

# TOTAL WEED CONTROL

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## SUMMARY

CONCLUSIONS from a number of trials of dalapon/amtrol mixtures have now been confirmed by large-scale use on some hundreds of miles of railway track. Applications of this material to some badly weed infested sections of track that had received no chemical treatment for more than 12 months previously resulted in the track being satisfactorily restored.

Suggested minimum rates of dalapon and amtrol are 10 lb and 4 lb per acre respectively.

Volume rates were not critical, but where they were low better results were obtained when light rain followed applications.

Dalapon/amtrol presents a number of important advantages over chlorate/chloride, both operational and in performance.

## INTRODUCTION

Railway track weed control is the most extensive, if not costly, single weed control project in the country. The cost is ever recurrent and it produces no revenue. The operation must be effective under wide variations of weather, climate, and habitat, and against an almost unequalled range of weed species.

Factors in weed control on railways make it necessary to seek for more efficient weedkillers and to accept greater expenditure on chemical weed control. Some older types of weedkilling materials are apt to cause wheel slip, resulting in the disruption of traffic by the stalling of heavy trains on grades. They cause unexpected brake failures to fast moving railcars and to heavy trains on down grades. They cause corrosion and short circuits in track-circuited signal and point-control appliances and in level-crossing safety devices.

The work described started as a routine comparison of dalapon and amtrol against other weedkillers, but before it was completed there arose an urgent need to find some alternative to replace the use of basic weed-killer material which had failed to arrive in the country in time for use during the spring of 1958.

## EXPERIMENTAL

Treatment rates quoted in this paper are expressed as lb per acre of the commercially available materials; that is, dalapon 85 per cent active sodium salt and amtrol 50 per cent active sodium salt.

Earlier work (1) carried out during 1957 and early 1958 with dalapon and amtrol applied in 100 gallons of water per acre gave some indication of their possibilities. Experimental gear was then developed in order to investigate economical methods of selective strip spraying of grass-infested ballast shoulders and cesses along the track. A limited water-carrying capacity was a major problem.

### *Low Volume, Rates, and Locality Trials*

During May 1958 a series of track trials were laid down at Whangarei, Waiuku, Inglewood, Longburn, Foxton, Manawatu Gorge, and Terrace End, using dalapon and amtrol and mixtures of both in order to investigate their effectiveness as specifics for paspalum (*Paspalum dilatatum*), tall fescue (*Festuca arundinacea*), and other grasses generally. As intended, some test strips were sprayed over later with the standard chlorate/chloride autumn spray and results were compared as between (a) specific plus chlorate/chloride and (b) chlorate/chloride alone. In other cases the

dalapon/ amitrol treatments were not oversprayed with chlorate/ chloride. The six treatments used were as follows:

	1	2	3	4	5	6
Dalapon	15	15	15	7.5	5	—
Amitrol	—	5	3.75	5	5	5

The volume used was 33 gallons per acre in all instances except in Treatment 6, where 16 gallons per acre was applied at double the speed travelled in the other applications.

Rainfall which occurred soon after application may have reduced the effect of the treatments with dalapon only, but did not reduce the effect of the dalapon/ amitrol or amitrol only treatments. Dalapon at 15 lb especially on soil-bound ballast gave poorer kills of fescue and paspalum than did the dalapon/ amitrol mixtures. Where not oversprayed with chlorate/ chloride surviving grasses and unaffected broad-leaved weeds soon took charge of the plots.

No important differences were apparent between the effects of the various dalapon/ amitrol treatments except that in one trial dalapon at 5 lb plus amitrol at 5 lb gave slightly better kills of both grasses and broad-leaved weeds than did dalapon at 15 lb plus amitrol at 3.75 lb. The spectrum of broad-leaved weeds killed by the mixtures and by amitrol at 5 lb alone was wider than that killed by chlorate/ chloride. Thus mature plants of white clover (*Trifolium repens*) and red clover (*T. pratense*) were important species killed, while sorrel (*Rumex acetosella*) was more severely damaged. Overspraying of the plots with chlorate/ chloride did not appear to increase the total kill of either grasses or broad-leaved weeds.

Amitrol at 5 lb in 16 gallons of water gave results superior to chlorate/ chloride alone, notably in respect of common grasses, white and red clover, and sorrel. Results suggested its use as a supplement to chlorate/ chloride in paspalum and fescue-free areas. The amitrol application at double speed was significant as an indication that coverage could be reduced to below 33 gallons with corresponding increases in speed of spraying and range of tank capacity.

