EFFECT OF WEEDS ON PASTURE PRODUCTION

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I intend to give in this paper the more important results which have been secured from two experiments at the Marton Experimental Area on the control of weeds in pasture.

The first of these trials was commenced in October 1948, when an old weedy pasture at the Marton Area was sprayed with the following treatments:-

- (a) M.C.P. salt as "Agroxone".
- (b) Sodium salt of 2,4-D as "Chloroxone".
- (c) Ethyl ester of 2,4-D as "Weedone".

Each of the above materials was sprayed at 0, $\frac{1}{2}$ and 1 lb. acid equivalent per acre. In addition, treatments of 0, 2 and 4 cwt. per acre of superphosphate were superimposed on the weedkilling treatments. In all, there were 27 treatment combinations derived from the 3 spray materials, each applied at 3 rates as well as the 3 rates of applying superphosphate. These treatments were all re-applied for a second time in November, 1949. Adequate lime was topdressed on all treatments.

Pasture production records were obtained for 2 years by mowing. The mown herbage was analysed both for dry matter and for the pasture species it contained. In addition to this, at regular intervals "point analyses" of the plots were taken to give the amount of ground which was covered by the various species of plants making up the pasture.

Before treatments were applied the sward was shown (by "point analysis") to consist of 65 to 70 per cent grasses - mainly ryegrass with some brown-top and crested dogtail, 15 to 18 per cent white clover, 9 to 12 per cent catsear, and 14 to 18 per cent other weeds, mainly plantain and daisy. It was a typical weedy sward which had not received fertiliser for several years.

Results of the Trial.

The results have been examined in six monthly periods and over the whole trial period of 2 years. The salient features can be summarised as follows:-

1. Total Pasture Yields: There was no significant difference between any treatments or means of treatments. However, differences between the rates or forms of weedkillers were very small, whereas over the whole period 2 cwt. per acre superphosphate increased yields by 3 per cent and 4 cwt. by 8 per cent.

This response to superphosphate is very much smaller than that obtained on better pastures at Marton in neighbouring trials, up to 54 per cent increases having been recorded to 4 cwt. per acre superphosphate on newly-sown pastures. It is striking evidence of the inability of poor, run-out, weedy pastures to give the same measure of production response that can be obtained from the better strains of more vigorous pasture species.

2. Production of Weeds: When the weed species were dissected out of the mown herbage it was evident that a marked and significant reduction in their amount was secured by both the $\frac{1}{2}$ lb. and 1 lb. rates, though there was no real difference between the $\frac{1}{2}$ lb. and 1 lb. rates. Over the 2 year period the weed production on sprayed plots was only about 37 per cent of the production on the unsprayed areas.

When the forms of weedkiller were compared it was evident that the best control had been obtained from the ethyl ester of 2,4-D. The M.C.P. salt and the sodium salt of 2,4-D showed little difference in effectiveness.

Superphosphate had no effect on the production of weeds at any period.

3. Production of Grasses and Clovers: Results were similar to those outlined for total pasture yields, no treatment, either weedkiller or fertiliser, giving a significant effect, although the response to 4 cwt. per acre superphosphate was substantial, averaging 8 per cent over the 2 year trial period.

Point Analyses.

The herbage dissection figures give a measure of the effect of weed-killers and fertilisers on the amount of herbage produced by weeds and by desirable pasture plants. However, weeds produce relatively much less herbage than do grasses and clovers, and a better measure of the importance of weeds in a sward is given by the amount of ground they cover. The "point analysis" technique measures the area taken up by each of the species that make up the sward.

These measurements were made on the trial a month before and three months after the original treatment, and a third set of readings was taken when the trial was closed in November 1950.

(a) Effect of the First Treatment with Weedkillers and Fertilisers: Over the four months of spring and early summer (October-January), a general increase in the amount of clover occurred on all treatments. This is a normal seasonal effect. However, the increase was much greater on the "no weedkiller" plots. The weed cover was reduced to nearly one-third of the original on the $\frac{1}{2}$ lb. acid equivalent plots and to one-sixth of the original on the 1 lb. plots. On plots treated with the ethyl ester of 2,4-D practically no weeds were present, while the M.C.P. salt and the sodium salt of 2,4-D were much less effective.

Superphosphate had little effect, other than a slight stimulation of clover.

