Identifying the Research Requirements for the Control of Silver Wattle *(Acacia dealbata)* in Natal

P.L. Campbell, R.S. Bell and **R.L. Kluge**

Plant Protection Research Institute
Department of Agricultural Development
Private Bag X9059, Pietermaritzburg 3200
Republic of South Africa

SYNOPSIS

Silver wattle is being effectively controlled by some land-users using combinations of mechanical and chemical control methods together with fire. In rare cases infestations are being indirectly controlled by utilisation. Most control is limited to high potential land. However, little control is being carried out on low-potential land. The development of cost-effective control methods for these situations was identified as the main research need for the control of silver wattle in Natal. Progress with control is also being hampered by poor dissemination of information. The proposed research is designed to meet these needs. The trials will be conducted within communities, in such a way that maximum transfer of results is ensured.

INTRODUCTION

Silver wattle *(Acacia dealbata* Link) originates from south-eastern Australia. It was probably introduced into South Africa after being confused with black wattle *(Acacia mearnsii* de Willd). Because of its fast growth, tolerance to severe frost and usefulness for poles and firewood, it has been planted extensively in montane, moist regions near the Drakensberg and the mistbelt regions of Natal where it is now seriously invasive. The weed has escaped cultivation and occurs widely in southern Africa from the Cedarberg in the south-western Cape Province to the eastern Transvaal and could still extend its range to many other areas of the Transvaal (Henderson and Musil, 1984). In colder regions, silver wattle competes successfully with the more frost-susceptible black and green *(A. decurrens* [Wendl] Willd) wattles.

The success of silver wattle as an invader plant is attributed to its prolific seed production and vigorous vegetative growth. Acacia seeds are long-lived in the soil (Crocker and Barton, 1953; Harrington, 1972) and well-suited to dispersal by water. Germination occurs only after the impermeable seedcoat is damaged by agents such as fire. The problems posed by the high seed production are aggravated by the lack of seed-attacking enemies in southern Africa.

Silver wattle can also sucker from roots and coppice from wounded stumps. Coppice frequently occurs in young trees that have been damaged, increasing the difficulty of access and the costs of control. This distinguishes it from black wattle, where older trees do not coppice from stumps.

Silver wattle is also considered to be allelopathic (Reigosa *et al.*, 1984). Thickets of silver wattle reduce the carrying capacity of veld, suppress desirable indigenous vegetation, disrupt water flow and increase the danger of erosion along streambanks.

The bark of silver wattle is inferior to that of the commercially important black wattle and cannot be sold or used for the extraction of tannin for the leather industry.

Silver wattle is a declared invader plant throughout the Republic of South Africa, as detailed in the Conservation of Agricultural Resources Act No. 43 of 1983 (Government Gazette 9238, 1984). In Australia several herbicides have been reported to be effective for the control of silver wattle (Minko and Flynn, 1981; Stephenson, 1983). Locally there is a paucity of literature on this subject although three herbicides have been registered for silver wattle control and these are applied either to the mature trees (basal stem, frill, stump) or to low foliar growth in the form of seedlings and coppice (Vermeulen and Rankin, 1990). Fire has also long been considered as an important tool in the control of acacias in South Africa (Milton and Moll, 1982; Pieterse and Cairns, 1986). Fire is advantageous because it can reduce the soil seedbank by killing seeds or inducing germination. This is usually combined with oversowing and follow-up spot-spray treatments with herbicides. In this survey we aimed to assess all the control techniques currently being used against silver wattle in Natal and the progress being made with the control of this weed.

METHODS

A survey, workshops and symposia were used to collect the required information.

Survey in Natal

In August/September 1989 a survey was conducted of farming areas in Natal where silver wattle is a problem. Twenty-one farms were selected in the districts of Newcastle/Utrecht; Ladysmith/Van Reenen; Bulwer and Kokstad/Matatiele to investigate which methods were being employed to control wattle infestations. The selection was necessarily biased in order to collate methods being employed by land-users who were active in the control of wattle. Land-users were also rated according to their attitude towards, and the progress made in controlling silver wattle infestations as they occurred in various situations on their farms.

Workshops

Two workshops were held at Cedara to help identify research needs. Representatives from commercial forestry, private herbicide companies, government weed control agencies, extension services and concerned farmers were present at these workshops.

Attendance at various wattle symposia

Three wattle symposia were attended at Normandien, Thomas River and Ladysmith. Attitudes of farmers to the control of wattle were noted, as was the discussion between farmers and the "panel of experts" over the controversy regarding the release of insects for the biological control of wattles.

RESULTS

Methods used in the control of wattle

Four main categories of control were identified for silver wattle in Natal: mechanical and chemical control, fire and utilisation *(Table 1)*. Because of conflicting interests with the black wattle industry (Strubbings, 1977), there is no immediate prospect for the implementation of biological control against silver wattle.

