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Docks in Western Australia

J M. Allen

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A survey carried out by the Department of Agriculture has shown that docks are the most serious weed of the higher rainfall areas of Western Australia. They are estimated to cost farmers $400,000 annually in lost production. One of the main reasons why they are important weeds is that they regenerate rapidly from tubers and compete with desirable annual pasture species. Also, the upright dock flowering stems are woody and unpalatable. Individual plants become intertwined and deter stock from grazing summer pastures.

Results from the survey of the dock problem are given in this article. The findings show that docks are spreading and that farmers are concerned about them.

The Department of Agriculture began a research programme in 1973 to develop an effective means of controlling docks. This article gives progress results from the studies with current recommendations for controlling docks.

Docks in Western Australia

By J. M. Allen
Adviser,
Weed Agronomy Section

DOCK PROBLEM SURVEY

The dock survey was planned to include all rural ratepayers in the Busselton Shire as well as 10 per cent of the farmers in other selected shires in the South West and Great Southern regions.

Farmers were interviewed and questionnaires filled in on the property.

Details were obtained on the area and density of infestations of the different species of dock present. The farmers' assessment of the importance and spread, together with suggested reasons for any changes in infestations were recorded.

As a guide, dock infestations were defined as follows:
- Dense—impossible to walk between individual plants;
- Moderate—impossible to drive between plants;
- Low—possible to drive between plants;
Very low—isolated plants or clumps of plants; Nil—dock free.

Incomplete forms were not included in the results and several shires were not included because too few completed returns were received.

**The species of dock**

Four species of dock are known to occur as agricultural weeds in Western Australia: Fiddle dock, *Rumex pulcher* L; curled dock, *Rumex crispus* L; clustered dock, *Rumex conglomeratus* Murray; and swamp dock, *Rumex brownii* Campd.

Fiddle dock is the most widespread species and it was the dominant species on more than 80 per cent of the properties in the survey. Because it is not restricted to wet areas fiddle dock is the most important.

Curled dock was found associated with fiddle dock on 32 per cent of the properties and was only occasionally the main species.

Clustered and swamp dock were reported from very few properties and were never the dominant species.

**Area infested**

Table 1 shows the area and density of pasture infested with docks in each shire included in the survey. The results show a degree of uniformity between shires and this suggests that the situation would be similar in those shires where insufficient returns were obtained.

About 5 per cent of the pasture had dense infestations of docks, while in another 5 to 10 per cent of pastures docks were moderate. As pasture is sown over about a million hectares in these high rainfall districts, docks are estimated to be in moderate to dense infestations over at least 100 000 hectares.

In a substantial area of pasture—20 to 60 per cent—depending on the shire—docks are present at a low or very low level. At this intensity they are unlikely to be of any consequence except in providing a seed supply for the development of a more serious infestation of this large area of pasture, when conditions are suitable.

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**The spread of dock**

Seventy five per cent of the farmers interviewed indicated that docks are increasing on their properties and 30 per cent said the spread was rapid in recent years. Farmers volunteered a number of factors which affect the spread or reduction in the density of docks:

**Hay cutting**

In 102 of the reports docks were considered to be worse in paddocks in which hay or silage is regularly cut compared with other paddocks on the same properties. On 11 of the 12 dock-free properties in the Albany Shire, hay is not cut at all. This supports observations that
docks build up in paddocks regularly cut for hay or silage.

When paddocks are locked up for hay or silage docks become dominant.

Also, after cutting the annual legumes and grasses generally make little growth. The dominance of dock is further enhanced by re-shooting and perhaps new germination.

The higher fertility of paddocks cut for hay and silage compared with other paddocks may also be important, as docks respond to high soil fertility.

Farmers generally observed that docks are spread by feeding out infested hay in dock-free paddocks and most now avoid this practice.

Grazing management
Nearly half the farmers interviewed mentioned grazing management as a means of controlling dock. They appreciated the need to maintain consistent heavy grazing pressure.

They also knew that docks do not invade pasture grazed by sheep, but often build up in cattle pastures. Sheep eat the pasture down shorter and grazing is generally continuous or nearly so. Cattle paddocks are spelled for longer periods between grazing, allowing the docks to dominate the pasture.

Cropping and cultivation
About 10 per cent. of the farmers reported that docks are worse in paddocks after they have been cropped or cultivated. As most of the 370 farmers interviewed undertake very little cropping or cultivation, this is a significant observation.

The reason for this is that large numbers of dock seedlings are normally encountered following cultivation. If steps are not taken to eliminate these seedlings, there is a build up in the dock population. It is possible to kill docks in cereal crops with the herbicide, dicamba; however few farmers reported that they use this treatment.

Competition
Kikuyu grass was reported as having choked docks out of pasture on 17 properties in the Albany and Denmark Shires. The survey also showed that docks are not widespread in the perennial irrigated pastures in the South-West, indicating that they are not able to compete with perennial grasses.

