Research Report

SWEET BRIER

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Summary

This paper summarizes results of chemical control trials conducted in Canterbury during the period 1958 to 1962. Both coverage spray and basal methods of application were used and the chemicals employed included the more recently introduced ones, 2,3,6-TBA; the invert emulsions; simazine and fenac. Basal applications of both sprays and pelleted or granular materials were made. The ability of 2,3,6-TBA to translocate in sweet brier was demonstrated by the "tip immersion" technique. Conclusions drawn from these and earlier trials are stated in the conclusion, which also makes brief mention of future investigations.

INTRODUCTION

THE MENACE of sweet brier (*Rosa rubiginosa* syn. *R. eglantaria*) and problems associated with its control is becoming almost a biennial feature of these conferences. The first paper specifically devoted to the subject appeared in 1952 (Sewell). Further papers followed in 1954 (Dingwall), 1956 (Dingwall) and 1960 (Dingwall *et al.*).

Such repetition is indicative of the significance of sweet brier as an aggressive and widespread weed and of the problems associated with the practical application of control measures.

The paper presented to the 13th Conference in July, 1960, summarized existing knowledge of sweet brier and investigated control methods as accumulated over a period of 12 to 14 years by several research workers. Though a solution to the problem, in general, had not been developed, certain recommendations were made regarding control measures that offered possible methods of approach.

The present paper reviews the chemical control trials, conducted by the author, and either still current in July, 1960, or commenced subsequent to that date. Also included are comments either confirming or, where necessary, amending, in the light of this further research, certain results reported and recommendations advocated in 1960.

1958-59 EXPERIMENTS CONCLUDED

Early investigations had shown that fenuron and monuron were effective on sweet brier when applied as basal dressings. The use of dry materials, especially in granular or pelleted forms, offers advantages in ease and convenience of transportation and application when dealing with scattered weeds in difficult and/or extensive country.

PELLETED MATERIALS — INITIAL TRIALS

In 1958, a limited supply of fenuron pellets (25% a.i.) became available and two, non-replicated, pilot trials were established. The initial trial, commenced in October, 1958, consisted of broadcast applications of pellets at 4, 8 and 16 lb a.i. per acre — plot size, 1/50 acre. (Unless otherwise stated, quantities given subsequently in this paper are in terms of active ingredient per acre.) A portion of each plot

was oversown with clovers and topdressed with sulphur-superphosphate in August, 1959 — some 10 months after chemical treatment.

The second trial followed in March, 1959, but incorporated basal applications of pellets at 2½ and 5 lb and, as a standard for comparison, 2,4,5-T in dieselene (dilution, 1:80) at 70 gal per acre.

Both trials were located on an open stand of small sweet brier not exceeding 4½ ft in height.

The effects of the 16 lb broadcast treatment, whilst showing promise in autumn, 1960, eventually failed to give satisfactory control. Best results were obtained from the 5 lb rate of pellets in the basal application trial, which eliminated 18 small plants and seedlings but failed on 13 of the larger, although still comparatively small, bushes.

Even the usually reliable 2,4,5-T in oil treatment failed on the larger plants, probably because of extraneous, basal trash protecting the "crowns" (and/or the extensive rooting systems of the plants) at the time of application.

The 16 lb rate suppressed clover establishment even when sown 10 months after chemical treatment. Clover establishment was satisfactory on plots treated at 4 and 8 lb.

2,3,6-TBA AND OTHER NEW COMPOUNDS

By 1959 2,3,6-TBA had shown promise, both as a coverage spray and as a basal application. Other herbicides newly available at that time included the invert emulsions of 2,4,5-T, simazine, fenac and a herbicide of mixed chemicals in granular form containing monuron, borate, chlorate and 2,4-D.

These materials, together with 2,4,5-T, mixed isomers, trichlorophenoxyacetic acid and fenuron pellets were tested in a replicated trial which commenced with basal applications in August, 1959, and was followed by a coverage spray section in December, 1959. All treatments applied to individual plants — 3 plants per treatment — of small to medium size: up to 3 to 4 canes and not exceeding 5 ft in height.

The results achieved are summarized in Tables 1 and 2.

The results confirm the efficiency of 2,4,5-T materials, as basal applications, when applied in oil, and their unreliability when water is the "carrier". They also indicate the relative efficiency of 2,3,6-TBA in water and of fenuron pellets applied at the higher rate; the ineffectiveness of fenac, simazine and monuron/borate/chlorate/2,4-D granules.

