Primary Industries, Water, and Environment

Service Sheet

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Ragwort
(*Senecio jacobaea L.*)

Identification and Characteristics

The ragwort seedling has two cotyledons (the first pair of "leaves" to appear at emergence), are 10-15 mm in length and have a characteristic spade shaped blade, notched at the apex. The cotyledons appear at the end of a short leaf stalk called the petiole. (see illustration A). After the cotyledons, leaves appear one at a time again on short petioles, the first true leaf being hairless, 10-12 mm in length and oval shaped with a smooth edge (margin). Later leaves are also produced one at a time and the margin begins to show a gradual increase in the degree of lobing and waviness typical of the older ragwort plants. Leaves also continue to become hairier as the plant gets older.

New shoots produced from the growing point or roots after established plants have been damaged are very similar to seedlings, except for the absence of cotyledons.

As the plant matures and forms a rosette (circular cluster) the leaves may vary in length from 50-200 mm. These leaves are stalked, and the blade is deeply lobed and convoluted (see illustration B). Leaf blades are usually deep green on top, and lighter green underneath, often being covered with cottony hairs. The bases of the leaf stalks are often purplish in colour.

At the flowering stage leaves at the base of the plant die off and the plant consists of an erect leafy stem that branches towards the top. The stems are circular in cross section, ridged, carry long cottony hairs and are often purplish in colour towards the base. Under favourable conditions stems often exceed one metre in height, and in exceptional cases may reach two metres. However, in pasture situations stem height is commonly 500-800 mm. The daisy-like flower heads are formed at the end of small branchlets resulting in the production of a dense flat-topped flower arrangement (see illustration C).

The flower heads vary from 15-25 mm in diameter, and consist of an outer row of 12-13 ray florets ('petals') and 50-60 central disc florets ('tubular petals'). The petals range in colour from almost white to golden-yellow.

Ragwort seeds are small, 1.5-2 mm in length and 0.3-0.5 mm in diameter (see illustration D). The seeds from the petals are smooth, whereas those from the tubular petals or disc region have small bristles which aid in dispersal. Dispersal is also aided by a feathery pappus (parachute) attached to the top of the seed.

Life Cycle

Ragwort if left undisturbed will in the first year form a leafy rosette, and then in the second year flower and die. This is referred to as a "biennial" (two year) life cycle. A biennial life cycle usually occurs in plants growing on waste land or other undisturbed areas.

In response to physical damage ragwort found in pasture normally behaves as a perennial (plants that live form more than 2 years), perhaps flowering several times before dying. This perennial life cycle is promoted by damage to the plant from stock hooves, grazing and cutting.
With the exception of some of the cooler districts the bulk of seed germination begins after the first substantial rain in the autumn, and may continue through to the spring. New leaf shoots from the previous year's plants also appear following

autumn rainfall, and may be mistaken for seedlings.

In contrast to the growth of new shoots arising from established plants, the growth of seedlings is normally slow. In pasture, seedlings seldom produce more than five leaves and leaf length seldom exceeds 50 mm in the first year of growth. In open situations rosettes up to 100 mm in diameter may be produced. Seedling mortality is also likely to be high in the first year of growth.

The restriction to growth caused by pasture competition makes seedlings more vulnerable to death from disease, trampling during the winter and drought during summer. Survival rates in the second year are much higher as the rosettes develop.

New shoots are readily produced from the rosette crown (growing point) following damage to established leaves. These may also develop from larger fleshy roots. This capability contributes significantly to ragwort's survival in pasture and commonly occurs following hoeing or pulling when roots become detached from the crown and are left in the soil.

The production of new shoots from the damaged crown can lead to the development of multi-crowned plants. These plants produce a greater number of flowering stems as opposed to that produced from a single crown plant. Continued damage to a plant delays flowering and may lead, over several years, to the development of a very large multi-crown plant.

A very leafy rosette, normally exceeding 150 mm in diameter, develops before stem elongation occurs in the late spring. Several stems may be produced from one rosette. In Tasmania, stem elongation usually begins in early November with flowering commencing in late December or early January. Mature seeds are produced in late January or early February, and seed production may continue until early April. Thus, any control measures aimed at preventing seed production must be completed by early January.

