DEPARTMENTAL TRIALS WITH "TORDON"*

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Summary

From preliminary work, "Tordon" has shown activity against a large number of weeds that are tolerant to 2,4,5-T and 2,4-D. These weeds include *Cytisus* spp., *Cirsium* spp., *Equisetum* spp., *Hypericum* spp., *Lonicera* spp., *Muehlenbeckia* spp., *Phytolacca* spp., *Rosa* spp., and *Rumex* spp. It has not been superior to 2,4,5-T on *Leptospermum* spp., *Ulex* spp., and possibly *Rubus* spp. *Cassinia* spp. and to some extent *Pteridium* spp. are resistant. Comparisons with other materials such as dicamba and 2,3,6-TBA are made. It is extremely damaging to pasture legumes, but could possibly be used as spot applications on *Cirsium* spp. and *Rumex* spp. It has no advantage in brassica crops except possibly as a salvage spray for the control of particular *Cirsium* spp.

INTRODUCTION

AT LAST YEAR'S Conference, the inclusion of a paper by Pengelly (1963) on the properties and effects of the new systemic herbicide trade-named "Tordon" (4-amino 3,5,6-trichloropicolinic acid) has now enabled one to deal specifically with the results from its use. This paper summarizes the results being obtained within the N.Z. Department of Agriculture from the use of "Tordon" since it became available in April, 1963. Initially the material was applied to individual plants, but recent spring and autumn applications have been mainly on replicated plots. Some of the early rates applied have proved high, and, as effectiveness has been demonstrated, rates in subsequent trials have been adjusted accordingly. To date (May, 1964) there have been 67 trials laid down, where "Tordon" has been included. The scope of this paper is therefore limited to being a general summary.

All rates mentioned are expressed in terms of acid equivalent per acre. Except where otherwise stated, the potassium salt of "Tordon" was used and refers to the product containing 17.3% w/v imperial measure. No wetting agent was added to the "Tordon" except in recent trials.

CONTROL OF SCRUB WEEDS

A comparison of "Tordon" and other chemicals is shown in Table 1. The gradings are provisional especially for the newer chemicals, as final results are not known.

BAMBOO

Apart from an initial slight discoloration of the leaves, there was no effect from 5.2 lb "Tordon" applied to *Phyllostachys mitis* in full laf; or regrowth shoots (after a cutting) up to 3 ft high of *Arundinaria japonica* and *Sasa palmata*.

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BLACKBERRY (*Rubus* spp.)

The 1.44 and 2.9 lb rates of "Tordon" have not given complete control in one application. Within 3 to 4 months of summer and autumn applications, canes were defoliated and small canes killed. In one trial regrowth took place from the larger canes. Recent work on the East Coast variety of blackberry is showing that 1.44 lb is effecting better control of the regrowths than 4 lb of the ester of 2,4,5-T.

BRACKEN FERN (*Pteridium esculentum*)

As with other chemicals on bracken, "Tordon's" effect varies from place to place. In one trial there was no effect for 5 months from 0.87 and 1.73 lb of "Tordon" when the higher rate gave a complete top kill, with no fresh regrowth. In another trial on semi-mature fern, 1.44 lb caused an initial severe twisting and curling of 70% of the fronds at about 5 weeks and this continued even to 6 months.

BROOM (*Cytisus scoparius*)

Individual plants, 7 to 8 ft high, were sprayed in May with 0.75 ml conc./plant (approx. 1.44 lb/acre). Within two weeks yellow chlorosis occurred at the leaf tips and a general curving of leaf stalks. The central trunk had green tissue but at 7 months it was noted that translocation had taken place to within 2 to 3 ft of the ground. There was complete death of the plants at 9 months as seen by the splitting of the stems and collapse of the plants caused by partial root decay. At no stage was there evidence of new growth. In a recent trial, after 2 months, 1.44 lb gave 70% defoliation and kill of small twigs, similar to 2,4,5-T. Lower rates were less effective.

FENNEL (*Foeniculum vulgare*)

Areas of fennel 6 to 7 ft and flowering were severely twisted by both 1.44 lb of "Tordon" and 2 lb of the ester of 2,4,5-T.

