

CHEMICAL CONTROL OF VEGETATION ON N.Z. RAILWAYS

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Summary

The New Zealand Railways Department must control vegetation on 6,500-odd kilometres of track and cess as well as on marshalling yards, and about road crossings. Until recently satisfactory control was achieved with herbicides except of paspalum (*Paspalum dilatatum*), yarrow (*Achillea millefolium*) and bracken (*Pteridium aquilinum* var. *esculentum*). Over the past year or two, considerable progress has been made in bringing these species under control as well. Track spraying is done by means of a spray train carrying a boom 5.5 metres in width. Vegetation between the track and reserves is treated with a motorized blower, while for road crossings trailer pump units are used. In vineyard areas pelleted formulations are used for on-track control.

INTRODUCTION

THE NATURE of the weed problem confronting the New Zealand Railways on its 5,300 km of track and 1,600 km of sidings was described previously (Kennedy, 1967). The problem subsequently changed to the extent that in the warmer, moister regions paspalum (*Paspalum dilatatum*) continued to emerge as a difficult-to-kill on-track weed, while yarrow (*Achillea millefolium*) has increased in importance in both North and South Islands.

Within the off-track, sprayed swath bracken (*Pteridium equinum* var. *esculentum*) has become the dominant weed in most districts.

WEED PROBLEMS

Favourable growing conditions over much of New Zealand encourage a generous cover of weeds across the ballast and adjoining cess on either side of the track. The cess is at a lower level than the stone ballast, and collects and holds germinating seeds, soil particles and moisture. This situation favours a wide variety of vegetation. The stone ballast beneath the track itself has much less moisture and organic matter and is less of a weed problem.

The weed problems on the railway can be considered under three headings:

- (1) Growth on the track itself.
- (2) Infestation of the right-of-way between the cess and the reserves.
- (3) Vegetation interfering with communication lines, equipment, vision at road crossings, and infesting yards and sidings.

EQUIPMENT EMPLOYED

Four types of equipment are used to cope with the situations encountered. The track is sprayed with a 5.5 m swath boom which applies

differential dosages across the ballast section. By the use of an auxilliary tank and a system of valves and independent spray line, an additional herbicide can be introduced either into the boom or applied through an off-centre nozzle mounted on an outrigger to the boom.

Vegetation between the track and the reserves is controlled by use of a motorized blower, while for road crossings, yards and slidings, mobile trailer pump units are employed. Finally, in areas sensitive to spray drift (*e.g.*, vineyards) a pellet spreader is used for on-track control.

A new weedspray train is at present under construction. It will consist of a Dsc engine, guards' van, box wagon for chemicals, a 27,000 litre water tank, and the spraying unit consisting of a 9,000 litre stainless steel tank with booms and mounted motorized blower. This will reduce one problem brought about as the price of progress, namely, the elimination of the many watering points previously needed for steam engines but not required for modern locomotives. The over-all greater capacity of the train will, of course, facilitate the treatment of acceptable daily distances with minimum interference to routine traffic.

ORGANIZATION

Not only must the railways weed problem be attended to, but these activities must be integrated into the normal traffic movements of the railways network. The N.Z. Railways system is divided into six districts, and the organization of the weed control operation is based on these. Eventually, it is hoped to have one of the spray trains, now under construction, operating in each of the six districts.

In each district a trained man is directly in charge of weed spraying. He is responsible for track inspection, evaluation of log-sheets, and organization of the weedspray trains. The District Engineer's circular in Appendix 1 illustrates what is involved in planning one application in one district.

RESEARCH

Information on the properties of candidate herbicides is available from various sources but all are tested by N.Z. Railways before inclusion in the weed control programme. Testing varies from small-plot trials on ballast, yards, etc., to large-scale assessments on selected lengths of track.

CONTROL PROGRAMME

With the introduction of spraying to a particular section of track, an initial three-year programme is followed. In the first year a heavy dosage (14 to 17 kg/ha) of an active non-selective herbicide is applied in the late spring/early summer. In the second year, a rate of about half the initial rate of the same or similar herbicide is applied while in the third year a maintenance rate of a residual herbicide is used.

The spraying programme in Appendix 2 indicates the basis on which track spraying is approached, following a track inspection within 30 days prior to treatment. It is emphasized that the specified compounds apply only to that length of track at that time. Other programmes include herbicides not involved in that particular district application.

By the end of the third year any resistant weed species will have made their presence felt. Following further track inspections, a programme for treatment with other materials is then drawn up to cope with problem species.

Where the risk of damage from spray drift is high, such as in vineyard areas, herbicide application is made in pelleted form. The swath width of the pellet application is adjusted to equal the 5.5 m wide swath of the spraying boom used elsewhere.

In the area between the track and the reserves (cess) a one metre swath is sprayed with a motorized blower to reduce reinfestation pressure on the track itself. Timing is manipulated to avoid clashing with track spraying and to minimize as far as possible the risk of damage from spray drift. Bracken is treated about November with either bromacil or karbutilate at 9 kg/ha. The treatment of yards, sidings and road-crossings is done as it can be fitted in during the growing season.