#### Low Volume Application Trials

In the spring of 1958 it became clear that there would be insufficient stocks available of chlorate/ chloride to complete the current track spraying programme. It was considered likely that there might be delay in the arrival of further supplies.

In anticipation of a call being made for advice on what alternative materials might be used at short notice further dalapon/ amitrol trials were initiated. If dalapon/ amitrol were to be used, low capacity spray gear would have to be requisitioned and modified for low volume spraying to extend operations from one available watering point to the next.

Trials were laid down near Hamilton early in November 1958 wherein, by varying the nozzle sizes, speeds, and pressures, an attempt was made to find out to what extent the volume rate of spray delivery could safely be reduced. Rates of 7.5, 11, 15, and 22 gallons per acre were investigated and two ratios of the materials were used, dalapon 10 lb/ amitrol 2.5 lb and dalapon 8 lb/ amitrol 4 lb. Attempts were made also to mix dalapon and amitrol separately with chlorate/ chloride. It was found that at the concentrations used precipitates formed which caused nozzle blockages. This idea was therefore abandoned.

Unfortunately the trial area was sprayed out with chlorate/ chloride by a yard spray gang before final results could be secured. Effects noted during the first three to four weeks after application were sufficient to indicate that all volume rates were likely to be effective. The stronger mixes, especially that at 7.5 gallons, caused more rapid browning, but at four weeks there was little difference between volume rates or material rates of application.

It was decided that 15 gallons per acre would be a workable optimum to use with spray plant available.

### *Large Scale Application Trials*

By the end of December 1958 approval had been secured for the expenditure of several thousand pounds to carry out an emergency spray application of dalapon/amitrol in those districts in which the usual spring application of chlorate/chloride had been missed. A limited quantity of a specified mixture was secured for January delivery. It was decided in order to use the material to the best advantage to provide for selective spot applications to the worst infested track lengths. Plant was fitted with section booms controllable by quick-shut-off valves. In the North Island plant tank capacity was limited to 400 gallons and the application rate was restricted to 15 lb mixture (dalapon 9.5 lb/amitrol 4 lb) in 15 gallons per acre. This allowed for the spraying of the worst infested portions of track between mixing points located about 20 miles apart. In the Dunedin and Invercargill districts a larger outfit was available and here the rates of application were 15 lb in 30 gallons per acre. Route miles covered by spray equipment approximated 2,500 miles and the equivalent of some 1,000 or more route miles was actually sprayed. No railguards were attached to the equipment, operations proceeded regardless of weather conditions, and where track circuits existed, if weed infestation justified spraying, the full width of track was treated. Wetting agent 0.03 per cent was added to the mix. Spraying operations were completed by the end of February 1959 within 10 weeks of project approval.

The result of this operation was an unqualified success, and the only complaint, expressed by engineering staff, was that the supply of material was inadequate to cover all track. No complaints regarding failures or disruption of traffic were received from signals, train-operating, or train-control staff.

One marked advantage of dalapon/amitrol lies in the greatly reduced quantity of material to be transported and mixed. Considerable savings in times taken to make up spray mixtures thereby resulted.

Some lengths of track had been omitted from both the previous autumn and spring spray operations, and when sprayed with dalapon/amitrol were 100 per cent covered with dense weed growth. It is likely that by the time the slow-acting dalapon/amitrol effect was complete (May 1959) these sections were cleaner than they would have been had they been treated regularly with chlorate/chloride. In the north both paspalum and tall fescue were largely eliminated or drastically reduced. Here, and also in Hawke's Bay, there was some evidence, in drought-ridden areas, that the low volume rate (15 gallons) did not exert the full effect. Rainfall, which continued during and after spraying in the Bay of Plenty, did not reduce kills, nor in the Wairarapa did a fall of 3 in. within 18 hours of spraying. In southern districts most applications were followed by light rain. It was here that best results were secured, but it is not possible to determine how much of this to attribute respectively to rainfall, climate, range of weed species, or the higher volume rate of application used (30 gallons per acre).

