# USE OF HERBICIDE TO REDUCE GRASS COMPETITION IN A WHITE CLOVER SWARD

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## ABSTRACT

*Low rates of* 2,2-*DPA* (2,2-*dichloropropionic acid*) *were used to reduce the competition from carpet grass* (Axonopus affinis) *in a white clover* (Trifolium repens) *pasture on the north coast of New South Wales. Herbicide applied in March, when grass leaves were approximately* 10 *cm long and little white clover was exposed to the spray, increased clover yields by* 54 *per cent the following September but had no significant effect at later samplings. An April spraying to a shorter pasture* (*approximately* 5 *cm*) *when more white clover was visible, significantly reduced clover yields. There was no difference between herbicide rates of* 2.2, 4.5 *and* 6.7 *kg ha* $^{-1}$ *on clover yields and only small differences on grass yields. The effect of herbicide on grass growth persisted for at least* 12 *months.*

## INTRODUCTION

White clover (*Trifolium repens*) is an important pasture species in sub-tropical coastal areas both in intensive pastures on better soils (Murtagh *et al.* 1975) and on extensive hill country (O'Brien 1970). Ladino and other of the more productive cultivars are normally used in intensive pastures and whilst they grow well, their usefulness is limited by the generally short (two to five years) life of swards. Ladino white clover produces little seed in sub-tropical latitudes and consequently its survival in a sward depends mainly on plant persistence rather than regeneration from seed. In the intensive situation, the clover is usually sown into a cultivated seedbed with a temperate grass, frequently perennial ryegrass (*Lolium perenne*). Cultivation is used to kill the existing summer-growing grasses such as carpet grass (*Axonopus affinis*) and paspalum (*Paspalum dilatatum*), but they invariably reinvade the sward and can quickly dominate the white clover.

The competitive ability of clover is severely reduced by shading (Donald 1963), and hence controlling grass growth can benefit the clover. This can be achieved by heavy grazing at selected times, but the clover plants can also be damaged and the heavy grazing intensity may not be consistent with the desired level of animal production. Under English conditions, Haggar (1974) considered that grass-suppressing herbicides were an attractive alternative to heavy grazing for controlling grass growth. Under sub-tropical conditions, the autumn growth of carpet grass and paspalum can be retarded by low rates of 2,2-DPA (2,2-dichloropropionic acid) (Murtagh 1971). As this herbicide is generally more effective against grasses than against clover (Ashton and Crafts 1973), an experiment was conducted to test whether low rates of 2,2-DPA could be used to reduce the competition from carpet grass in a white clover sward.

## METHODS

The experiment was located at Byrrill Creek in the Tweed Valley on the north coast of New South Wales on an alluvial soil of sandy-loam texture. The pasture was sown five years previously on a cultivated seedbed using white clover cv. Ladino, perennial ryegrass and prairie grass (*Bromus catharticus*). When the experiment commenced, carpet grass and white clover were the main species in the pasture and virtually no ryegrass or prairie grass remained. The area had been topdressed with 250 kg superphosphate ha $^{-1}$ yr $^{-1}$ (sometimes with Mo) since 1952.

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The renovation treatments were three rates of herbicide (2.2, 4.5 and 6.7 kg 2,2-DPA $ha^{-1}$) plus a control with no herbicide, by two times of application (March 28, and April 26, 1962). The herbicide contained 74 per cent active ingredient and was applied in solution at 445 *l* $ha^{-1}$. The herbicide treatments were replicated four times and the control treatment eight times. Plots were 3.0 m by 15.2 m and were arranged in four randomized blocks.

The area was grazed and mown before each spraying. On March 28, the grass leaves were approximately 10 cm long after mowing, and white clover plants were small having just commenced to grow following the period of summer dormancy. On April 26, the grass was shorter (approximately 5 cm) and there was a greater proportion of white clover leaf in the sward. Rain fell soon after the March 28 spraying, but it was dry for fifteen days after April 26 (Table 1).

TABLE 1

*Rainfall received during the experimental period*

| Date | Amount | Date | Amount | Date | Amount |
|---|---|---|---|---|---|
| | *mm* | | *mm* | | *mm* |
| March 25 1962 | 15 | April 1 | 4 | June 1962 | 18 |
| 26 | 5 | 2 | 14 | July | 347 |
| 27 | 2 | 3 | 3 | August | 157 |
| 28* | 4 | 4 | 8 | September | 42 |
| 29 | 5 | 6–11 | 105 | October | 28 |
| 30 | 10 | 12–18 | 24 | November | 39 |
| 31 | 4 | 19–23 | 25 | December | 406 |
| | | 26* | 0 | January 1963 | 288 |
| | | May 11 | 13 | February | 143 |
| | | 12 | 8 | March | 508 |
| | | 20–28 | 51 | | |

*Herbicide applied.