Results confirm the inefficiency, as coverage sprays, of 2,4,5-T formulations and of fenac and simazine at the dilutions and rates used. They indicate the relative efficiency of 2,3,6-TBA and fenoprop.

PLOT TRIAL

A further trial incorporating some of the newer chemicals was also established in December, 1959. Treatments were, 2,4,5-T 4 lb; 2,3,6-TBA 4 lb; fenoprop 4 lb; fenac 4 lb as coverage sprays in 100 gal water; and in addition fenuron pellets and monuron/borate/chlorate/2,4-D both at 32 lb pellets or granules per acre.

Plants treated were medium-sized, dense, up to 6 ft in height, and approximately 250 per acre.

Though 2,4,5-T, fenoprop and 2,3,6-TBA gave good top growth kills and suppressed seeding for two seasons, none of the treatments proved satisfactory. Dry weather following application adversely affected the efficiency of fenuron, but the rate per acre of this material and of 2,3,6-TBA and monuron/borate/chlorate/2,4-D granules would be too low for the type and density of infestation concerned. Fenac killed 40% of original top growth but monuron/borate/chlorate/2,4-D granules had no apparent effect on the sweet brier.

TABLE 1: BASAL APPLICATIONS

<i>Treatments</i>			<i>Per Plant (Pints)</i>	<i>Results*</i>		
<i>Chemical</i>	<i>Dilution</i>			<i>Eff.</i>	<i>Mod. Eff.</i>	<i>Non-Eff.</i>
2,4,5-T (in oil)		1: 100	1	X		
2,4,5-T (in oil)			2	X		
2,4,5-T (in water)		1: 50	1			X
2,4,5-T (in water)			2		X	
Isomers trichlorophenoxyacetic acid (in water)		1: 55	1			X
Isomers trichlorophenoxyacetic acid (in water)			2			X
Isomers trichlorophenoxyacetic acid (in oil)		1: 55	1	X		
Isomers trichlorophenoxyacetic acid (in oil)			2	X		
Invert emulsion trichlorophenoxyacetic acid (in water)		1: 55	1			X
Invert emulsion trichlorophenoxyacetic acid (in water)			2		X	
2,3,6-TBA (in water)		1: 30	1		X	
2,3,6-TBA (in water)			2	X		
Fenac (in water)		1: 25	1			X
Simazine (in water)		50%	¼ oz			X
Simazine (in water)			½ oz			X
Simazine (dry)			1 oz			X
Fenuron pellets (dry)		25%	½ oz			X
Fenuron pellets (dry)			1 oz		X	
Fenuron pellets (dry)			2 oz	X		
Monuron/borate/chlorate/2,4-D granules (dry)		—	1 oz			X

* Eff.: Efficient — all 3 plants killed.

Mod. Eff.: Moderately efficient — 2 plants killed.

Non-Eff.: Inefficient — not more than 1 plant killed.

TABLE 2: COVERAGE SPRAYS

<i>Treatments</i>			<i>Per Plant (Pints)</i>	<i>Results*</i>		
<i>Chemical</i>	<i>Dilution</i>			<i>Eff.</i>	<i>Mod. Eff.</i>	<i>Non-Eff.</i>
2,4,5-T (in water)		2: 100	3			X
2,4,5-T (in oil)		2: 100	1½			X
Invert emulsion 2,4,5-T (in water)		3: 100	3			X
2,3,6-TBA (in water)		5: 100	3	X		
Isomers of trichlorophenoxyacetic acid (in oil)		2: 100	1½			X
Isomers of trichlorophenoxyacetic acid (in water)		2: 100	3			X
Fenoprop (in water)		3: 200	3		X	
Fenac (in water)		4: 100	3			X
Simazine (in water)		8: 100	3			X

* Eff.: Efficient — all 3 plants killed.

Mod. Eff.: Moderately efficient — 2 plants killed.

Non-Eff.: Inefficient — not more than 1 plant killed.

1960-61 TRIALS

As initial investigations indicated that 2,3,6-TBA as a coverage spray might have to be employed, in relatively concentrated solutions, a trial was started in December, 1960, to compare 2,3,6-TBA with the butyl ester of 2,4,5-T at three comparable strengths as in Table 3.

TABLE 3: 2,3,6-TBA AND 2,4,5-T AS COVERAGE SPRAYS

Solution Strength of	
2,3,6-TBA	2,4,5-T
1: 25	1: 35
1: 50	1: 75
1: 75	1: 105

All treatments were applied at 2 pints per plant, sufficient for complete coverage, with 3 plants per treatment.