Soil fertility
Docks are believed to be favoured by high levels of soil fertility. Numerous farmers reported that properties in their neighbourhood that had received regular dressings of potash were more seriously infested with docks.

RESEARCH
Because of increasing concern over the spread of docks, the Department of Agriculture began two research programmes in 1973; studies on the biology of docks and field evaluation of techniques for their control.

Characteristics of dock rootstocks, dock seed and seedling growth were studied.

Dock rootstocks
Docks are taprooted perennials. Old plants have a woody underground stem from which one or numerous taproots project. The underground stem is formed as the rootstock contract at the end of the growing season.

Rootstock dormancy
In dry land pastures of southern Australia the growing season ends in early summer, the top dies off and the dock enters an environmentally-induced dormant state. Regrowth will occur if the rootstock is watered during the summer.

Dormancy breaks very early in the new growing season which gives a competitive advantage to old dock plants in pasture. Sampling in a dry soil at Mundijong at the end of March 1973 (no rain was recorded in February or March) revealed that the rootstocks in a reasonably dense fiddle dock infestation possessed 64 ± 20 unemerged sprouts and 8.5 ± 5 emerged sprouts per square metre.

Survival over summer
Investigations have shown that dock rootstocks will not survive if brought to the soil surface in the summer. Results from laboratory studies indicate that one week of dry hot weather is sufficient to kill exposed rootstocks.

Cultivating in February has only been partially effective in reducing the level of dock in field trials. With the implements used, namely offset discs and a rotary hoe, it has not been possible to expose the whole rootstock.

Inevitably some fragments remain buried and bottom fragments often remain undisturbed. Regrowth occurs from bottom portions of dock rootstocks and from buried top fragments.

Rootstock development
When grown in good conditions in a glasshouse it takes only five weeks from the time of planting seed for docks to produce a rootstock capable of regeneration.

This was the finding in an experiment in which the dock tops were killed by drying out the soil at five weeks. When rewatered three weeks later, many of the rootstocks produced new shoots.

Field studies are needed to examine the development pattern of docks. It is important to know the minimum time taken to produce a

Table 1—The degree of infestation and percentage of pasture infested with dock in each of eight shires

<table>
<thead>
<tr>
<th>Shire</th>
<th>Dense</th>
<th>Moderate</th>
<th>Low</th>
<th>Very low</th>
<th>Nil</th>
<th>No. of farms surveyed</th>
<th>Percent of pasture surveyed*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Busselton</td>
<td>7</td>
<td>13</td>
<td>14</td>
<td>43</td>
<td>22</td>
<td>143</td>
<td>65</td>
</tr>
<tr>
<td>Plantagenet</td>
<td>4</td>
<td>9</td>
<td>11</td>
<td>25</td>
<td>50</td>
<td>74</td>
<td>17</td>
</tr>
<tr>
<td>Albany</td>
<td>6</td>
<td>2</td>
<td>19</td>
<td>37</td>
<td>29</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>Denmark</td>
<td>5</td>
<td>2</td>
<td>19</td>
<td>37</td>
<td>29</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>Waroona</td>
<td>3</td>
<td>5</td>
<td>10</td>
<td>63</td>
<td>19</td>
<td>17</td>
<td>9</td>
</tr>
</tbody>
</table>

* The pasture area surveyed expressed as a percentage of the pasture area in each shire given in the 1972/73 statistical returns.
rootstock capable of surviving the summer.

Dock seed
Docks are capable of producing large amounts of seed. Overseas workers have counted as many as 40,000 seeds on one dock plant.

The germination pattern and dormancy of the seed are vital factors in the spread and persistence of docks.

Germination pattern
Little is known at this stage of the factors controlling the pattern of germination of dock seed in Western Australia. Generally the germination percentage of fiddle dock seed is greater than that for curled dock collected from the same location.

The survey results previously discussed show that fiddle dock is more abundant in pastures than curled dock and one of the reasons for this may be the difference in the germinability of the seed in the autumn. However, fiddle dock seed germinates throughout the growing season and seedling counts in excess of 500 per sq. metre have been recorded in the field in both autumn and spring.

Seed dormancy
Results from laboratory tests indicate that fiddle dock does not possess a high level of dormancy.

Germination percentages for fiddle dock and curled dock seed collected in January 1975 at Serpentine and Elgin are shown in Table 2. The seed was stored enclosed in the fruiting valve at fluctuating (15°C/40°C) temperatures for nil, three and nine months. It was threshed immediately before each germination test, which was carried out in an incubator at 20°C.

The high germination percentage for fiddle dock seed stored for three and nine months gives one some hope for eradication of this troublesome species. However, experience in the field has not confirmed that this is possible.

One explanation for the apparent dormancy in the field is that dock seed tends not to germinate when enclosed in the fruiting valve. This has been so in recent tests with threshed and unthreshed seed.