DISCUSSION

The programmed approach to weed control has served the railways well. But species resistant to the herbicides in use become of increasing importance (Kennedy 1967), and there is always the possibility of new introduction from overseas. According to Powell (1968), 116 plant species capable of reproduction were intercepted by the N.Z. plant quarantine authorities between 1963 and 1967. Of these, 65 species were considered harmful, of which 45 had never been recorded as growing in New Zealand.

Even species present in the country for many years can change radically in status from a plant of benign habits to an apparently aggressive weed. *Senecio spathulatus* has been known to exist in New Zealand for more than 50 years (Cheeseman 1920), but only in recent years has it emerged as an important weed. This change is highlighted by the fact that, while material was being compiled for inclusion in the book *Standard Common Names for Weeds in New Zealand*, *Senecio spathulatus* was not among the species listed; yet three or four years later it is a weed of importance on railways at least.

At the same time, the introduction of a new herbicide has enabled the previously resistant species *paspalum* to be kept under control.

Thus the presence of resistance species or the introduction of new problem weeds calls for continuing study. The botanical features of the plant (Rochecoutste, 1968) in relation to the environment in which it grows have an influence on the effectiveness of herbicides, necessitating trial work throughout the districts. But, by means of the range of chemicals available, the application equipment already being constructed and trained personnel to utilize it, a high level of weed control on New Zealand railways is possible.

ACKNOWLEDGEMENT

Thanks to A. I. Healy, Botany Division, DSIR, for confirmation of identification of *Senecio spathulatus*.

REFERENCES

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- Powell, R. H., 1968. Harmful plant species entering N.Z. 1963-1967. *N.Z. Jl Bot.*, 6 (3).
- Rochecoutste, E., 1968. Consideration on the role of plant growth in the control of perennial grass. *Proc. 1st Victorian Weed Conf.*: 2.

APPENDIX 1

District Engineer's Office,
Auckland.

1 November, 1971.

District Traffic Manager,
Auckland.

MAIN LINE WEEDSPRAYING

It is proposed, weather permitting, to carry out main line on-track weedspraying throughout this District commencing on Saturday, November 6th, 1971.

Various chemicals will be used including karbutilate, 2,4-D salt, 2,2-DPA, 2,4,5-T, and atrazine.

These chemicals should not cause slipping on the rails, but the usual precautions of advising locomotive staff should be taken.

Spraying will be carried out by Unit No. 12001 mounted on E wagon 3340. The train, which will be hauled by a Dsc locomotive, should be marshalled as follows: Guards' van, chemical wagons (one Lp and one Lc probably), water wagon, and spray unit at the rear.

The mixing operations, spraying etc., will be carried out as directed by a member of my engineering staff who will accompany the unit. He will also make any decisions concerning the postponement of any portion of the programme due to wet weather, etc.

The spraying speed of the unit is 10 mph but this can be varied to suit crossing requirements if necessary.

Saturday, 6 November, 1971

Mix Auckland. Depart 7.00 a.m.

Spray Auckland-Papakura via Orakei.

Mix Papakura.

Spray Papakura-Mercer.

Mix and lunch Mercer.

Spray Mercer-Amokura.

Run Amokura-Te Kauwhata.

Spray Te Kauwhata-Huntly.

Water and mix Huntly.

Spray Huntly-Ngaruawahia.

Stable Ngaruawahia. Arrive 5.00 p.m.

Note: The above programme represents one day in a 9-day operation covered by this District Engineer's circular. To facilitate the work copies were sent to the following people—

Locomotive Supervisor,
Westfield
Te Rapa
Whangarei

Chief Stationmaster,
Auckland
Otahuhu
Huntly
Frankton
Maungaturoto
Whangarei

District Engineer

APPENDIX 2

Chief Civil Engineer's Office,
Research,
Wellington
12 October 1971

District Engineer,
Auckland.

WEED CONTROL—TRACK SPRAYING PROGRAMME

<i>Station</i>	<i>Station</i>	<i>Distance</i>	<i>Treatment*</i>
1 Auckland	Papakura	32 km	4500 litres water 144 kg karbutilate 9 litres wetting agent
Down Main Line via Meadow Bank			
2 Papakura	Mercer	37 km	4500 litres water 144 kg karbutilate 72 kg 2,4-D sodium salt 9 litres wetting agent
3 Mercer	Huntly 62.75	32 km	4500 litres water 144 kg karbutilate 72 kg 2,4-D sodium salt 9 litres wetting agent
4, 5, 6 Repeat Treatment	Up Main Line via Penrose		
7 Onehunga Branch	5 km		2250 litres water 71 kg 2,2-DPA 36 kg atrazine 3600 litres water
8 Waiuku Branch	11 km		109 kg atrazine 36 kg 2,4-D sodium salt 4.5 litres wetting agent 4.5 litres wetting agent
9 Auckland	Waitakere	27 km	4500 litres water 144 kg 2,2-DPA sodium salt 12 kg amitrole/ammonium thio-cyanate 9 litres wetting agent

*For the purposes of these proceedings, the identifying trade names appearing on the original programme have been replaced by common names and measurements converted to metric terms.