Fall Application of Herbicides Improves
Macartney Rose-infested
Coastal Prairie Rangelands

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Highlight: Picloram combined with 2,4,5-T (1:1) at 0.56 or 1.12 kg/ha was
the most effective of several herbicides and herbicide combinations applied in
the fall for control of Macartney rose. Aerial application of the 2,4,5-T/picloram
combination at 1.12 kg/ha reduced Macartney rose canopies on Texas Coastal
Prairie rangeland by 70 to 80% after a year. The same rate of 2,4-D, the standard
treatment, reduced the canopies by 40 to 50%. The herbicide combination was
equally effective whether applied in water containing 0.5% (v/v) of commercial
surfactant or in a diesel oil:water (1:4) emulsion. Herbicides more effectively
controlled undisturbed Macartney rose than plants that previously had been
shredded or sprayed. Increasing the volume of carrier from 47 to 94 liters/ha did
not adequately increase Macartney rose control to justify extra application costs
associated with the higher spray volume.

Macartney rose (Rosa bracteata) is
a severe range management problem
on over 200,000 ha of highly produc-
tive rangeland in southeast Texas. It
reaches greatest proportions in the
humid Gulf Prairies and western portions of the Post Oak (Quercus
stellata) Savannah. Also called "Cherokee rose," "hedge," "wild
rose," or "Chickasaw rose" (Hoffman
et al., 1964), it is estimated to have
increased to the present level of infes-
tation from about 16,000 ha in 1948
(Hoffman, 1966). Native to China,
Macartney rose was evidently intro-
duced into the United States in the
early 1800's for use as hedge. Macartney rose has some value as food and
cover for wildlife. At certain periods, the young shoots are browsed by cattle.1
Unless controlled, however,

Macartney rose spreads until grazing of
livestock is severely limited. It not
only competes with desirable species
but restricts accessibility of grazing
animals to herbage.

Macartney rose is spread by live-
stock, birds, and wildlife, which eat
the mature rose hips. The seeds readily
germinate after passage through the
digestive tracts of most birds and
animals (McCully, 1951). The long
spreading canes of Macartney rose may
also take root at the nodes after being
trampled into damp soil. Undisturbed
individual Macartney rose plants form
dense clumps that may exceed 3
meters in height and several meters
wide. As the infestations thicken, the
clumps merge, forming dense thickets
(Fig. 1). Macartney rose occurs on a
range of soil types but is most
common on heavy clays.

Upon disturbance of the top-
growth, Macartney rose sprouts
profusely from the base, cane sections,
and from shallow lateral roots (Haas,
et al., 1970). Livestock tend to avoid
grazing near the Macartney rose plants
or about the long trailing canes which
may extend several meters from the
parent clumps. Mechanical methods
such as shredding or bulldozing
generally have not been found effec-
tive for permanent control of
Macartney rose. Repeated annual
mowing may increase the area
occupied by the dense thorny growth
which further reduces the amount of
usable grazing land. This may result
from the canes being cut and spread
over moist soil where they take root and increase the Macartney rose stand
density.

From early research (McCully et al.,
1959), 2,4-D [(2,4-dichlorophenoxy) acetic acid] was developed as the
primary herbicide treatment for
Macartney rose control. A single ap-
plication of 2,4-D as an individual-

1Durham, A. J., and M. M. Kothmann.

Fig. 1. Macartney rose is a severe range management problem on the Texas Coastal Prairie.
If not controlled, the clumps rapidly increase in size forming almost impenetrable thickets.
least 1.12 kg/ha to effectively control when growing conditions are conducive to herbicide effectiveness. The initial 2,4-D application usually must be followed by a minimum of two consecutive annual applications of at least 1.12 kg/ha to effectively control the Macartney rose.