Any action during flowering which damages but does not kill the plant, such as grazing, slashing or incorrect herbicide application is likely to result in the production of new flowering stems. These arise as either branches from the original stem or at the base of the plant. These new stems can continue flowering well into the autumn and even into winter. Plants damaged but not killed at the flowering stage behave as perennials, and commonly continue to produce new leaves after flowering.

The majority of the seeds are deposited within 20 metres of the parent plant but under favourable conditions seeds may be dispersed by wind for distances of a kilometre or more. Dispersal on the coats of animals, on farm machinery, logging equipment, trucks and other vehicles, and in hay may be more important than wind in long distance dispersal.

Seeds on the soil surface germinate readily following rain in the autumn, whereas seeds covered by soil or litter may exhibit delayed germination. Buried seeds may remain viable for a number of years, possibly 20 years or more.

Preventing seed production is an essential component of any successful ragwort management plan.

Distribution

Ragwort is widely distributed throughout the grazing areas of Tasmania, with exception of the Midlands where it occurs only as isolated plants and small patches. Its spread in this region has apparently been limited by low rainfall and sheep grazing. Infestations also occur on the shores of several lakes on the Central Plateau, and along roadsides in many areas.

The heaviest infestations occur on land which has been cleared in the past but never properly developed for agriculture, or on run-down pastures and grasslands. Pastures grazed by cattle are particularly prone to ragwort invasion as the death of desirable plants from cattle hooves leaves openings for seedlings to establish. As cattle normally avoid grazing ragwort it also has a competitive advantage over other pasture plants that are grazed.

Economic significance

Ragwort is thought to cost Tasmania approximately $3 million each year in lost production and control costs. Competition from ragwort causes a significant reduction in pasture production. Once established, ragwort plants are extremely competitive. Second-year and older rosettes can make rapid growth and suppress neighbouring pasture plants. When plants die after flowering, bare patches may be left in the pasture, allowing other weeds to establish.
Ragwort is also poisonous to all types of livestock. Cattle losses due to ragwort poisoning do occur in Tasmania where stock have been forced to graze ragwort due to food shortages. Further significant losses to livestock production

may occur through lowered milk production, or meat or wool losses from ragwort poisoning.

Poisoning

The greatest danger of poisoning to cattle and horses is in hay and silage containing ragwort. Ragwort still retains its poisonous properties when dry, and it is readily consumed in this condition.

Although normally avoided by cattle and horses it may also be consumed when pasture is scarce. Occasionally individual animals develop a 'taste' for ragwort and preferentially graze it. Many herbicides increase the palatability of ragwort and the risk of preferential grazing and poisoning. All herbicides should be considered as having this potential.

Sheep the only stock able to eat ragwort normally graze it quite readily, often showing a preference for it at the early flowering stage. It is because of this that ragwort is less prevalent in pastures grazed by sheep.

The toxicity of ragwort to grazing animals is due to the presence of a number of alkaloids that cause liver damage. All livestock are affected by these toxic alkaloids although sheep appear to be more tolerant than cattle and horses.

Liver damage in animals exposed to ragwort is cumulative, the amount of damage being dependent upon the quantity of ragwort eaten and the period of time over which it is eaten. However, the onset of clinical symptoms is usually quite sudden, and can occur some time after the stock have been removed from ragwort-infested areas.

Weakness, jaundice and photo-sensitisation are the major symptoms of poisoning. Severe diarrhoea, straining and nervous signs are often seen terminally in cattle, while in horses, lethargy and apparent blindness are common. Sheep poisoned with ragwort accumulate copper in the liver and death is characteristically associated with the passing of red urine ('red water'). This is due to the breakdown of red blood cells caused by the sudden release of copper from the liver. This does not occur in cattle or horses.

There are no satisfactory tests that can be carried out on animals before the onset of clinical symptoms to see if they have suffered liver damage from exposure to ragwort.

Status under the *Weed Management Act 1999*

Ragwort is a declared weed in Tasmania, largely due to its impacts on agricultural productivity. As such, its importation, sale and distribution are prohibited. The legal responsibilities of landholders and other stakeholders for this declared weed are specified in a statutory weed management plan available from the DPIWE.

Control

Direct approaches to control include pulling or grubbing, applying herbicides and grazing with sheep. Cutting or slashing flowering stems with no other follow up is ineffective as a control measure as the plants quickly recover and flower again within a few weeks.

Indirect approaches to control include pasture improvement, grazing management, cropping and establishing a tree cover.

