SWEET BRIAR CONTROL

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THIS is the third occasion that the problem of sweet briar (*Rosa eglan-teria*) has come up for discussion at a Weeds Conference. I doubt very much whether it will be the last.

In two previous papers, Sewell (1952) and Dingwall (1954) outlined the scantily recorded history of sweet briar in this country, gave some indication of its growth habits and distribution, commented on control problems, and detailed the results of experimental work carried out from 1946 to 1954.

Schofield (1954) in a further paper entitled "Scrub Weeds of Central Otago" also made special reference to this weed and its alarming spread in Central Otago following the decrease in rabbit population and the increase in bird life. He also strongly advocated investigating the possibilities of biological control.

All three papers have been published in the proceedings of either the 5th or 7th Conference. Hence, this paper will be confined mainly to a summary of the results obtained with various weedicides throughout a series of chemical control trials conducted from 1951 to the autumn of 1956.

But, first, some mention will be made of the present distribution and extent of sweet briar throughout New Zealand as revealed by a survey in the 1954-55 season.

DISTRIBUTION AND EXTENT (*The 1954-55 Survey*)

The 1954-55 survey took the form of a questionnaire circulated to Extension Division field officers of the Department of Agriculture.

The information obtained is as follows:—

For the North Island

Sweet briar, though fairly widespread, is not a serious problem of northern farmlands. Only in parts of the King Country, Manawatu-Horowhenua, the Wairarapa, and Poverty Bay does it appear to cause local concern. Even in these areas infestations are comparatively light and mainly confined to roadsides and waste places.

Heaviest infestations consist mainly of scattered plant communities located near Otorohanga in the King Country, on the eastern bank and middle reaches of the Rangitikei River (Manawatu County), between Otaki and Te Horo in Horowhenua, near Gladstone and Pirinoa in the Wairarapa, and in the Matakaoa County and watersheds of the Uawa and Waiapu Rivers in northern Poverty Bay.

Sweet briar appears elsewhere as in Northland, the Wairoa district, and near Norsewood and Piripiri in southern Hawke's Bay, but is rarely observed in the Waikato or Taranaki. It has not become established in the tussock country of the Central Plateau.

There are few reports of stock losses or wool damage and apparently few attempts at control.

Sweet briar's significance as a weed problem in the North Island is overshadowed by the more aggressive manuka (*Leptospermum scoparium*), gorse (*Ulex europaeus*), and fern, (bracken, *Pteridium esculentum*, and hard *Paesia scaberula*), which thrive on the heavier soil

types and under the relatively high rainfalls that generally prevail in the north.

The South Island

The position in the South Island is vastly different. Here sweet briar occurs in all of the 48 counties covered by the survey (Fiordland not included). It is widespread from the Nelson Land District to Southland and from sea level up to 3,000ft. and is encountered in most areas of the vast extent of fescue (*Festuca* spp.) and silver (*Poa* spp.) tussock grasslands of the foothills and high country.

Heavy to moderately heavy infestations—in places extending up to 100 acres or more, and often including dense thickets—occur in the Waihopai Valley, on Molesworth Station and the middle reaches of the Clarence River in Marlborough, at Glenhope (Upper Waiau River), Hanmer, the Leader River, Lees Valley in North Canterbury, in the Esk Valley and Bealey, Cass and Broken River Districts of the Waimakariri Catchment, and east and south of Lake Tekapo and on both sides of Lake Pukaki in the Mackenzie Country.

Otago-Southland areas occur at Omarama and the Hakataramea Valley (North Otago), along the Shag River (Waihemo County), between Patearoa and Naseby (Maniototo County), near Lawrence (Tuapeka County), in the Lakes, Te Anau-Manapouri area (Wallace County), and between Lumsden and Garston (Southland County). Sweet briar is very strongly established in the Upper Shotover catchment.

In fact, it is not difficult to find in the inland watersheds of all the snow-fed rivers east of the main divide.

Sweet briar is spreading in most inland, high country areas with most rapid, recent gains in Central Otago and the Mackenzie Country.

In the Nelson and Westland districts and in eastern coastal areas generally it is but lightly established, though there are some moderately heavy infestations in some of the more fertile valleys of Banks Peninsula.

Some stock loss and wool damage is reported and, in a number of areas, control is attempted by cutting, grubbing, and the use of sodium chlorate dressings or hormone sprays.

EXPERIMENTAL RESULTS

The main series of chemical control experiments began in 1951 with various weedicides applied either as coverage sprays or basal sprays and dustings to established plants, or as sprays or dressings to the regrowth from cut stumps.

Results achieved to date with each of these weedicides are as follows:—

(1) As Coverage Sprays on Well-established Plants:—

(a) **Butyl and butoxy ethanol esters of 2,4,5-T:** In 11 trials some 103 plants have been treated with complete foliage sprays using either of these volatile or low volatile, oil-soluble esters of 2,4,5-T. Spray dilutions, in water, ranged from 1 in 20 to 1 in 1500. Spraying was done in June and July (plant dormancy); August (commencement of spring growth); November to December (full leaf to flowering period); and in February and March (advanced "hip" stage).