Chemical control of Macartney rose significantly increases forage produc-
tion (Hoffman, 1966; Hoffman et al., 1968). However, many area ranchmen have applied 1.12 kg/ha of 2,4-D annually for the past 7 to 10 years without completely controlling severe infestations. These repeat annual applications progressively increase the hazard of damaging adjacent agricultural crops, reduce the economic feasibility of Macartney rose control, and virtually eliminate forbs from the rangeland. Therefore, research was initiated in 1970 to a) develop more effective herbicide treatments which could reduce the herbicide load introduced into the range ecosystem and b) concentrate on fall applications when hazard to nontarget agricultural ecosystems is minimal.

Materials and Methods

Initial chemical control studies were installed near Benchley in Robertson County, Texas, with ground spraying equipment. The study area had not been grazed by livestock for 5 years. Topography was level to gently rolling and the soil was Wilson clay. The area supported about 250 Macartney rose plants/ha which had been shredded 3 years previous to the study. The Macartney rose plants averaged 1 meter tall and 2.5 meters in diameter.

Herbicides and herbicide combinations evaluated at 1.12 kg/ha for Macartney rose control near Benchley were: 2,4-D, 2,4-D combined with picloram (4-amino-2,6-trichloro-picolinic acid) or dicamba (3,6-dichloro-o-anisic acid); 2,4,5-T [(2,4,5-trichlorophenoxy) acetic acid] and silvex [(2,4,5-trichlorophenoxy) propionic acid] each alone or combined with picloram or dicamba; and 2,4,5-T + picloram combined with picloram. Combinations contained equal amounts of each herbicide and all but 2,4,5-T + picloram were tank mixed in the field. Herbicides were applied broadcast in 94 liters/ha of water plus 0.5% (v/v) commercial surfactant to 10-35 meter plots. Treatments were applied on September 26, 1970, in a randomized complete block experiment with three replications. This date of treatment was chosen based on previous study of spray dates for Macartney rose control (Haus, et al., 1970). At 1 and 2 years after treatment, reduction of live canopy of each plant within the plots was estimated.

On October 3, 1972, and October 11, 1973, various herbicides, herbicide combinations, application rates, and formulations were applied to dense stands of Macartney rose near Bloomington, Tex. Soils of the nearly level grassland are predominately Lake Charles and Victoria clays. The area is poorly drained such that standing water is common from late fall through the winter. However, conditions are usually dry during July and August. Herbaceous vegetation was dominated by little bluestem (Schizachyrium scoparium) with scattered clones of switchgrass (Panicum virgatum), Knotroot bristlegrass (Setaria geniculata), dallgrass (Paspalum dilatatum) and longtom (Paspalum lividum) were also common. During the study, the area was grazed by cows and calves at approximately 1 AU/4 ha from late October or early November to late March.

Herbicides applied in 47 liters/ha of a diesel oil-water emulsion (1:4) with 2,4,5-T in 1972 to disturbed (topgrowth previous to spraying) treated with 2,4-D at 4.48 kg/ha (the following year and with 1.12 kg/ha each year thereafter for 7 years) Macartney rose included 2,4-D, dicamba and 2,4-D + dicamba (1:1) at 1 kg/ha and 2,4,5-T + picloram (1:1) at 0.28, 0.56, and 1.12 kg/ha. In addition, the 2,4,5-T + picloram combinations were applied in water containing 0.5% (v/v) of the commercial surfactant, 86% a-(p)-nonylphenyl-w-hydroxypoly (oxyethylene). The 2,4,5-T + picloram combinations in the two carrier systems were also applied to undisturbed Macartney rose to compare the reaction to that of disturbed growth. Using the diesel oil-water emulsion and 0.56 kg/ha of 2,4,5-T + picloram, carrier volumes of 47 and 94 liters/ha were compared on disturbed growth. The 2,4,5-T + picloram in combination were formulated as triethylamine salts, 2,4-D and 2,4,5-T were applied as the propylene glycol butyl ether esters and dicamba as the dimethylamine salt. All herbicide combinations except 2,4,5-T + picloram were tank mixed at the application site. In 1973, all herbicides were applied in 47 liters/ha of water and 0.5% commercial surfactant.

In most cases, aerially applied treatments were duplicated or triplicated although plots were randomly located over the study area. Data analysis was handled as a completely random design. Plots ranged from 8 to 20 ha.

