THE CONTROL OF SWEET BRIER

By A. R. DINGWALL, J. G. RICHARDS and R. C. SCHOFIELD,
Department of Agriculture

SUMMARY

SWEET brier (*Rosa rubiginosa*: syn. *Rosa eglanteria*) has been long established in New Zealand and has become one of the most widespread and difficult-to-eradicate weeds of pasture land, and notably so in the open tussock grasslands and waste places of the South Island high country. Its encroachment has been rapid in recent times in many areas where rabbits were formerly a serious pest. Endeavours to find a practical solution to the problems posed by this aggressive and difficult-to-kill weed have been intensified during the past 10 years. The ultimate solution has not, as yet, been found, but some progress has been made. Sweet brier can be eradicated, but with the materials and methods available there are still practical difficulties and eradication is costly under the environmental and economic circumstances associated with large-scale and widespread infestations.

The paper deals briefly with such aspects as species propagation, seed dormancy and viability, the influences of browsing, cutting, grubbing and burning on brier growth and control, and biological control as a possible solution. Mechanical aids are also discussed and chemical control methods outlined.

The paper concludes with the authors' recommendations as to ways and means of attack.

A reference to previous papers is appended.

Sweet brier (*Rosa rubiginosa*: syn. *eglanteria*), a native of Europe and western Asia, has been naturalised in New Zealand since early colonial days (1).

From its innocent introduction as an ornamental and hedgerow plant, sweet brier soon became an aggressive and widespread weed of waste places and open pasture lands.

Its encroachment has been much more marked in the South than in the North Island and especially so in the favoured environments of open tussock grasslands east of the Main Divide. Today, it occurs in all South Island counties and is viewed with concern in many inland parts of Marlborough, Canterbury, Otago, and Southland (2).

The Rabbit Destruction Council's successful "killer" policy removed a significant form of biological control and has been, indirectly, partially responsible for sweet brier's conspicuous advancement in recent times. But sweet brier has also gained ground in areas where rabbits have never been a problem.

PROPAGATION

As a long-lived perennial—there appears to be no known record of sweet brier dying of old age, though a proportion of the older canes may die out annually—sweet brier propagates both sexually—by prolific seeding—and asexually by crown tillering and root suckers. Under natural conditions its encroachment and widespread distribution are largely attributable to seed dispersals by birds and animals, which relish its attractive, many-seeded fruits.

SEED DORMANCY AND VIABILITY

There is little factual evidence concerning the viability and longevity of sweet brier seeds. A laboratory test of freshly gathered seed has shown 1 per cent germination in 49 days and only 19 per cent in 451 days. Seed has to be held constantly at 41 degrees F (5 degrees C) for at least six months to

induce germination readily. A tetrazolium test on seed collected from sprayed bushes indicated possible germination of from 47 to 86 per cent, while a similar test on a sample after seven years' storage suggested a possible 50 per cent viability.

Preliminary investigations in mountain tussock grassland soils indicate that fresh seeds sown in late winter (August) do not give rise to seedlings until the second spring; that is, 14 months after sowing, with approximately 50 per cent seedling emergence (3).

On the other hand seed ingested and subsequently deposited by cattle has been observed to germinate immediately favourable conditions arose. It would appear therefore that naturally shed seeds exhibits a considerable period of dormancy, but that dormancy can be affected by ingestion of the seed.

The prolific and widespread appearance of sweet brier seedlings in many areas following the removal of dense rabbit populations also suggests that seeds remain dormant and viable in the soil, constituting a potential source of reinfestation for many years.

BROWSING

Seedlings, while soft and succulent, are susceptible to browsing, but growth soon becomes woody, thorny, and unattractive to animals. Browsing, when sufficiently concentrated, can prohibit the establishment of sweet brier seedlings. Under the natural vegetative and topographical conditions of montane tussock grasslands adequately concentrated grazing by stock is, too often, impracticable. The position can sometimes be rectified by grassland improvement—oversowing, topdressing, and subdivision—to intensify competitive cover and browsing and thus minimises the risk of sweet brier establishment in areas threatened by invasion or reinvasion. Such measures should be adopted wherever feasible.

Autumn and winter browsing has been demonstrated as an essential eliminating factor where sweet brier top growth has been removed and the stump is sprayed with certain chemicals that, in themselves, are not fatal to sweet brier. The practical drawback to this method of control lies in the cutting, removal, and disposal of top growth where large-scale infestations are involved. It is physically impossible for stock to browse completely all the crown regrowths of mature, uncut plants.