On some badly ballasted and some shaded lengths in the Dunedin and Invercargill districts clovers and grasses have persistently resisted repeated chlorate/chloride applications, while in both dry and moist situations tufts of Chewing's fescue (*Festuca rubra* var. *commutata*) have also persisted. Dalapon/amitrol effected good kills of these species. On a test length near Ranfurly the dalapon/amitrol sprayed section, after two subsequent chlorate/chloride applications, remains free of Chewing's fescue, while the section unsprayed with dalapon/amitrol remains clothed with Chewing's fescue, one to three tufts per sq. ft. Cutty grass (*Carex ternaria*), commonly invading wet sections of track, responded promisingly also. The most important result, of course, was that 1,000 miles of the worst infested track in the country was successfully reclaimed from a condition which otherwise would have persisted through several seasons. It would have been very costly otherwise to restore such track to a satisfactory condition.

### *Successive Dalapon/Amitrol Applications Trials*

It is important to learn what cumulative effects result from successive

dalapon/amtrol applications and also whether the application rate can confidently be reduced.

Two track circuited sections approximating 100 miles in the Hamilton district have been treated successively with three low volume applications of dalapon/amtrol.

These trials, in which the rate of application was reduced to 12 lb of mixture per acre, have demonstrated clearly that increases rather than decreases in application rate are necessary. The spring application in particular gave a restricted kill of weeds and grasses and there is evidence of a build-up in the population of resistant species; for example, wild carrot (*Daucus carota*), fennel (*Foeniculum vulgare*), black medick (*Medicago lupulina*), and several others. Final results may prove that it will be necessary to reinforce the dalapon/amtrol mixture with an additional specific for the control of resistant broad-leaved weeds. It is proposed to test 2,4-D and 2,3,6-TBA for this purpose.

In recent months some 600 miles of track in the North Island have been treated with 15 lb of dalapon/amtrol mixture in 45 gallons per acre by means of a weed spray train.

In the South Island several hundred miles have been treated with either 10 or 15 lb per acre of monuron in addition to dalapon/amtrol, while a further 50 miles have been treated with 15 lb of monuron and 112 lb of chlorate/chloride per acre. These figures will indicate the interest and importance that some Railway Department officers attach to improved techniques and materials for total weed control. The results of these large scale tests will go far to show whether further increases in weedkiller expenditure are justified.

#### CONCLUSIONS

1. Tracks which have received no chemical treatment for more than 12 months can be reclaimed satisfactorily by the application of dalapon/amtrol.

2. For this work the ratio of dalapon to amtrol does not appear to be critical, but the rate of dalapon should not be less than 10 lb and the amtrol 4 lb per acre.

3. Volume rates were not critical, but where they were low, light rain after application was beneficial. Heavy rainfall soon after application did not appreciably reduce the effect of treatments.

4. Results were much better than could be expected with chlorate/chloride mixtures used at conventional rates.

5. Dalapon/amtrol has particular advantages over chlorate/chloride, notably reduced interference with train traffic control and greater ease of operation through reduced rates and volumes.

6. Because of build-up of resistance species dalapon/amtrol, after several applications, may have to be used at higher rates or may have to be supplemented with other specific weedkillers.

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#### REFERENCE

1. Ward, R. K. 1958. Proc. 11th N.Z. Weed Control Conference, 92-94.

#### DISCUSSION

Q.—What is the value of a wetting agent with chlorate/chloride mixtures?

A.—Normal practice to use it with chlorate mixtures. It is of doubtful value, but looks impressive.

- Q.—What are the relative costs of chlorate and dalapon?  
A.—Dalapon is about 50 per cent dearer.
- Q.—Has the speaker done any work with 2,4,5-TP/dalapon?  
A.—No.
- Q.—Has the speaker used any granular materials?  
A.—No.
- Q.—Was there any twitch in areas sprayed and did you get control at 10 and 5 lb of dalapon?  
A.—It is not a common track weed, but a rate of 10 lb is rather low.
- Q.—How much more difficult are broad-leaved weeds to control on tracks than in pastures?  
A.—Weed growth on tracks is a tougher proposition than in pastures. Broad-leaved weeds are harder growth than in pasture; require additional dalapon rather than more amitrol.
- Q.—Once ballast is in really clean condition after repeated applications of knockdown chemicals, does the speaker think applications of these can be reduced and soil sterilants employed?  
A.—Re-invasion of weeds from outside sprayed area occurs between spraying; new materials such as soil sterilants may be justified but they are expensive.