Results and Discussion

Environmental conditions were excellent for application of herbicides to Macartney rose in all experiments. Application was usually preceded by 5 to 7 days of bright, warm weather. The air temperature was usually around 23°C at the time of herbicide application and the Macartney rose was actively growing.

Ground Herbicide Application

Silvex was less effective than 2,4-D or 2,4,5-T at 1.12 kg/ha applied with ground broadcast equipment for the control of disturbed Macartney rose near Benchley, Tex. (Table 1). Dicamba, 2,4-D and 2,4,5-T reduced Macartney rose canopies from 40 to 50% at a year after treatment. Canopy reduction with combinations of 2,4-D or 2,4,5-T with dicamba a year after application was as expected from either herbicide used alone at the same application rate. The additive effect of 2,4,5-T + dicamba has also been demonstrated with honey mesquite (Prosopis glandulosa var. glandulosa) (Scifres and Hoffman, 1972) and sand shinnery oak (Quercus havardii).
Table 1. Canopy reduction (%) of disturbed Macartney rose 1 year after broadcast application of various herbicides alone and in 1:1 combinations at 1.12 kg/ha with ground equipment on September 26, 1970, near Benchley, Tex.*

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>None</th>
<th>Dicamba</th>
<th>Picloram</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4-D</td>
<td>0 a</td>
<td>38 c</td>
<td>62 e</td>
</tr>
<tr>
<td>2,4,5-T</td>
<td>53 d</td>
<td>42 d</td>
<td>50 d</td>
</tr>
<tr>
<td>Silvex</td>
<td>40</td>
<td>31 bc</td>
<td>40 d</td>
</tr>
<tr>
<td>22 b</td>
<td>5 a</td>
<td>44 cd</td>
<td></td>
</tr>
</tbody>
</table>

*Means followed by the same letter are not significantly different at the 95% level.

(Schires, 1972). Combinations of silvex with dicamba were ineffective for Macartney rose control. Picloram at 1.12 kg/ha was the most effective single herbicide applied with ground broadcast equipment near Benchley. Combining picloram with 2,4-D, 2,4,5-T or silvex reduced the level of picloram control as compared to picloram alone. Based on results from Benchley, silvex was not included in subsequent experiments and treatments containing picloram were expanded.

Aerial Applications

Canopy reduction of disturbed Macartney rose from aerial application of 2,4-D at 1.12 kg/ha in the fall of 1975 near Bloomington, Tex. (Table 2) was roughly equivalent to that resulting from ground broadcast application near Benchley (Table 1). Dicamba or 2,4-D + dicamba were no more effective than 2,4-D alone for Macartney rose control (Table 2). The most effective herbicide treatment applied at 1.12 kg/ha was 2,4,5-T + picloram.

In another experiment, the rate of 2,4,5-T + picloram was increased from 0.28 kg/ha to 1.12 kg/ha, disturbed Macartney rose canopies were reduced proportionally based on evaluations 1 year after treatment (Table 3). At 0.28 kg/ha, only about 40% canopy reduction occurred at a year after treatment. By 2 years after aerial application of the low rate, less than 15% canopy reduction was apparent. New canes had grown over the sprayed growth such that area occupied, as compared to original canopy cover, had actually increased. Increasing the herbicide rate to 0.56 kg/ha resulted in a 60% canopy reduction at 1 year after application (Table 3) and 50% by 2 years after treatment. Where 1.12 kg/ha of the herbicide combination was applied, Macartney rose canopies were reduced, on the average, by 80%. Level of control was maintained at about 60% canopy reduction by 2 years after treatment. However, less than 20% of the disturbed Macartney rose plants were completely defoliated and not resprouting 2 years after treatment with the high rate of the herbicide combination, indicating the need for subsequent treatment.