Biological control of ragwort has been initiated in Tasmania since 1979 through the release of natural predators of the plant.

Pulling and grubbing:

For pulling or grubbing to be effective the crown, together with the larger roots, must be completely removed from the ground or rapid regrowth may occur. Regrowth from the small roots that would normally be left after pulling or grubbing is also possible. However, any shoots that do arise from these small roots will be weaker than those arising from the crown or large roots, and will therefore take longer to re-establish.

Pulling is best carried out at the flowering stage, but this is only possible if the soil is reasonably loose or moist. Grubbing may be carried out at any stage of growth using a pick or fork to loosen the soil so that the plant can be removed with the roots intact. A mattock or hoe is not a suitable tool for grubbing since large roots, or even parts of the crown, are likely to be cut off and left in the ground.
In general, plants should be collected and destroyed after pulling or grubbing. This avoids the possibility of stock eating the plants, which are more palatable when wilted. Flowers should always be removed and destroyed to prevent seed being shed.

Sheep grazing:

Sheep will graze ragwort at both the rosette and the flowering stages. Grazing at the rosette stage can weaken the plant and delay flowering, while

at the flowering stage it can prevent seed production. While continuous grazing over several years may reduce the ragwort population it will not destroy the majority and other methods should be used in addition to grazing. Old wethers (four tooth and older) rather than ewes or younger sheep should be used to graze ragwort, as they will be less affected by the toxic nature of the weed.

Heavy stocking is normally necessary to ensure that at least the larger rosettes and the flowering plants are grazed. However, continuous exposure of sheep to dense ragwort infestations should be avoided as toxicity problems can occur, particularly in areas known to have a high copper content in the soil.

Following grazing, ragwort plants may recover quickly and produce new shoots. A second crop of flowers may be produced following grazing at the flowering stage, which will necessitate a further grazing if seed production is to be prevented.

Pasture improvement and grazing management:

Pasture improvement should be viewed as an essential adjunct to any control program. Maintenance of a dense vigorous pasture will reduce the opportunity for seedlings to establish and help to prevent the spread of ragwort. This requires the judicious use of fertilisers and grazing management to avoid both overgrazing and undergrazing. Block grazing is recommended where practicable.

A degraded pasture lacking a high proportion of perennial ryegrass and clover (or other suitable grass / legume mixes) will need to be ploughed and resown to provide effective competition for ragwort. Where ragwort is well established the area should be cropped for at least one year before resowing to pasture.

Cropping:

Cropping a paddock infested with ragwort is one of the most effective ways of reducing the infestation. Repeated cultivation destroys the established plants and exhausts the seed reserves in the soil. A herbicide program in the crop can further enhance the level of control achieved during the cropping phase. Suitable crops include cereals, peas, poppies and forage crops.

Establishing trees:

In some agricultural areas where ragwort is a problem, alternative uses of the land may be considered. This would apply particularly to non-arable areas where pasture establishment and management is difficult such as on stony or rocky ground, steep hillsides and gullies. Establishing trees, particularly radiata pine and eucalypts, for forestry or amenity purposes provides an effective way of suppressing ragwort in such areas. This is a long term control measure and will not control plants in the short term (until canopy closure and dense shading occurs). Interim control measures are essential.

Biological control:

The Tasmanian Institute of Agricultural Science has been undertaking a biological program for ragwort since 1979.

The ragwort flea beetle, *Longitarsus flavicornis,* which is a natural predator of ragwort in Europe, was introduced to Tasmania in 1979. In 2000, field surveys indicated that the ragwort flea beetle had spread over 90% of the total area of land infested by ragwort. Within this area it is now starting to have a significant impact on ragwort.

Other biological control agents will be available for release in the future. These include Cinnabar moth, *Tyria jacobaea* (L.) which was released in 1994. This agent has failed to establish in Tasmania.

The stem and crown boring moth, *Cochylis atricapitana* was released in Tasmania in 1995. This agent has now established at numerous field sites throughout the State and is starting to have an impact on ragwort.

The ragwort plume moth, *Platyptilia isodactyla* was released in Tasmania in 2000. This agent is showing promise and has established at some sites in the State. Further releases are underway.
For more information on biological control of ragwort refer to the TIAR Weed Biological Control Pamphlets available for each agent.