CUTTING AND BURNING

Hand cutting is laborious and time consuming. Mechanical cutting, whether by chain- or knife-type cutters, generally proves inefficient, owing to the tough and whippy nature of sweet brier growth and the difficult terrain it frequently inhabits.

Neither cutting nor burning will eradicate sweet brier and, if repeated, may tend to stimulate rather than eliminate. The explanation for this lies in the fact that regrowth from bud development in sweet brier arises from several forms of buds: (a) normal, leaf-axial, buds; (b) latent, stem, buds located along the basal portions of the canes; (c) dormant, crown buds; and (d) adventitious buds in the root tissues, from which suckers arise.

When the top growth, with the exception of an inch or two of the cane bases, is removed by cutting, the plant retains the power of regeneration from latent stem and dormant crown buds or by adventitious suckering.

Burning, and sweet brier does not burn readily, may kill all top growth and surface crown buds, but fails to affect deep-seated crown and adventitious (root) buds.

Cutting and/or burning are useful only for opening up difficult stands of sweet brier to facilitate further treatment or for suppressing seed formation for two, or possibly three, seasons.

GRUBBING AND MECHANICAL METHODS

Complete removal of the crowns and root system by hand grubbing, mechanical pulling, and rooting or some form of deep cultivation offers the only physical means of ensuring that bud growth regeneration is suppressed. But even these methods are of limited application.

Hand grubbing is confined of necessity to seedlings and small scattered plants of light infestations. Mobile power can be applied in pulling denser stands and larger plants, especially where the latter exist as distinct crown rather than as individual thickets. Bulldozing and rooting can be usefully employed in dealing with excessively large bushes in dense thicket formation or in cleaning up accessible waste area such as river and stream beds. Deep cultivation, combined with crop rotation and sowing down to permanent pasture, while effective, is only occasionally feasible.

BIOLOGICAL CONTROL

The biological control of weeds—both intentionally, as of St. John's wort (*hypericum perforatum*) by chrysomella beetles, and unintentionally, as of manuka (*Leptospermum scoparium*) by "blight" (scale insects and sooty mould)—has, at times, proved spectacular. Considerable interest has been expressed on more than one occasion in this method as a possible solution to the sweet brier problem.

Most of the diseases and pests which plague the rose enthusiast are well established and widely distributed throughout New Zealand, but have failed to have any significant effect on sweet brier, which appears highly resistant to natural, biological attack, browsing by rabbits excepted.

Though endemic diseases and pests have, so far, proved innocuous in controlling sweet brier—either in New Zealand or in overseas countries where this species is a problem, it is not beyond the bounds of possibility that some successful form of biological control could be located. Should this occur, its introduction would need careful screening to safeguard the many important commercial members of the order *Rosaceae*.

CHEMICAL CONTROL

Attempts at chemical control of sweet brier commenced in New Zealand as early as 1899 (4). None of the non-selective inorganic herbicides initially available met with any success, with the possible exception of sodium chlorate, which became more or less standard practice as a basal dressing on sweet brier during the 1930s.

Sodium chlorate will kill sweet brier if applied in sufficient quantity, but in recent trials has been proved much less efficient than some of the newer compounds, notably the synthetic ureas.

The discovery of organic chemicals with selective herbicidal properties reawakened interest in the possibilities of chemical control of sweet brier.

Since T. G. Sewell's first trials with hormones in 1946-48 (5), approximately 70 official experiments have been under action by several investigators in North Canterbury and North and Central Otago (6). Many and various types and formulations of hormone compounds and the more recently introduced weedicide materials such as synthetic ureas (monuron and fenuron); phenols, polyborchlorates, TCA, fenac, and simazine have been tested.

COVERAGE SPRAYS

In view of the nature and extent of the majority of sweet brier infestations and the environmental, farm management, and economic factors associated with them the search for a cheap and efficient coverage spray adapted to aerial application has been foremost in the minds of most investigators.

To date this search has proved unavailing.

Summer (November-December) applications of the esters of phenoxyacetic or phenoxypropionic acids (2,4,5-T and 2,4,5-TP) or mixed esters of 2,4-D/2,4,5-T result in rapid and spectacular foliage kills and suppress seeding for at least two seasons. But the plants themselves almost invariably recover from a single treatment. Two further repeat treatments may achieve satisfactory kills, but are not always reliable, especially so with aerial applications.