(b) State of the Sward at the Close of the Trial: Of the forms of weed-killers the ethyl ester of 2,4-D plots had the fewest weeds (6 per cent ground cover), the sodium salt of 2,4-D plots having 13 per cent and the M.C.P. salt 19 per cent of the sward occupied by weeds. Over all forms the $\frac{1}{2}$ lb. application reduced weeds from 31 per cent ground cover to 18 per cent, and the 1 lb. treatments to 8 per cent ground cover of weeds. On the 4 cwt. per acre superphosphate plots there were as many weeds as on the "no phosphate" plots.

Clover content seemed little affected by weedkiller treatment, but had increased from 17 per cent on the "no phosphate" plots to 23 per cent on the 4 cwt. superphosphate plots. The only marked change in grasses was seen in the comparison of rates of weedkillers, the percentage on the 1 lb. treatments being 60 per cent, or 10 per cent above the "no weedkiller" plots.

If these results are compared with the herbage production of weeds, grasses and clovers, it is clear that the weed content is more prominent in terms of ground cover than if measured as the contribution weeds make to pasture production. It is also plain that the 1 lb. treatments have exerted considerably better weed control than the $\frac{1}{2}$ lb. treatments - a fact not shown by the production figures. Otherwise the agreement is good.

At the close of the trial - after two applications of weedkillers - there was still a considerable amount of weeds in the pasture, the lowest figure being 8 per cent ground cover on the 1 lb. per acre treatments. On the control plots 31 per cent of the sward was occupied by weeds. The reduction in weed population has been substantial, but by no means complete, on most treatments, and there is evidence of considerable re-infestation. A feature of the ethyl ester of 2,4-D plots at the 1 lb. rate was a complete elimination of catsear, and these plots also showed the best weed control, there being only 2 per cent recorded in the final point analysis.

To summarise, it is evident that, despite the fact that the weed-killing sprays, particularly the ethyl ester of 2,4-D, gave excellent weed control, this did not result in increased pasture production from the sward as a whole.

Second Trial.

In this trial a somewhat better pasture was sprayed on 28th November, 1950, with 1 lb. per acre ethyl ester of 2,4-D (as "Weedone Standard"). The trial was a simple one of duplicate plots of sprayed and unsprayed treatments, with adequate fertiliser and lime to both.

Production records are to hand for the 6 months, December 1950, to May 1951, and these show a production from the sprayed plots only 75 per cent of that from the unsprayed. This has arisen despite the fact that an 85 to 90 per cent control of flatweeds was secured. These weeds were mainly hawkbit, dandelion, plantain and mouse-eared chickweed. At the cut on 7.3.51 the herbage dissection analysis gave the following results:-

	<u>Mean Percentages.</u>		
	<u>Grasses.</u>	<u>White Clover.</u>	<u>Weeds.</u>
Sprayed plots.	78.	17.	5.
Unsprayed plots.	52.	17.	31.

Again, it is clear that the virtual elimination of flatweeds does not automatically mean an increase in pasture production: for a period at least a decline in production has resulted from the replacement of weeds by bare ground.

The Practical Significance of these Results.

I wish to emphasise that these results apply only to the control of "flatweeds" in pasture by weedkillers at the Marton Area. The results in other districts may be different. Of course, weeds like ragwort and thistles are a different kettle of fish, and the benefits from the elimination of such weeds are too obvious to warrant investigation.

However, the trials were started because we were not sure what results would follow the elimination of a fairly severe infestation of flatweeds in a pasture. And I think it can be fairly stated that it is not enough just to consider the control of such weeds without the adoption of positive means such as oversowing and topdressing to take their place. Again, the poor response to superphosphate from such a sward suggests that ploughing and resowing would be a better proposition than tinkering about with weedkillers and fertilisers. The total pasture production over the 2 years of the first trial at Marton was about 11,000 lb. dry matter per acre, whereas another trial on better pasture at Marton yielded 22,200 lb. dry matter during that period, or more than twice as much.

Where it is practicable to plough and resow with improved strains of pasture plants a run-out pasture infested with flatweeds, it would seem, therefore, that pasture production can be greatly stimulated and a much better utilisation of topdressing achieved. Furthermore, such a deteriorated pasture does not warrant expenditure of time and money in an endeavour to eliminate the weeds it contains by spraying with weedkillers.

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