The experiment was located in the middle of a farm paddock which was strip grazed with dairy cows at intervals of approximately four to eight weeks according to the normal practice. The experimental area was grazed over two days. After most winter-spring grazings, the paddock, including the experimental area, was mown at approximately 10 cm to control tall weeds.

Yield samples (0.9 m by 13.4 m) were taken on three occasions immediately before selected grazings. They were cut with an autoscythe from a different position within a plot at each sampling, and a 400 g sub-sample was separated into the component species. Significant treatment effects were identified by an analysis of covariance using location covariates to account for variation in clover growth over the experimental area (Outhwaite and Rutherford 1955).

## RESULTS

Neither white clover nor the grass grew to any extent during the autumn-winter period following spraying. By June, there was an obvious kill of grass on all sprayed plots, although the effect was less on the 2.2 kg $ha^{-1}$ treatments. On the April sprayed plots, the clover was stunted on the 6.7 kg $ha^{-1}$ treatment and slightly stunted at the other rates of herbicide.

At September 9, the yield of clover was significantly increased on the March-sprayed plots, and significantly decreased on the April-sprayed plots relative to the control (Table 2). The difference in clover yield between the two spraying times persisted until November 11. The different rates of herbicide had no effect on clover yields and few significant effects on grass yields. Herbicide treatment markedly reduced the grass yield and the effect persisted for at least one year.

The cows showed a marked preference to graze the herbicide treated plots, and after-grazing yields on these plots were much less than on the control treatment.

TABLE 2

*Yield of white clover and carpet grass at three sampling times*

| Species | Treatment | | 9.ix.62 | 11.xi.62 | 7.iii.63 |
|---|---|---|---|---|---|
| | Herbicide* | Spraying | | | |
| | | | | kg DM ha$^{-1}$ | |
| White Clover | +H | March | 1286 a | 1292 a | 86 d |
| | +H | April | 379 c | 825 b | 109 d |
| | C | — | 835 b | 1010 ab | 50 d |
| Carpet grass/Paspalum | 6·7 | March | 1 f | 72 de | 927 b |
| | 4·5 | March | 1 f | 157 d | 1021 b |
| | 2·2 | March | 4 f | 148 d | 1042 b |
| | 6·7 | April | 7 f | 52 e | 834 b |
| | 4·5 | April | 4 f | 64 de | 651 c |
| | 2·2 | April | 5 f | 154 d | 1028 b |
| | C | — | 63 e | 586 c | 1681 a |

*+H = mean of three herbicide rates when differences between rates were not significant, C = control, and numerals indicate the rate of herbicide in kg product ha$^{-1}$.

Values for the same species and with the same letter are not significantly different ($P > 0{\cdot}05$).

## DISCUSSION

The differences in clover growth between the two times of spraying indicates that care is required when using the technique. With the March spraying the longer grass leaves and the smaller amounts of clover probably reduced the interception of herbicide spray by clover plants. In addition, white clover leaves have a wax covering which reduces their wettability (Holly 1964) and this, combined with the rain soon after the March spraying, could have also reduced the toxic effect on clover. When 2,2-DPA was applied at 3.8 kg product ha$^{-1}$ to short (5–8 cm) perennial ryegrass swards in England, Oswald *et al.* (1972) recorded a mean reduction of 15 per cent in white clover yield relative to the control at 5 weeks, and a mean increase of 48 per cent at 10 weeks after spraying.

Even at the lowest rate of 2.2 kg ha$^{-1}$, the herbicide reduced grass growth for at least one year. Although 2,2-DPA applied in April is more effective than earlier applications (Murtagh 1971), the time-of-application effect could have been balanced by the increased effectiveness of herbicide on grass arising from the wet conditions during March. The small increase (seldom significant) in grass control with the heavier rates of herbicide compared to the lighter rates, did not lead to increased growth of clover and consequently cost considerations would favour the 2.2 kg ha$^{-1}$ rate.

The sprayed plots, with less carpet grass, were more attractive for grazing than the control plots and hence were more heavily defoliated. This appeared to reduce the regrowth of all species including clover, and thus the measured yield of clover appeared to underestimate the benefits of grass control. Whilst this problem became obvious during the course of the experiment, it was not practical to separate the plots for grazing and the experiment was terminated after one year.

Pests and diseases can also contribute to the decline of white clover and renovation with herbicide would not necessarily ensure a productive sward. Nevertheless, the ability to significantly reduce carpet grass/paspalum competition by a low cost (approximately $8.00 ha$^{-1}$) application of 2,2-DPA could be a useful management practice, but there is a need to test its potential under a wider range of conditions.

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