Most applications were made during November to March and at dilutions of 1 in 20 to 1 in 500. The results of these are to be seen in Table 1.

TABLE 1: Coverage Sprays—Oil-soluble esters of 2,4,5-T
(November to March Applications)

No. of trials	No. of applications	No. of plants Treated	No. of plants Killed	Per cent. kill
9	1st	66	2	3
5	2nd	52	25	48
3	3rd	34	31	94

These results indicate that the butyl and butoxy ethanol esters of 2,4,5-T diluted in water and applied as coverage sprays to well-established plants are not particularly efficient against sweet briar. They give spectacular foliage kills and may delay full recovery for two seasons. However, plants invariably recover from crown or basal cane buds and three sprayings are required to secure satisfactory kills.

The addition of 10 parts of dieselene to the ester and water solution increases its efficiency to some extent in that 5 plants sprayed with this mixture were all eradicated by two applications.

(b) **2,4,5-T and other weedicides in combination:** The oil-soluble esters of 2,4,5-T have been tried to a limited extent in combination with other chemicals. The mixed esters of 2,4-D and 2,4,5-T, applied in December at 1 in 100, gave good foliage kills, but plants recovered earlier than those treated with 2,4,5-T alone. A second application of the mixed esters killed 1 of 3 plants, whereas 2,4,5-T alone killed 4 out of 6 plants.

In a June application of 2,4,5-T (1 in 250) as a coverage spray plus sodium chlorate (4oz.) as a basal dressing 1 of 3 plants was killed, the remaining plants failing to recover strongly until the second season. 2,4,5-T (1 in 20) had a similar delaying effect, but at 1 in 250 the plants fully recovered during the second season.

DNBP was added to 2,4,5-T (1 in 500) at the rate of 4oz. per gallon of spray mix, but did not improve efficiency.

On the other hand, with December-treated plants a 50/50 mixture of butyl ester of 2,4,5-T and ATA at 1 in 100 top growth was quickly killed and regrowth did not appear for 18 months. Plants treated with ester 2,4,5-T alone commenced regrowth within 9 months and were strongly re-established at 18 months.

(c) **Polyethylene glycol ester of 2,4,5-T:** The water-soluble polyethylene glycol ester of 2,4,5-T was tested twice as a coverage spray. Dilutions ranged from 1 in 250 to 1 in 700. A single application failed to kill any of the 16 plants treated and only 10 per cent. to 40 per cent. of existing top growth was killed. Plants recovered quickly. Only 2 plants were given a second treatment with this ester. Both appeared to recover fully, but one of these subsequently died some 18 months after the second treatment.

(d) **2,4,5-TP:** In a recent trial, December treatment with 2,4,5-TP at 1 in 100 gave complete top growth kill and long delayed recovery similar to that obtained with 2,4,5-T plus ATA. This propionic acid derivative appears more efficient against sweet briar than the acetic acid one, without actually proving lethal as a single application.

(e) **4-C:** This hormone was tried at 1 in 100 and 1 in 500 as a December spray. It had no significant effects and even failed to suppress "hip" development during the following autumn.

(f) **Inorganic chemicals:** Sodium chlorate, as 5 and 10 per cent. solutions, was applied during July, August, November, and December in 4 trials. Complete coverage gave good foliage kills in summer sprayings. None of the 16 treated plants was killed by a single spraying, and leaf bud formation was not greatly suppressed. Hence, plants recovered more quickly than from 2,4,5-T treatment.

In 3 trials, 13 plants received a second chlorate treatment, but only 1 (less than 8 per cent.) was killed. This compares unfavourably with the 48 per cent. kill with two applications of 2,4,5-T. Three applications of sodium chlorate killed 2 out of 6 plants; that is, 33 per cent. compared with 94 per cent. achieved with three 2,4,5-T sprayings.

A boron-chlorate material, tested only in one trial and as a weak, 5 per cent. solution, had very little effect on sweet briar.

(2) Basal Applications to Established Plants

Basal applications were applied in two forms: (a) as sprays applied to the crown and cane bases up to a height of 15in., and (b) as a basal dressing in dry, powdered form.

Sodium chlorate in dry form or diluted in water was included in 7 trials laid down in May, June, July, August, and December. Rates varied from 2oz. to 8oz. per plant with most applications at 4oz. or more. Only 1 of the 30 plants so treated was killed. This one died suddenly over 12 months after treatment. At best, sodium chlorate dressings seldom kill more than 40 per cent. of existing top growth.

TCA was employed in only one trial and at 4oz. per plant. As might be expected, sweet briar appeared to thrive on it.

The boron-chlorate weedicide at 4oz. and 8oz. per plant failed to kill more than 25 per cent. of existing top growth.

Much better success was achieved with two urea compounds, CMU and PMU. CMU in 3 trials was applied to 18 plants at rates varying from $\frac{1}{4}$ oz. to 8oz. per bush. Fourteen, or approximately 78 per cent. of these, were killed by a single application and only the lowest ($\frac{1}{4}$ oz.) rate proved relatively ineffective.