Plants treated with the two weaker dilutions of both herbicides were recovering strongly 14 months after spraying, with the exception of one (smallest) plant treated with 2,4,5-T at 1:105 which had died.

2,3,6-TBA (1:25) and 2,4,5-T (1:35) had each killed one plant, the remaining plants in each treatment showing long delayed and very weak signs of recovery. The chances of survival of these appear better where 2,4,5-T was used even though all three plants in this treatment appeared dead when examined 11 months after spraying.

A second trial was also established in December, 1960, with a tractor-operated spray unit on three blocks of medium-sized sweet brier. The blocks varied in size from $\frac{1}{4}$ to $\frac{1}{2}$ acre.

Treatments were applied as coverage sprays as follows:

Block 1: Sodium salt of 2,3,6-TBA*				1:40
Block 2: 2,3,6-TBA				1:20
Block 3: 2,4,5-T				1:35

* Equivalent to 1: 40 amine salt of 2,3,6-TBA.

When inspected in May, 1962, results were assessed as shown in Table 4.

TABLE 4: BLOCK TRIAL, COVERAGE SPRAYS
(Recorded as number of plants affected)

Treatment	Recovery Effects		
	Dead	Slight	Strong
Sodium salt of 2,3,6-TBA (1: 40)	19	12	Nil
2,3,6-TBA (1: 20)	3	10	8
2,4,5-T (1: 35)	Nil	9	20

The difference in formulation of the two 2,3,6-TBA materials is not considered responsible for the variation in results obtained. Other variables, in laying down an intended demonstration rather than an experiment, confuse the issue.

FURTHER BASAL AND COVERAGE SPRAY TRIALS

The final two trials considered in this review were established in August and October, 1961, and are still current.

The August trial included two sections, both of basal treatments.

Section A is a non-replicated block trial and the treatments were: (1) 2,4,5-T in oil — dilution 1: 80; (2) 2,3,6-TBA in water, 1: 30; (3) invert emulsion in 2,4,5-T in 92% water + 8% oil, 1:55, and fenuron pellets at 0.75 oz a.i. per plant. The solutions were applied at $1\frac{1}{2}$ to 3 pints per plant according to size. The plants were mainly medium-sized, tending towards "thickets", with much dense basal trash, mostly grass.

The 2,4,5-T in oil and invert emulsion treatments suppressed normal spring foliage development. Sparse foliage developed on the other plots with 2,3,6-TBA giving the greater suppression of the two.

In April, 1962, 34 weeks after application, the 2,3,6-TBA and fenuron treated plants still exhibited chemical treatment effects but fresh "crown" regrowths were apparent on most plants in the 2,4,5-T in oil and 2,4,5-T invert emulsion plots. The failure of 2,4,5-T in oil in this trial could be attributed to the "thicket" nature of individual plants and the interference by dense basal trash which rendered thorough basal application very difficult. The exceptionally dry spring and summer periods following upon application would have adversely affected the fenuron pellet treatment.

In Section B of this trial, 2,3,6-TBA pellets (5%) at 0.25 and 0.5 oz a.i. per plant were compared with fenuron pellets at 0.5 oz a.i. per plant. As only a limited supply of 2,3,6-TBA pellets was available, only 3 plants were included in each treatment.

By April, 1962, none of these treatments had proved fatal to sweet brier though the highest rate of 2,3,6-TBA had suppressed "hip" formation to the greater degree and residual effects of treatment were still apparent. Unseasonal weather following application, doubtlessly affected the efficiency of pellet treatments.

The last trial for discussion is a coverage spraying one commenced October, 1961. The individual, small-medium-sized, plants in this trial also tended towards thickets but offered no difficulty to coverage spraying. There are five plants per treatment and all chemicals were applied in water solutions.

The treatments applied and interim results are given in Table 5.

TABLE 5: COVERAGE SPRAYS
(Recorded as number of plants affected)

<i>Treatment Chemical</i>	<i>Dilution</i>	<i>Interim Results</i>	
		<i>Apparently Dead</i>	<i>Recovering</i>
2,4,5-T	1: 60	Nil	5
Fenoprop	1: 66	4	1
Methoxy 2,3,6-TBA	1: 40	2	3*
2,3,6-dichlorobenzoic acid	1: 66	2	3

* Slow, weak recovery with residual effects apparent.

The interesting feature of this trial, to date, is the promising results shown by fenoprop. This material has always been considered more efficient than 2,4,5-T as a coverage spray on sweet brier, but the difference was not thought to be significant.

