



CENTRE FOR EVIDENCE-BASED CONSERVATION

SUMMARY REPORT

**Effectiveness of the Control of Ragwort (*Senecio*) Species
Systematic Review Series:**

SYSTEMATIC REVIEW N^o. 5a.

**“Are currently recommended herbicides effective
for control of ragwort (*Senecio*) species?”**

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October 2004

Roberts, P.D. & Pullin, A.S. (2004) *Effectiveness of the control of ragwort (*Senecio*) species: “Are currently recommended herbicides effective for control of ragwort (*Senecio*) species?”* Systematic Review N^o. 5a. Collaboration for Environmental Evidence.

COVER SHEET

Title	Are currently recommended herbicides effective for control of ragwort (<i>Senecio</i>) species.
Reviewer(s)	Roberts, P.D., (PDR) & Pullin, A.S. (ASP)
Date protocol first published on website	28 th June 2004
Date review first published on website	December 2004 (as draft)
Date of most recent amendment	February/March 2005
Date of most recent SUBSTANTIVE amendment	-
Most recent changes	-
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Systematic review N ^o .	N ^o . 5 part a
Sources of support	NERC, English Nature.
Conflict of interests	None reported.

SUMMARY

BACKGROUND

Ragwort (*Senecio* spp.) is poisonous and can have lethal effects on grazing animals, particularly horses. In the UK, as a result of The Ragwort Control Act 2003, landowners are expected to manage common ragwort (*S. jacobaea*) infestations so that they do not spread to adjacent sites. This systematic review, by the use of explicit methodology to capture and evaluate primary evidence, provides an evaluation of the effectiveness of the herbicides available to control *Senecio* species and highlights knowledge gaps within this area requiring further research.

OBJECTIVE

To assess the effectiveness of currently available and recommended herbicides documented for the control of ragwort species.

SEARCH STRATEGY

Electronic databases: ISI Web of Knowledge (WoK) containing ISI Web of Science and ISI Proceedings; Science Direct; JSTOR; Index to Thesis; UMI ProQuest Digital Dissertations; COPAC (incl. British Library); Natural History Museum Library; AGRICOLA and SCIRUS. English Nature (EN); Countryside Council for Wales (CCW) and Scottish Natural Heritage (SNH) publications were all searched online.

Other searches: Additional references not captured by the initial searches, were located via the inspection of all reference lists of studies accepted at full text.

SELECTION CRITERIA

All primary, quantitative studies and reports comparing a herbicide application (treatment plot) against no treatment (control plot) were included within the systematic review when focused upon one or more of the following species: common ragwort (*S. jacobaea*); marsh ragwort (*S. aquaticus*); Oxford ragwort (*S. squalidus*) or hoary ragwort (*S. erucifolius*).

DATA COLLECTION AND ANALYSIS

Both reviewers assessed study inclusion/exclusion, methodological quality & data extraction. Any discrepancies were resolved by discussion. Information on the population focus, methodology, interventions and outcomes were abstracted from the original studies into a specially designed, pre-tested spreadsheet. Data synthesis using standardised mean difference (SMD), random effects model meta-analysis and linear regression was performed by one reviewer, with the results being discussed by both reviewers.

MAIN RESULTS

All the meta-analyses concerning the mortality datasets show that the herbicides: 2,4-D, Asulam, MCPA, Clopyralid, Triclopyr, Picloram, Flazasulfuron, Chlorsulfuron, Metasulfuron, 2,4-DB and the herbicide mixtures: 2,4-D/Dicamba and 2,4-D/Triclopyr are effective at increasing mortality of *S. jacobaea* compared to no treatment. However, not all herbicides are effective in reducing the population densities of ragwort species even over a one year period. Three herbicides to note are 2,4-D, Asulam and MCPA. Both 2,4-D and MCPA significantly reduce population density of *S. jacobaea* (for 2,4-D, SMD = -1.44: 95% confidence intervals [CI] = -2.49 to -0.51 and for MCPA, SMD = -1.26: 95% CI = -1.97 to -0.55) but not *S. aquaticus* (for 2,4-D SMD = -0.77: 95% CI = -1.62 to 0.08 & for MCPA, SMD = -0.50: 95% CI = -1.27 to 0.28). Asulam significantly reduces population density of *S. aquaticus* (SMD = -4.87: 95% CI = -6.54 to -3.20), but not *S. jacobaea* (SMD positive sensitivity analysis = -5.26: 95% CI = -16.59 to 6.06 and SMD negative sensitivity analysis = -5.18; 95% CI = -16.70 to 6.33).

	Species to control	
	<i>S. jacobaea</i>	<i>S. aquaticus</i>
Effective control significantly reduces species density	2,4-D MCPA	Asulam
Not effective does not significantly reduce species density	Clopyralid Asulam	2,4-D MCPA

REVIEWERS' CONCLUSIONS

The current evidence from all randomised control trials and control trials captured by the comprehensive search strategy suggests that either 2,4-D or MCPA will effectively increase mortality and reduce the population density of *S. jacobaea*, thus potentially providing effective control, however for reduction of *S. aquaticus*; Asulam applications appears more effective.

Further randomised control trials are required on the following areas of herbicidal control of ragwort (All new trials should be based on a suitably long time period):

1. **All herbicides with small sample numbers** within this systematic review
2. **Species specific trials** to determine a definitive list of which herbicide to use for the particular species which control of is required. (e.g. Asulam on *S. jacobaea* currently only have a small number of datasets; Clopyralid on *S. aquaticus* no data was found by the search strategy of the review).
3. **The methods of herbicide application**, data was lacking on the application of herbicides using spot spraying, rope wick and weed wiping.

Additional recommendations are made for more detail in the reporting of study site descriptions, experimental methodology and adverse effects.