Chemical control:

Ragwort is susceptible to a number of herbicides, which may be applied by boom, spot spray or wiping equipment, or as granules, depending on the density and extent of the infestation being treated (see Table 1).

Herbicides need to be applied at the seedling or rosette stage to be most effective, and best results can be expected when the plants are actively growing at the time of application. Autumn and spring are thus the normal seasons for undertaking chemical control, although winter applications can also be effective on mild sunny

days if the plants are still green and not damaged by frost.

Boom spraying in the autumn has a less severe effect on clovers than spring spraying. Also, spring spraying is more likely to be affected by unsuitable weather or the ground being too wet. If spraying is delayed until after October the chance of preventing flowering is greatly reduced.

Herbicide treatments at the flowering stage can be applied by either spot spraying or by the use of a wiper. These treatments prevent seed set and reduce the numbers of large ragwort plants. The area will require a follow up boom spray in the following autumn or spring.

MCPA and 2,4-D are suitable for use as boom applied sprays in pasture, and 2,4-D can also be used as a spot spray to treat isolated plants or small infestations.

New pasture can be treated with MCPA as the sodium salt or amine after the clover germination reaches the 3 leaf stage, and the ragwort plants are either seedlings or small rosettes (up to 50 mm diameter).

2,4-D is more effective than MCPA on larger rosettes. Although it may kill annual clovers such as subterranean clover, these can be expected to re-establish from seed in the soil. White clover may also be damaged but will normally re-establish both vegetatively and from seed. The amine formulation of 2,4-D is safer than the ester formulation where clover damage is to be minimised, but it is also less active on ragwort. The amine formulation, being non-volatile, should be used in situations where neighbouring crops or gardens could be at risk from vapour drift. Ester formulations should not be used in hot weather near susceptible crops.

The use of 2,4-D is restricted to the period between 15 May and 15 September. To use 2,4-D outside this time period a permit is required from the Registrar of Chemical Products.

Metsulfuron methyl and clopyralid are effective herbicides against ragwort even at the flowering stage. However as both of these herbicides are very active against clovers and have a residual activity in the soil, application is best undertaken by a wiper or as a spot spray.

Granular formulations of dicamba and picloram are convenient and highly effective for spot treatment of individual plants. The use of granules to mop up isolated plants is very effective and convienent especially with application devices such as Weedsticks®.

Diquat can be applied as a spot spray before the flower heads start to brown off. This treatment quickly kills the top growth and hence prevents seed production. The addition of 2,4-D ester or clopyralid to diquat helps to reduce regrowth of treated plants in the following autumn. Thorough coverage of the whole plant, and in particular of the flower heads, is essential. The addition of a wetter is recommended to improve coverage.

Withholding periods for stock following spraying, are indicated on the herbicide container and should be adhered to. The increased palatability of ragwort following spraying is a further problem to be considered. **Where dense infestations of well developed plants are involved it is best to exclude stock completely from the area until the treated plants are dead.** Where the amount of ragwort is not so great and there is ample pasture available this precaution may not be essential. In such cases stock grazing the area, particularly cattle or horses, should be carefully watched to make sure that ragwort is not being selectively grazed, particularly by only one or a few individuals.

Herbicide formulations:

Several commercial formulations of MCPA, 2,4-D amine and 2,4-D ester are available in Tasmania. The application rate or dilution rate of the commercial product will need to be altered to give the same rate of active constituent if the commercial formulation of the chosen product differs from that in the table.

Bee Careful!
Some herbicides are toxic to bees. As a general rule, avoid applying herbicides when and where bees are foraging. Always read the label.

Note: These herbicide recommendations are made subject to the product being registered for that purpose under relevant legislation. It is the user's responsibility to check that registration or an off-label permit covers the proposed use. If in doubt, check with the Registrar of Chemical Products, Department of Primary Industries, Water and Environment. Statewide Freecall 1300 368 550.