Mechanical control methods most frequently used included ringbarking and hoeing or digging out seedlings, and these methods were considered satisfactory (++) for the initial control of wattle *(Table 1)*. Ringbarking involved stripping away bark, usually from waist height down to ground level. These mechanical treatments were usually supplemented by some form of chemical control.

Only seven of the 21 farmers were using currently registered herbicide products on wattle. However, most products used were reported to work well and were given a rating of good (+++), irrespective of the type of application *(Table 1)*. The herbicides were generally applied to cut stumps, or to seedlings, coppice or root suckers. Five of the farmers also mixed a non-registered herbicide in diesel and applied it to the base of the stems of saplings *(Table 1)*. The frill application technique was not used by any of the farmers, even though it is a recommended treatment for one of the registered herbicides. This method has been shown to be impractical, wasteful and non-cost-effective (unpublished data). It was therefore not given further consideration. The most common cause of failure with chemical control was lack of supervision, which resulted in problems such as incorrect mixing or application of herbicide.

Fire was used by 11 of the farmers to burn trash after felling trees and was also considered a useful tool in depleting the soil seedbank (+++; *Table 1*). Subsequent mechanical or herbicide follow-up treatments of emerged seedlings were then practiced. Eight of the farmers frequently oversowed with *Eragrostis curvula* seed after burning to suppress re-establishment of wattle seedlings. Sometimes a second burn was carried out using the established clumps of grass as fuel. This destroyed wattle seedlings which had emerged through the grass. Kikuyu was used by five of the farmers to suppress re-establishment of wattle. This species was not suitable for dry areas.

In areas where farmers did not want to burn, trees were felled and stumps treated with herbicide or the standing trees were ringbarked. In this situation the few wattle seedlings which emerged (since there was no burning) were hand-pulled or killed with herbicides in follow-up operations *(Table 1)*. Thus oversowing was not necessary, and veld grasses slowly colonised these areas.

Eighteen of the farmers felt that a limited area of wattle was useful to satisfy their own needs (for firewood, windbreaks or shade) but that most of the wattle on their farms had to be controlled. As a control method, utilisation was considered a poor proposition (rating +; *Table 1*). Only three of the farmers were in a position to commercially exploit their trees, to a greater or lesser extent, for charcoal, firewood, or the woodchip industry *(Table 1)*.

The top priority of all farmers was to clear infested areas which were most suitable for conversion to grazing (high potential land). Farmers who were successful with control on high potential land were generally effective in controlling wattle jungle on low potential land.

Progress being made

Twelve of the farmers visited in this survey were successful in reducing the total amount of silver wattle on their land. The most important factors determining the progress being made appeared to be the accessibility of the wattle, the potential of the land and the control strategy being employed by the land-user.

Characteristics of land-users that were succeeding in their efforts to control silver wattle were the following:

(a) they were aware of the need to be flexible in integrating chemical and mechanical methods;
(b) they initially concentrated on clearing isolated

TABLE 1. A summary of a survey done in Natal during 1990 to identify and assess the main methods used to control silver wattle, Acacia dealbata. *The survey was conducted among 21 land-users who were actively involved in the control of silver wattle*
Ratings: +++ = good; ++ = satisfactory; + = poor

Control method	Number using the method	Attitude and application of method	Progress with and cost-effectiveness of method	Conclusion
Mechanical Ringbarking	8	++ Used when labour available. Usually combined with chemical control	++ Root-suckering sometimes a problem	Good to control isolated patches
Hoeing/Digging	10	++ Used mostly for seedlings after fire and also on saplings	+ Labour costs prohibitive at high plant densities	Must be done in conjunction with oversowing and spot-spraying
Chemical Basal stem treatment	5	+++ Used mostly on sparse populations of saplings	+++ Costly for large trees	Cost-effective for follow-up on saplings
Foliar spray	9	+++ As follow-up treatment on sparse populations of young plants	+++	Most cost-effective on young plants
Stump treatment	10	+++ In accessible areas where it is possible to remove firewood	+++ Labour and herbicide costs can be high	Cost-effective if used correctly where fire is not wanted
Fire	11	+++ Usually combined with oversowing	+++ Labour costly. Dangerous in some situations	Long-term follow up costs low, reduces seedbank
Utilisation For own use	21	+ Suitable only for limited areas of infestation	+	Limited scope for control
For commercial use	3	+ Impractical owing to inaccessability and transport costs	+ Site dependent	High input costs and slow profit returns make this option unattractive

patches before attempting to control dense, large infestations;

(c) when tackling these large infestations, wattle trees on the perimeter were initially killed either by ringbarking or by the application of herbicides to stumps, to prevent further encroachment into veld. Gradually these infested areas were decreased by progressively controlling trees closer to the centre of the infestation, as time, labour and finance allowed;

(d) follow-up operations were carried out consistently;

(e) they did not try to tackle too much wattle at one time. Only the amount of wattle which could be adequately controlled with follow-up treatments was initially treated;

(f) successful farmers appreciated that this was a long-term project, with good control of wattle being achieved over a period of 25 to 40 years on heavily infested farms.