TRANSLOCATION OF 2,3,6-TBA

The ability of 2,3,6-TBA to translocate in sweet brier was demonstrated by the "tip immersion" technique in December, 1960. Cane tips, in full leaf, were immersed in 200 ml of 2,3,6-TBA solutions for periods of 30 minutes.

Where the 1:35 solution was used, a young axial shoot and its foliage 4 ft below the immersed tip reacted, typically, to chemical treatment. Similarly, young shoots up to 4 ft above "crown" level on an adjoining cane evidenced typical reactions. The total distance translocated was estimated as approximately 12 ft. No signs or symptoms of chemical treatment were noted in the older shoots and leaves of the plants concerned except for those portions actually immersed in the solutions.

CONCLUSIONS

Investigations outlined in this paper have confirmed a number of earlier findings and added some further knowledge concerning a few materials showing promise in 1960 or becoming available since.

Conclusions drawn can be summarized as:

- (1) The inefficiency of 2,4,5-T as a coverage spray on sweet brier and the relatively better efficiency of 2,3,6-TBA in this respect, even though the latter requires to be used at the fairly concentrated spray solutions of 1:20 to 1:40. Improved efficiency is considered due to 2,3,6-TBA's ability to translocate, as demonstrated by "tip immersion" technique.
- (2) The more severe effects produced by fenoprop than by 2,4,5-T as a coverage spray. In one trial, at least, the former shows promise of comparing favourably with 2,3,6-TBA. This warrants further investigation.
- (3) The failure of materials other than 2,3,6-TBA and possibly fenoprop to show any promise as being worth while for coverage spraying — the most desirable chemical method for eradicating sweet brier.
- (4) The relative efficiency of 2,4,5-T in oil, 2,3,6-TBA in water and fenuron pellets, as successful basal applications, provided the treatment can be thoroughly and efficiently applied.
- (5) The unreliability of even the best of the basally applied materials when (a) plants are of a "thicket" nature, or (b) when excess basal trash interferes with chemical application, or (c) in the case of fenuron applied as powders or pellets, when prolonged periods of low soil moisture conditions follow upon application.
- (6) The relative inefficiency of 2,4,5-T in water solutions compared with 2,4,5-T in oil solutions and 2,3,6-TBA in water, for basal spraying.
- (7) That basal spraying, where and when it can be efficiently applied, still offers the most reliable method of attack on sweet brier and one that is most economical of materials.
- (8) That 2,3,6-TBA and possibly fenoprop offer the best possibilities, as coverage sprays.

FUTURE WORK

Attempts to determine more efficient materials and methods for the chemical control of sweet brier will continue. Further trials will include the benzoic acid and 2,4,5-TP formulations including polychlorobenzoic acid in granular form; the triazines; pentachlorophenol; amitrole, and other weedicides that offer any promise as coverage sprays or basal treatments.

The influence of grazing management and other farm management practices in relationship to sweet brier invasion and eradication are also being investigated in Central Otago.

B. J. Molloy, Department of Agriculture, is engaged on intensive studies relating to the autecology of sweet brier and it is anticipated that his work will be of material assistance in eventually solving the brier problem.

The Entomology Division of the Department of Scientific and Industrial Research has also requested the Commonwealth Institute of Entomology to search for a likely, biological control, agent.

Somewhere within these spheres and within the future, lies the final answer to sweet brier. Meanwhile, the problem should be tackled with the methods available.

REFERENCES

- Sewell, T. G. 1952: Chemical Control of Sweet Brier. *Proc. 5th N.Z. Weed Control Conf.*
- Dingwall, A. R. 1954: Sweet Brier Control Trials. *Proc. 7th N.Z. Weed Control Conf.*
- 1956: Sweet Brier Control. *Proc. 9th N.Z. Weed Control Conf.*
- ; Richards; Schofield, 1960: The Control of Sweet Brier. *Proc. 13th N.Z. Weed Control Conf.*

Unless otherwise stated, the herbicides quoted as being used in trials were:

Butoxyethanol ester of 2,4,5-T as the oil-soluble ester	7.2 lb a.i. per gal.
Butyl ester of 2,4,5-T	3.6 lb a.i. per gal.
Invert emulsion 2,4,5-T	4.0 lb a.i. per gal.
Mixed isomers of trichlorophenoxyacetic acid	4.0 lb a.i. per gal.
Mixed isomers of trichlorophenoxyacetic acid oil soluble ester concentrate	7.2 lb a.i. per gal.
Polypropylene glycol butyl ether ester of fenoprop	4.8 lb a.i. per gal.
Amine salt of 2,3,6-TBA	2.4 lb a.i. per gal.