been the effect of leaving the weeds unmown?

A.—We do not know, but this effect is being examined in a similar trial to the one reported today, but using sheep grazing instead of the mower.

Q.—What are the general climatic conditions in the area for pasture growth?

A.—Twenty-six inches of rain well distributed throughout spring and summer, though often a dry period during February. Young pasture is normally sown in late spring or late summer, but can be sown at any time from September to March. Fathen infestation is generally greater with spring sowings and at this time high rates should be avoided under weedy conditions.