Coverage spraying is useful for opening up difficult-to-treat stands to facilitate a follow-up basal treatment. The oil-soluble concentrate ester of

2,4,5-T at 1.8 lb acid equivalent in 15 gallons of diesel oil per acre applied aerially at the full leaf-flowering stage is suitable for this.

An autumn burn may serve the same purpose at the cost of a match!

Coverage spraying is inefficient except for spot spraying of seedlings and very young plants, mainly because the chemicals available do not translocate readily if at all in sweet brier. 2,3,6-TBA, a benzoic acid derivative reputed to be useful against cherokee (*R. laevigata*) and macartney (*R. caractiata*) briars in America is slower acting than 2,4,5-T (7). The amine salt formulation available appears to translocate to some extent, but current tests are as yet inconclusive.

BASAL TREATMENTS

Sprays

Basal spray treatment of sweet brier has proved more reliable than coverage spraying, always providing the treatment is applied thoroughly. This entails spraying the crown and all canes to a height of 12 to 15 in. and the ground surrounding the crown within a radius of up to 18 in. The oil-soluble concentrates of ester 2,4,5-T in diesel oil at 3.6 to 4.5 lb acid equivalent in 60 to 80 gallons of oil per acre should prove sufficient for basally treating a moderately dense stand of medium-sized sweet briars, which require approximately 1 pint of spray solution per plant.

Basal spraying is most reliable where the plants exist as distinct, individual crowns that are readily accessible to treatment. Where individual plants form thickets or the crowns are protected by other plant growth the efficiency of basal applications can be seriously impaired. Basal sprays should be applied in late winter or at spring growth initiation, usually in July or early August.

Dusts and Pellets

So far the most reliably efficient materials for basal treatment of sweet brier have proved to be the synthetic ureas, fenuron and monuron. Both are relatively non-selective soil sterilants with residual effects.

In powder forms (80 per cent active ingredients) they prove effective when applied at $\frac{1}{2}$ to 1 oz. per small to medium-sized plant. More recently limited quantities of pelleted fenuron have become available. These pellets are convenient to apply as a basal dressing and also show distinct promise for broadcast distribution by air if needs be.

The pelleted fenuron available contains 25 per cent active ingredients and in moderately dense infestations of small- to medium-sized sweet briars is reasonably effective at 6 to 8 lb (active ingredient) per acre when applied basally and 12 to 16 lb when broadcast. Both monuron and fenuron appear equally effective on sweet brier. Their time of application does not appear to be very restricted, providing rain can be expected within a week or two after application and there is some growth movement in the treated plants. Plots treated with pellets at the higher rate mentioned have been successfully oversown with clover six to eight months after treatment.

The screening of any new and promising chemicals continues, but to date 2,4,5-T, 2,4,5-TP, fenuron or monuron, and possibly 2,3,6-TBA have proved the only likely materials.

RECOMMENDED ACTION

In the meantime the sweet brier problem tends to grow and any land-owners faced with the seriousness of this problem would be well advised to take immediate action, even though the resources at their command may, at first sight, appear both inadequate and costly.

Where improvable grassland is threatened by invasion, oversow and top-dress or otherwise improve competitive ground cover and grazing control. Maintain constant vigilance and grub out any sweet brier seedlings immediately they appear.

If sweet brier is already invading, with seedling and scattered small plants apparent, preferably grub or spot spray with 2,4,5-T/diesel oil mixture. Follow up wherever possible by improving ground cover and controlled grazing.

Where scattered plants have grown beyond the convenient grubbing stage remove by mechanical pulling or by basal treatment with either 2,4,5-T spray or urea pellets, whichever is the more convenient.

When infestations are already firmly established on a relatively large scale and individual plants are readily accessible to treatment spray basally with the 2,4,5-T/oil mixture.

Under similar circumstances, but where plants tend to form individual thickets rather than distinct and separate crowns, use urea pellets in preference to basal spraying.

Surface trash that interferes with basal treatments should be removed by grazing or burning before attempting chemical control.

Where infestations are strongly established and difficult to penetrate or sweet brier grows in association with other scrub, but would be otherwise suitable for basal treatment, either burn off or open up the area with a light spray of 2,4,5-T applied aerially in summer. Follow up with winter basal spray or spring pellet dressing according to the general nature of the sweet brier plants.