Table 3. Canopy reduction (%) of disturbed Macartney rose 1 year after aerial spraying with various rates of 2,4,5-T + picloram (1:1) on October 3, 1972, near Bloomington, Tex.*

<table>
<thead>
<tr>
<th>Rate</th>
<th>Canopy reduction a</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 a</td>
<td>0 a</td>
</tr>
<tr>
<td>0.28 b</td>
<td>38 b</td>
</tr>
<tr>
<td>0.56</td>
<td>60 c</td>
</tr>
<tr>
<td>1.12</td>
<td>78 d</td>
</tr>
</tbody>
</table>

*Means followed by the same letter are not significantly different at the 95% level.

Regardless of herbicide rate, disturbed Macartney rose was more tolerant of 2,4,5-T + picloram treatments than were the original undisturbed stands (Table 4). The differential reaction was similar to that described by McCully et al. (1959) from applications of 2,4-D. Comparing the average response to 2,4,5-T + picloram at 0.56 kg/ha at 1 year after treatment, canopies of disturbed Macartney rose were reduced by about 50% whereas reduction of undisturbed canopies exceeded 70%. This reaction was presumably due to the greater foliar area in relation to the root mass on undisturbed as compared to disturbed plants. Within a growth type regardless of herbicide rate, there was little difference in reaction of

Macartney rose whether the herbicides were applied in 47 liters/ha of a diesel oil:water emulsion or with water containing surfactant (Table 4).

In previous work, the importance of carrier volume in providing complete coverage of Macartney rose foliage with herbicide was stressed (Haas et al., 1970). Where 0.56 kg/ha of the 2,4,5-T + picloram mixture was applied in 47 liters/ha of total solution, Macartney rose canopies were reduced by about 75% at a year after treatment. Where the carrier volume was doubled, canopy reduc-

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Table 4. Canopy reduction (%) of Macartney rose growth types 1 year after aerial application of various rates of 2,4,5-T + picloram (1:1) in water containing surfactant or in diesel oil:water emulsions on October 3, 1972, near Bloomington, Tex. a

<table>
<thead>
<tr>
<th>Diesel oil</th>
<th>Water</th>
<th>Diesel oil</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>(kg/ha)</td>
<td>Water</td>
<td>(kg/ha)</td>
<td>Water</td>
</tr>
<tr>
<td>0</td>
<td>0 a</td>
<td>0</td>
<td>0 a</td>
</tr>
<tr>
<td>0.28</td>
<td>29 b</td>
<td>0.28</td>
<td>29 b</td>
</tr>
<tr>
<td>0.56</td>
<td>48 c</td>
<td>0.56</td>
<td>50 c</td>
</tr>
<tr>
<td>1.12</td>
<td>76 de</td>
<td>1.12</td>
<td>71 d</td>
</tr>
</tbody>
</table>

*Means followed by the same letter are not significantly different at the 95% level.

Initially spread, sprayed with 4.48 kg/ha of 2,4-D two years later, and then treated with 1.12 kg/ha of 2,4-D for 7 consecutive years.

Fig. 2. Spraying will control much of the above-ground Macartney rose growth, but standing canes present management problems. Prescribed burning effectively removed Macartney rose debris following the sprays.

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tion was about 85% from the same herbicide treatment. Considering internal variation in the study, it is doubtful that the increase provided by the additional carrier would justify the reduction in application time and increased application cost.

Although combinations of 2,4,5-T and picloram (1:1) at 0.56 and 1.12 kg/ha total herbicide were more effective than other treatments evaluated for Macartney rose control, in no case was complete control achieved. Also, application of the herbicide mixture does not remove the mechanical hindrance resulting from dead standing canes (Fig. 2). In subsequent studies, these canes have been removed by a prescribed burn in the winter 18 months after herbicide application. The prescribed burn eliminated the old dead Macartney rose debris (Fig. 3) and increased oven-dry native grass production to over 2,000 kg/ha as compared to 690 kg/ha with no treatment and 1,790 kg/ha from areas sprayed only (Scafres, 1973). Also, in burned areas, forbs such as Texas croton (Croton texensis) reappeared in abundance where previously they had been greatly reduced by the sprays. The combination of prescribed burning following herbicide application appears promising for extending the herbicide effectiveness for Macartney rose control.

**Literature Cited**


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