GORSE (*Ulex europaeus*)

Unfortunately, gorse is somewhat tolerant to "Tordon", except perhaps for certain stages of growth. The effect generally occurring has been an overall stunting, light yellow green colour, flower inhibition for a long period, dead or severely affected spines, and death of most of the stem terminals. The proliferated new growth has been characterized by longer internodes. Variable results have been obtained, especially within the same plot, and results have been somewhat difficult to interpret. In an early trial, 1.44 lb of "Tordon" gave a poor kill but 2.9 lb gave satisfactory control on a plant with many buds. In another trial where monthly applications of 1.44 lb were being applied, the best results were obtained from flowering bushes in spring and vegetative bushes in summer and autumn. Mixtures containing 0.36 and 0.72 lb of "Tordon" with 3 lb of the ester of 2,4,5-T do not yet appear better than 2,4,5-T alone. In recent trials 2.9 lb "Tordon" in summer has been slightly inferior to late spring, and not as effective as 3.6 lb of the ester of 2,4,5-T. In one area, 1.44 lb of "Tordon" mixed with 4.4 lb of 2,4-D, both amine salts, caused more yellowing and tip curl than the potassium salt of "Tordon" alone.

HONEYSUCKLE (*Lonicera japonica*)

Mature honeysuckle was well controlled with 0.72 lb of "Tordon" after 2 months. The barberry (*Berberis vulgaris*) hedge was not

TABLE 1: COMPARISON OF "TORDON" WITH OTHER CHEMICALS

Weed	"Tordon"	2,4,5-T	Dicamba	2,3,6-TBA	Amitrole-thiocyanate
Bamboo	R 5.2 lb	R	R 20 lb	R 20 lb	I 20 lb
Barberry	R 2.9 lb	R	I 5 lb	I 5 lb	
Blackberry	I 1.44 lb	S/I 4 lb	S 15-20 lb	S 15-20 lb	S 16 lb
Bracken fern	I 1.44 lb	R 4 lb	I 8 lb		R 8 lb
Broom	S 1.44 lb	I 3.6 lb	I/R 4 lb	R 4 lb	R 4 lb
Gorse	S/I 1.44 lb	S 4 lb	I 16 lb	R 16 lb	I/R 4 lb
Honeysuckle	S 0.72 lb	I 3.6 lb	S/I 5 lb	S/I 5 lb	
Horsetail	S 0.7-1.8 lb	I/R 4 lb	I 4 lb	I 10 lb	2,4-D 8 lb I
Inkweed	S 2.9 lb		S 8 lb	S 8 lb	2,4-D 8 lb I
Manuka	S/I	S/I	I/R		
Sweet Brier	S	I	S	S	I/R
Tauhinu, seedlings	S 1.44 lb	R 2 lb	I 2 lb	I/R 2 lb	As foliage applications
Tauhinu, mature	R 2.9 lb	R 4 lb	I 16 lb	R 16 lb	
Tutsan	S 1.44 lb	I 2 lb	I 20 lb	I/R 20 lb	R 8 lb

Code: S = Fairly susceptible
I = Initial control but regrowths occur
R = Fairly resistant

damaged by 2.9 lb and thus some selectivity in control was obtained. Dicamba and 2,3,6-TBA have also been effective but barberry damage can occur.

HORSETAIL (*Equisetum arvense*)

Vegetative horsetail was killed within 3 weeks with 1.8 lb of "Tordon". After 5 months translocation appeared to have taken place to the rhizomes. Recent trials have shown promising results with even 0.72 lb.

INKWEED (*Phytolacca octandra*)

Bushes in the semi-flowering stage were killed in 5 months by 2.9 lb of "Tordon". At this time the stems were brittle and roots decaying. It took 2 to 3 months for complete defoliation to take place. In recent trials, "Tordon" and mixtures of such with 2,4-D have given twisting and initial defoliation.

MANUKA (*Leptospermum scoparium*)

In a pilot trial, single plants up to 4 ft high and vigorously growing were sprayed with 1 ml conc. of each chemical per plant. After 8 months "Tordon" was not as effective as 2,4,5-T which had given a 97% defoliation, while dicamba was much inferior to them both.

SWEET BRIER (*Rosa rubiginosa*)

To date (May, 1964), 9 trials have been laid down using various rates of "Tordon" depending upon the size and type of infestation. It appears that a 1:25 or 1:50 ratio of "Tordon" to water is optimum to give a complete kill, when 1 pint of the solution is applied as an overall spray. Lower concentrations of 1:200 have given leaf recovery. Rates from 0.5 ml conc. to 5 ml conc./plant have caused very severe effects, with the higher rates dead, brittle canes. The mixture of amine salts of 2,4-D and "Tordon" at 2.5 ml conc./plant do not appear as effective. Tip immersion techniques, where the cane tip is immersed in a 1:50 solution of "Tordon" to water, have shown translocation to canes and leaves some distance from the tip. Granular applications of the 7.2% active pellets have shown remarkable activity, as also have the 2,3,6-TBA technical acid pellets, but these are dependent upon adequate rainfall for root absorption. Rates of about 4 g of either "Tordon" or 2,3,6-TBA in pellet form have given control. Definite conclusions from the use of "Tordon" on sweet brier cannot be made until the spring when leaf and shoot growth would appear. At the present time, promising means of control are being shown.