Alternatively such infestations could be treated initially by aerial distribution of urea pellets followed up by basal treatment of any surviving plants.

In waste places that are accessible or exceptionally large plants or thickets bulldozing or mechanical rooting and subsequent chemical treatment of any reviving plants would be appropriate.

For rugged inaccessible areas where aerial application is the only feasible method of attack urea pellets could be used. The expenses involved under such circumstances may not be warranted, at least until the more readily accessible infestations on the better-class country have been eradicated. Seed dispersal from these difficult areas could be prevented by a mid summer application of 2,4,5-T in fuel oil applied aerially every second or third year.

CONCLUSION

On a property where sweet brier is strongly entrenched, it is inevitable, with the present means at our disposal, that more than one method of attack will have to be employed against this aggressive invader.

Moreover, no matter how efficiently infestations of sweet brier are treated initially it must be realised that some regeneration will occur from surviving crowns, root suckering, and dormant seeds.

Constant vigilance and prompt action ably supported by a strongly competitive ground cover and controlled grazing will keep sweet brier out and prevent re-invasion.

Repeated action over a period of time will be necessary to drive it out.

REFERENCES

1. "Sweet Briar Control Trials" (A. R. Dingwall), Proc. 7th N.Z. Weed Control Conf. 1954.
2. "Sweet Briar Control" (A. R. Dingwall), Proc. 9th N.Z. Weed Control Conf. 1956.
3. Unpublished Information—B. J. Molloy, Dept. of Agric.
4. Report of the Department of Agriculture, 1900.
5. "Chemical Control of Sweet Briar" (T. G. Sewell), Proc. 5th N.Z. Weed Control Conf. 1952.
6. T. G. Sewell 1946-52 (North Canterbury), A. R. Dingwall 1951-60 (North Canterbury and Mackenzie County), J. G. Richards 1956-60 (Hakataramea), R. C. Schofield 1957-60 (Central Otago), H. Sievwright (Mackenzie), D. K. Johns (Banks Peninsula) and R. Goodall (Riwaka) have conducted chemical trials. B. J. Molloy (Canterbury) and T. Ludecke (Alexandra) have recently commenced histological and ecological investigations.
7. The Cherokee Rose: *R. Laevigata* Misha—syn. *R. sinica*; *R. Cherokeeensis*; and *R. ternata*. A native of China, Japan, and Formosa. The Macartney Rose: *R. craticata* Wendle—syn. *R. Macartney*.

DISCUSSION

Q.—Have there been any tests carried out with inverse emulsions?

A.—Tests have been done, but to date results are not conclusive.

Comment: Pure acid of 2,4-D and 2,4,5-T in powder form were tested, but proved unsuccessful.

Q.—With 2,3,6-TBA did you apply the material primarily to the ground or as a coverage spray?

A.—Did both separately and together. Quite effective both as coverage and basal application.

Q.—2,3,6-TBA appears to remain active for up to 12 months.

A.—Where treatments were applied in November, autumn regrowths showed effects.

Q.—Would speaker comment on question of farm management in relation to sweet brier problem?

A.—Improvement of ground cover, subdivision, topdressing, and controlled grazing are essential.

Q.—In view of long period before pasture renewal is possible after using monuron and fenuron, has there been any evidence of sweet brier developing again neck and neck with pasture species?

A.—No, sweet brier is slow in establishing and the oversown species get away faster.

Q.—Has work been done with 2,4,5-T granules?

A.—No work has been done with 2,4,5-T, but some with 2,4-D. Results were not good.

Q.—How quickly do canes break down after application?

A.—Brittle canes which break down readily result with 2,3,6-TBA. This material, however, is slow in killing the plant.

Comment: 2,3,6-TBA is effective both on the soil and the foliage.

Comment: 2,3,6-TBA, though a most highly translocated compound, persists for a very long time in soil, especially under low rainfall conditions.

Q.—Fenuron, monuron, and 2,3,6-TBA persist for a long time in the soil. What is the effect of these materials on the germination of sown seed?

A.—This would depend on soil type, rainfall, etc., but six months should be a safe period before oversowing.

Q.—How rapid is the spread of sweet brier? Is there any difference between high and low rainfall?

A.—Under low rainfall sweet brier establishes fairly slowly. Under high rainfall conditions, provided other plant competition is not severe, sweet brier tends to spread more rapidly.

Comment: In the Oamaru area sweet brier is spreading rapidly after seven to eight years.