An important problem which emerged from this survey was that no dissemination of effective control methods was occurring within a community. Many farmers were unaware of the methods being used by their neighbours. This seriously limited the progress made with the control of wattle in a community.

DISCUSSION AND CONCLUSIONS

Methods for the control of silver wattle

Chemical and mechanical methods were the most widely used for the control of wattle in Natal. The main problem with these methods was seen to be economic in nature. Although the costs of the available control methods (described above) were considered high by most of the farmers visited, these costs were considered acceptable for wattle control on high-poten-

tial land. Farmers were, however, loath to control wattle on low-potential land, e.g. in kloofs, on steep rocky hillsides and on streambanks. Containment only within these areas (e.g. along rivers) was considered feasible by the farmers to prevent encroachment into high potential areas. This however presents problems for farmers lower down the catchment area who may lose water flow and get a continual seed input from higher areas. There clearly is a need to overcome reluctance of farmers to clear wattle in these areas. In order to achieve this, immediate research should be aimed at finding cost-effective methods for the control of wattle on low-potential land.

Most farmers had experienced uncontrolled wildfires at one or other time. In infested areas not previously burnt, this resulted in mass germination, and farmers could not cope by using the required follow-up control procedures. This should be considered when developing a control programme.

The utilisation of wattle was generally rejected as a viable proposition since much of the wattle was not easily accessible to contractors, transport costs rendered the operation unprofitable, and those who allowed contractors to clear their wattle were dissatisfied since only trees of a certain diameter were removed. Even those farmers who were selling wattle found financial returns to be slow, and the idea was therefore not adopted by neighbouring farmers.

Progress in the control of silver wattle

Although more than half the farmers visited were making progress with the control of silver wattle, this sample was, however, necessarily biased to suit the main aim of the study to collate current control methods. A more detailed, unbiased survey would probably show that the majority of farmers are not succeeding in controlling wattle (various Farmers Days, extension officers and farmers, pers. comm.).

Identification of research needs

Following the findings of this survey, three treatments are to be compared for the control of silver wattle on low potential land:

Treatment A

Trees are felled, stacked in rows, then burned. This treatment is suited to situations which do not have too heavy a fuel-load, e.g. in dense younger stands, where stacking wood is not too time-consuming and therefore expensive in terms of labour costs. Alternatively, heat intensity and labour costs will be reduced if contour bands of trees are left standing (they will still be killed during burning). Follow-up treatments would involve mechanical treatments or registered herbicide treatments together with oversowing, where recommended grass species will be established immediately after the burn. The competitive ability of different grass species against wattle seedlings will be compared.

Treatment B

Standing trees are killed either by ringbarking or the application of herbicides to basal stems. Once trees are dead, the area is burned. This treatment is suited to situations where most wood cannot easily be removed for fuel, e.g. on steep slopes. Again, to reduce heat intensity and herbicide or labour costs, contour bands of trees could be left untreated. Follow-up treatments would involve mechanical treatments or registed herbicide treatments together with oversowing of recommended grass species which will be established immediately after burning the area. The competitive ability of different grass species against wattle seedlings will be compared.

Treatment C

Trees are cut and removed from the area. Stumps are treated with registered herbicides. This treatment is suited to situations where wood can be removed for fuel. Follow-up treatments would involve mechanical treatments or registered herbicide treatments together with oversowing of recommended grass species which will be established at the time of applying chemicals to the stumps. Once the grasses are established, the area will be burnt and recovery of grasses and their competitive ability against wattle seedlings compared. A much reduced fuel-load before the burn will result in a low-intensity fire.

Costs of treatments will be monitored. Fire has been incorporated at some stage in all treatments, because of the inevitability of wildfires. The aim, however, is to reduce the intensity of the controlled burn within these treatments, since with a relatively low fuel-load there is less chance of nutrient loss through erosion, especially on slopes (De Bano *et al.*, 1979; Wright *et al.*, 1982). It is known that the use of fire will not completely eradicate the soil seedbank (Pieterse and Cairns, 1986). A small but significant proportion of the soil seedbank will therefore remain dormant and will continue to germinate sporadically over many years. Thus follow-up work such as weeding or herbicide application is essential after burning (Pieterse and Cairns, 1986).

Since poor dissemination of information has also been identified as a problem in silver wattle control, the above trials will be designed in such a way that they will also serve an extension function. In order to achieve this aim, research will initially be carried out in a receptive community who will be involved from the start and can compare results for themselves. Thus research findings will be disseminated locally to concerned farmers within a particular area. It is hoped that by using this approach we can develop cost-effective methods that will be used by farmers to control silver wattle infestations on low potential land.

ACKNOWLEDGEMENTS

We would like to thank Mr J. Clayton (Agricura) for his co-operation with trials; and all participants of

panel discussions at Cedara. We also appreciate the critical appraisal of the manuscript by Mrs Clare Erasmus.

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