RAGWORT

Chemical Control Recommendations

BOOM SPRAYING

Stage of growth*	Herbicide (Active ingredient)	Commercial product (Content of active ingredient)**	With-holding Period (Days)	Application rate of Commercial product per hectare	Comments
Seedlings and small rosettes up to 50 mm diameter	MCPA sodium salt MCPA amine	(250 g/L formulations) (500 g/L formulations)	7 days	1.0-2.0 L 0.5-1 L	Use the lower rate for seedlings, the higher rate for rosettes to 50 mm in diameter
Rosettes* **	2,4-D amine 2,4-D ester	(500 g/L formulations) Low Volatile Ester 400 Herbicide® (400 g/L) LV 2,4-D Ester 600 Selective Herbicide® (600 g/L)	7 days 7 days 7 days	4.8 L 6.0 L 4.0 L	For plants up to the rosette stage. Some regrowth may occur from large multi-crown plants Apply up to the late rosette stage. Severe clover damage will result from application at this rate.
	metsulfuron methyl	Brush-Off® (600g/kg) Renovate® (600g/kg)	nil	10 - 15 g	Apply to actively growing plants. Clover damage is likely.Residual activity against clovers is likely.

* Boom spraying is not recommended after the rosette stage of growth.
** See notes on herbicide formulations.
*** Some regrowth may be expected from large multi-crown plants.

GRANULAR TREATMENT

Stage of growth	Herbicide (Active ingredient)	Commercial product (Content of active ingredient)	With-holding Period (Days)	Application rate per plant Commercial product	Comments
Rosettes: single-crown plants	dicamba	Banvel 100G® (100 g/kg)	7 days	2 g	Apply to centre of plant
	picloram	Tordon Granules® (20 g/kg)	Nil	2 g	Apply to crushed centre of plant
Rosettes: multi-crown plants	dicamba	Banvel 100G® (100 g/kg)	7 days	3-5 g	Use higher rate on larger plants. Some regrowth may be expected from large multi-crown plants
	picloram	Tordon Granules® (20 g/kg)	Nil	2 g	Apply to crushed centre of plant

WIPER APPLICATION

Stage of growth	Herbicide (Active ingredient)	Commercial product (Content of active ingredient)	With-holding Period (Days)	Application rate of Commercial product	Comments
Shooting and early flowering plants	clopyralid	Lontrel® (300 g/L)	7 days	1L of product to 2 litres of water	Plants need to be actively growing. A height differential is required between the ragwort and the clover
	metsulfuron methyl	Brush-Off® (600 g/kg) Renovate® (600g/kg)	Nil	1g per litre of water	

SPOT SPRAYING

Stage of growth*	Herbicide (Active ingredient)	Commercial product (Content of active ingredient)**	With-holding period (days)	Application rate of Commercial product per L	Comments
Rosettes: single-crown plants	2,4-D ester	(400 g/L formulation)	7 days	6 mL	Add surfactant.
	clopyralid	Lontrel® (300 g/L)	7 days	2 mL	
	metsulfuron methyl	Brush-Off® (600 g/kg) Renovate® (600g/kg)	Nil	0.05 g	Add surfactant. Apply to actively growing plants.
Rosettes: multi-crown plants**	2,4-D ester	Low Volatile Ester® (400 g/L)	7 days	10 mL	Add surfactant.
	clopyralid	Lontrel® (300 g/L)	7 days	4 mL	
	metsulfuron methyl	Brush-Off® (600 g/kg) Renovate® (600g/kg)	Nil	0.05 g	Add surfactant. Apply to actively growing plants.
Shooting plants***	2,4-D ester	(400 g/L formulation)	7 days	10 mL	Add surfactant.
	clopyralid	Lontrel® (300 g/L)	7 days	4 mL	
	metsulfuron methyl	Brush-Off® (600 g/kg) Renovate® (600g/kg)	Nil	0.05 g	Add surfactant. Apply to actively growing plants.
Flowering plants*§**	2,4-D ester or clopyralid	(400 g/L formulation) Lontrel® (300 g/L)	7 days 7 days	6 mL 2 mL	Use either 2,4-D or Lontrel with a diquat product. Addition of a surfactant is essential
	plus diquat#	(200 g/L formulation)	7 days	10 mL	
	metsulfuron methyl	Brush-Off® (600 g/kg) Renovate® (600g/kg)	Nil	0.05 g	Add surfactant. Apply to actively growing plants.

* The rosette stage of growth is the preferred stage for effective chemical control.
** See notes on herbicide formulations below.
*** Some regrowth may be expected from large multi-crown plants and from shooting and flowering plants.
§ Apply to flowering plants before flower heads begin browning-off.
# Clean water is essential when using diquat.


A

Ragwort (*Senecio jacobaea*)

A. Seedling **B.** Rosette **C.** Flowering Stem **D.** Seeds