Seedling growth
Dock seedlings are poor competitors. This has been clearly demonstrated by growing docks with and without ryegrass.

Observations in the field confirm that dock seedlings are unlikely to become established in a well-grown pasture. When the ground is bared as happens after pastures are heavily grazed in wet conditions or after cutting hay or silage, dock seedlings are often very obvious.

CONTROL
Major land use changes would be required to prevent the further spread of docks.

For instance, docks could be reduced by replacing cattle with sheep. Apart from the effect of the more intensive grazing by sheep on the docks there would not be the same requirement for hay or silage. Obviously this is of limited practical value on wholemilk or butterfat producing properties.

Where it is possible to establish perennial grasses, in particular kikuyu, docks will gradually disappear.

Cropping makes it possible to kill docks by spraying. Again this is of limited practical value as cropping is not possible over much of the dock-infested area.

Control in crops
Docks are readily controlled in cereal crops. Dicamba applied at the rate of 150 to 200 grams of active ingredient per hectare, depending on the size of the docks will give good control. Dicamba is safe to apply when the crop is in the tillering stage but before the boot stage is reached.

Control in pastures
It is recognised that the real dock problem is in areas where cattle graze annual legume-based permanent pastures. A number of techniques have been evaluated in these pastures. All have some limitations.

Spray-graze
The spray-graze technique involves the application of a low dose of 2,4-D, followed by heavy grazing one week later. Best results have been achieved with 1.4 litres per hectare of 50 per cent. 2,4-D amine. Treatment in early winter has been superior to late winter treatment.

Strip grazing with cattle has been an effective means of heavily grazing treated areas.

Severe clover damage has occurred on some occasions and results have been extremely variable using the spray-graze technique.
Dicamba

Dicamba is an effective herbicide against docks in pasture, but it also kills legumes. When docks are heavily infesting a pasture it may pay to kill them with dicamba at the expense of the clover.

Treatments applied early in the season (May/June) have been more effective than August treatments. It is necessary to apply 280 g of active ingredient per hectare.

In the year following treatment docks have been reduced by 75 to 80 per cent by one treatment and by 90 to 95 per cent by treatment in each of two successive years.

In trials at Margaret River, Mt Many Peaks and Baldivis there has been sufficient carry-over of clover seed to give a good legume component in the year following two successive years of treatment.

A second alternative is to renovate dock-infested pastures by sowing ryegrass. With the addition of fertiliser nitrogen, pasture production is maintained even though the legumes are killed when dicamba is applied to kill docks. This treatment was considered to have merit in the days of high beef prices and relatively low nitrogen prices in 1973. Changing economic circumstances could again see it as a practical treatment for controlling docks.

Asulam

Asulam will also kill docks in pasture and is not as damaging to the legumes as dicamba.

Although results with asulam have generally been good in the year of treatment, docks have often recovered in the following year.

RECOMMENDATIONS

Dock control in crops

Apply dicamba at the rate of 0.75 to 1.0 litre of commercial product per hectare, depending on the size of the dock. The spray should be applied when the cereal is at the tillering stage. Barley and oats are more susceptible than wheat.

Dock control in pasture

Although it is not possible to kill docks selectively in annual legume-based pasture, a number of steps can be taken to overcome the problem.

1. In paddocks which contain only isolated dock plants, spot spray with dicamba.
2. Heavily graze dock-infested pasture during the late winter and spring.
3. Avoid overgrazing of pastures during the winter.
4. Where possible grow perennial pasture, particularly kikuyu, in dock areas.
5. Avoid cutting hay or silage in dock-infested paddocks.
6. Renovate badly infested pastures by sowing oats or ryegrass. Spray about six weeks later with dicamba. Treatment for two successive years is likely to be required.
7. Dry cultivate to bring dock rootstocks to the surface in the summer before renovating and spraying a pasture. This treatment stimulates the germination of dock seed and the rootstocks that are not killed by desiccation are fragmented, which makes them more susceptible to dicamba.
8. Do not cultivate after the growing season commences if it is not possible to spray with dicamba later in the season as dock seedlings will be a problem.

Table 2—The germination percentage of fiddle dock and curled dock seed stored at fluctuating (15°C/40°C) temperatures for 0, 3 and 9 months

<table>
<thead>
<tr>
<th>Species</th>
<th>Location</th>
<th>Length of storage—months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Fiddle dock</td>
<td>Serpentine</td>
<td>84±3.3</td>
</tr>
<tr>
<td></td>
<td>Elgin</td>
<td>40±6.5</td>
</tr>
<tr>
<td>Curled dock</td>
<td>Serpentine</td>
<td>1±0.03</td>
</tr>
<tr>
<td></td>
<td>Elgin</td>
<td>10±1.7</td>
</tr>
</tbody>
</table>