TAUHINU-KOROKIO (*Cassinia leptophylla*)

Seedlings up to 9 in. high were sprayed with 1.44 lb of "Tordon". After one year there was a 90% kill with remaining plants growing normally. All plants up to 3 in. high were killed. Semi-mature woody plants 3 ft high and flowering were completely resistant to 2.9 lb of "Tordon". Only dicamba at 16 lb showed any activity of the chemicals used.

TUTSAN (*Hypericum androsaemum*)

Within 6 months, rates of 0.72 and 1.44 lb of "Tordon" to semi-mature bushes killed all leaves and smaller branches. There was no regrowth from the base or branches, apart from some from 2 lb of the ester of 2,4,5-T. Dicamba 4 lb was very poor.

WEED CONTROL IN PASTURES

With any weed control in New Zealand pastures, clover damage must be minimized. The effect of "Tordon" is severe, as rates as low as 2 to 4 oz have given complete kills.

CALIFORNIAN THISTLE (*Cirsium arvense*)

"Tordon" at even 0.18 lb has given a complete top kill. Dicamba and 2,3,6-TBA at 4 and 8 lb, respectively, have initially been less effective. Repeat applications of the butyric hormones are necessary. The control of rhizomes will not be ascertained until regrowth occurs in the spring.

Docks (*Rumex* spp.)

The following tabulation summarizes the % control given:

		<i>Docks</i>	<i>Ranunculus</i> spp.	<i>White Clover</i>
"Tordon" 1.44 lb		100	100	100
Dicamba 10 lb		100	100	100
2,3,6-TBA 10 lb		100	85	100
2,4-DB 2 lb		33	93	0

Spot applications would need to be employed for most of these chemicals.

CAREX LONGIBRACHIATA

"Tordon" 0.36 lb applied in mid-February to regrowth sedge, was completely ineffective at 2 months. Control has been obtained with at least 4 lb of the ester of 2,4-D in the early summer period.

MISCELLANEOUS SPECIES

Other weeds that have been controlled with 1.44 lb of "Tordon" include *Muehlenbeckia complexa*, *Tetragonia expansa*, fleabane (*Erigeron canadensis*), pearlwort (*Sagina procumbens*), sheep's sorrel (*Rumex acetosella*), catsear (*Hypochaeris radicata*), chickweed (*Stellaria media*) and *Veronica* spp.

WEED CONTROL IN CROPS

This section deals with brassicas, and the weeds usually found growing in association with them. Of the 20 trials summarized, 16 were conducted by F. B. Thompson (1964 a,b) who has given details of results of them in this and another *Proceedings*.

CROP TOLERANCE

Pre-emergent: Applications of 2.9 and 5.8 oz of "Tordon" caused little damage to soft turnips, swedes, choumoellier or kale. Kale tolerated 23.2 oz but this was toxic to choumoellier.

Post-emergent: A rate of 2.9 oz was damaging to soft turnips and swedes, but kale and to some extent choumoellier were resistant. The addition of 1.4 oz of "Tordon" to nitrofen was not generally beneficial, as it caused root deformities, especially in soft turnips.

WEED TOLERANCE

Pre-emergent: A rate of 2.9 oz gave good control of redroot (*Amaranthus hybridus*), fathen (*Chenopodium album*) and nightshade (*Solanum nigrum*), but redshank (*Polygonum persicaria*) was fairly tolerant even of 1.44 lb.

Post-emergent: A similar rate of 2.9 oz controlled fathen, redroot and redshank when up to 10 to 12 in. high. Twin cress (*Coronopus didymus*) was somewhat tolerant. Very early applications failed to give effective redshank control owing to later germination taking place.

GENERAL

"Tordon" does not appear to have a place for general weed control in brassica crops. Nitrofen is satisfactory when applied early and has a sufficiently broad enough weed control spectrum not to warrant the addition of "Tordon". However, as a salvage spray, "Tordon" would be probably more effective than most other chemicals owing to it being translocated. The control of Californian thistle is a real problem in certain areas, and there "Tordon" could be beneficial.

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