PMU was used in only 1 trial on 9 plants at rates from $\frac{1}{4}$ oz. to 2oz. It killed 7 (also 78 per cent.), including one at the $\frac{1}{4}$ oz. rate, and appears more efficient on sweet briar than CMU, especially at the lower rates.

These urea weedicides, though expensive, were by far the most effective basal dusts tried.

2,4,5-T in dieselene and in water: However, the most reliable and cheapest form of basal application proved to be the oil-soluble esters of 2,4,5-T in dieselene. In 2 trials 12 plants were treated with this solution at dilutions of 1 in 20 and 1 in 40. All 12 plants were killed by one application. The 1 in 40 solution proved as effective as 1 in 20 and 1 pint per plant as efficient as 2 pints.

On the other hand, with similar dilutions and rates of 2,4,5-T in water all 14 plants so treated recovered.

In a recent trial (February 1955) dieselene alone has shown distinct promise and is being further tested.

(3) Treating Cut Stump Regrowth

Economy in spray materials and more effective results can usually be obtained by treating young regrowth rather than mature plant material.

In a 1952 trial 5 per cent. sodium chlorate and the butoxy ethanol and polyethylene glycol esters of 2,4,5-T at 1 in 500 and 1 in 700 respectively were applied to 15 plants; 5 replications of each treatment at 1 pint per stump.

Sodium chlorate killed all 5 plants and the esters, 2 each. The weak regrowth from the remaining 6 plants was readily killed by a second spraying. Results of a further trial in October 1953, with sodium chlorate, 2,4,5-T, and a boron-chlorate weedicide suggested that the regrowths could be killed—irrespective of chemical treatment—provided stock had access to and browsed the treated shoots.

Consequently a more comprehensive experiment was started in 1954 incorporating protected and unprotected regrowths treated with an oil-soluble ester of 2,4,5-T in water and in dieselene; sodium chlorate and CMU.

A summary of the 3 trials clearly indicates that the success of single applications of some chemicals, notably sodium chlorate and 2,4,5-T in water, is also dependent upon sheep browsing the treated stumps. In all 28 chemically treated plants were protected from stock and only 6, or approximately 21 per cent., were killed by one application. On the other hand, of 43 unprotected plants 32, or approximately 75 per cent., were eliminated.

In the latest trial, as in the case of basal applications, the 2,4,5-T and dieselene mixture (1 in 20, at 1 pint per stump) proved most efficient, killing 5 out of 6 stumps irrespective of whether they were protected or not. CMU at $\frac{1}{4}$ oz. and 1oz. killed 6 unprotected plants but, so far, only one of the protected ones. In all regrowth treatment trials sodium chlorate has killed 12 of 13 unprotected plants and only 1 out of 8 protected ones.

CONCLUSION

After 5 years of trials these are the main conclusions reached:—

First: Of the chemicals tested extensively the oil-soluble esters of 2,4,5-T provide the most efficient coverage sprays. Three applications are necessary to ensure satisfactory kills. Spray, initially, at the full leaf-flowering stage with dilution of 1 in 100 to 1 in 250. Repeat treatments when regrowths are in leaf. Complete spray coverage is essential.

Secondly: 2,4,5-TP and a 50/50 mixture of 2,4,5-T and ATA appear, from limited evidence, more efficient than 2,4,5-T without actually proving lethal at one application.

Thirdly: Basal application—especially with the oil-soluble ester of 2,4,5-T in dieselene at 1 in 40 and 1 pint per plant—is the cheapest and most reliable method for chemically eradicating standing sweet briar. One application gives very satisfactory results.

The urea compounds CMU and PMU are also reliable, but more expensive, at 1oz. per plant.

In comparison sodium chlorate at rates of up to 8oz. per plant is relatively inefficient.

Finally, cut stumps can be eliminated, generally, by one treatment of the regrowth with either 10 per cent. sodium chlorate; 2,4,5-T in water (1 in 100); CMU or PMU at 1oz. or less or even 5 per cent. boron-chlorate, providing sheep have access to and browse the treated stumps.

2,4,5-T in dieselene (1 in 40) at 1 pint per stump kills them whether they are browsed or not. It will also kill uncut plants just as readily as it kills cut ones.

DISCUSSION

Q.—Were any trials carried out in Wanganui and Rangitikei areas?

A.—No. All trials were conducted in the Upper Waimakariri Catchment.

Q.—Was CMU applied as a dust or a liquid?

A.—Both forms were used.

Q.—Has sodium chlorate any harmful effects on the operator?

A.—Fire risk is the main danger. Atlacide is used as a safer alternative. Stock appear to be attracted to stumps treated with Atlacide and sodium chlorate, but with no harmful effects.

Q.—What is your experience of spraying the whole plant as against a basal dressing in the dormant period?

A.—To date coverage sprays are not effective in the dormant period, but further trials are necessary.