

Proposed plant host test list for assessing risk of candidate biological control agents for *Conyza bonariensis*

G. C. Hunter, M. A. Rafter, S. Raghu, L. Morin

December 2018

Citation

G. C. Hunter, M. A. Rafter, S. Raghu, L. Morin (2018) Proposed plant host test list for assessing risk of candidate biological control agents for *Conyza bonariensis*. CSIRO, Australia.

Copyright

© Commonwealth Scientific and Industrial Research Organisation 2018. To the extent permitted by law, all rights are reserved and no part of this publication covered by copyright may be reproduced or copied in any form or by any means except with the written permission of CSIRO.

Important disclaimer

CSIRO advises that the information contained in this publication comprises general statements based on scientific research. The reader is advised and needs to be aware that such information may be incomplete or unable to be used in any specific situation. No reliance or actions must therefore be made on that information without seeking prior expert professional, scientific and technical advice. To the extent permitted by law, CSIRO (including its employees and consultants) excludes all liability to any person for any consequences, including but not limited to all losses, damages, costs, expenses and any other compensation, arising directly or indirectly from using this publication (in part or in whole) and any information or material contained in it.

CSIRO is committed to providing web accessible content wherever possible. If you are having difficulties with accessing this document please contact csiroenquiries@csiro.au.

Background

The following proposed plant list for testing candidate biological control agents for *Conyza bonariensis* (flaxleaf fleabane; “target weed” hereafter) was developed based on currently accepted phylogenetic information available in literature (Brouillet et al. 2009; Li et al. 2012; Fu et al. 2016) and on the Angiosperm Phylogeny Website (Stevens 2001). *Conyza bonariensis* belongs to the tribe Astereae in the subfamily Asteroideae of the Asteraceae family.

Test plant species have been selected using the centrifugal phylogenetic method that is based on the phylogenetic relationship of test plants to the target weed (Briese 2003; Gilbert et al. 2012; Wapshere, 1974). This method is underpinned by evidence that specialist candidate biological control agents are evolutionarily more likely to infect or feed on non-target species closely related to the target weed relative to those that are more distantly related. Within such a phylogenetic-based framework, selection of representative test species places an emphasis on endemic species, species of economic importance and those that are likely to overlap biogeographically with the target weed. Representatives from 16 tribes of the Asteraceae subfamily Asteroideae that are present in Australia¹ have been included in this proposed host-test list for candidate agents for *C. bonariensis*. The phylogenetic position of the selected tribes are presented in the appendix to guide the reader as to their phylogenetic relatedness.

Any suggestions for plant species substitutions or additions are welcomed but we kindly ask that they be justified within the phylogenetic framework approach used to develop the plant host test list. Feedback and comments on this proposed plant host test list can be addressed to Dr Gavin Hunter (gavin.hunter@csiro.au; 02 6218 3658) or Dr Michelle Rafter (michelle.rafter@csiro.au; 07 3833 5549).

¹ We are not aware of any species from tribes Feddeae, Chaenactideae, Polymnieae and Perityleae of the Heliantheae alliance that are present in Australia.

Proposed plant host test list

Table 1: List of proposed plant species for testing the specificity of candidate biological control agents for the target weed *Conyza bonariensis*. All these species have an overlapping biogeographic range with the target weed.

SUBFAMILY	TRIBE	TRIBE NO. ¹	SUBTRIBE	RELATIONSHIP TO THE TARGET WEED	GENUS SPECIES	STATUS IN AUSTRALIA ²	
Asteroideae	Astereae	1	Conyzinae	Target weed	<i>Conyza bonariensis</i>	Introduced and weed	
				Same genus	CONYZA		
					<i>Conyza canadensis</i>	Introduced and weed	
					<i>Conyza sumatrensis</i>	Introduced and weed	
					<i>Conyza bilbaoanus</i>	Introduced and naturalised	
				<i>Conyza primifolius</i> ³	Introduced and naturalised		
				Same subtribe	ERIGERON		
					<i>Erigeron conyzoides</i> ³	Native	
					<i>Erigeron karvinskianus</i>	Introduced and naturalised	
				Chrysopsidinae	Same tribe	HETEROTHECA	
					<i>Heterotheca grandiflora</i> ³	Introduced and naturalised	
				Solidagininae		SOLIDAGO	
					<i>Solidago canadensis</i>	Introduced and naturalised	
				Symphotrichinae		SYMPHYOTRICHUM	
					<i>Symphotrichum novi-belgii</i> or <i>S. subulatum</i>	Introduced and weed	
				Machaerantherinae		GRINDELIA	
					<i>Grindelia camporum</i> ³	Introduced and weed	
	Grangeinae		ERODIOPHYLLUM				
		<i>Erodiophyllum elderi</i>	Native				
	Hinterhuberinae		OLEARIA				
		<i>Olearia nernstii</i> or <i>O. oppositifolia</i>	Native				
	Podocominae		MINURIA				
		<i>Minuria cunninghamii</i>	Native				
	Lagenophorinae		LAGENOPHORA				
		<i>Lagenophora gracilis</i>	Native				
	Baccharidinae		BACCHARIS				

SUBFAMILY	TRIBE	TRIBE NO. ¹	SUBTRIBE	RELATIONSHIP TO THE TARGET WEED	GENUS SPECIES	STATUS IN AUSTRALIA ²
					<i>Baccharis halimifolia</i>	Introduced and weed
			Brachyscominae		BRACHYSCOME	
					<i>Brachyscome</i> sp. ⁴	Native
			Bellidinae		BELLIS	
					<i>Bellis perennis</i>	Introduced and naturalised
			Homochrominae		FELICIA	
					<i>Felicia amelloides</i> ³	Introduced and weed
	Anthemideae	2	Artemisiinae	Same sub-family	CHRYSANTHEMUM	
					<i>Chrysanthemum × morifolium</i>	Ornamental
			Glebionidinae		GLEBIONIS	
					<i>Glebionis coronarium</i>	Introduced and weed
			Anthemidinae		TANACETUM	
					<i>Tanacetum vulgare</i>	Introduced and weed
	Gnaphalieae	3			CASSINIA	
					<i>Cassinia</i> sp. ⁴	Native and weed
					XEROCHRYSUM	
					<i>Xerochrysum bracteatum</i>	Native
					OZOTHAMNUS	
					<i>Ozothamnus</i> sp. ⁴	Native
	Calenduleae	4			CALENDULA	
					<i>Calendula officinalis</i>	Introduced and weed
					DIMORPHOTHECA	
					<i>Dimorphotheca sinuata</i> or <i>D. pluvialis</i>	Introduced and weed
	Senecioneae	5			SENECIO	
					<i>Senecio pinnatifolius</i> var. <i>lanceolatus</i>	Native
					ABROTANELLA	
					<i>Abrotanella scapigera</i> or <i>A. forsteroides</i>	Native
	Inuleae	6			PLUCHEA	
					<i>Pluchea</i> sp. ⁴	Native
	Athroismeae	7			CENTIPEDA	
					<i>Centipeda minima</i>	Native
	Helenieae	8			GAILLARDIA	

SUBFAMILY	TRIBE	TRIBE NO. ¹	SUBTRIBE	RELATIONSHIP TO THE TARGET WEED	GENUS SPECIES	STATUS IN AUSTRALIA ²
					<i>Gaillardia grandiflora</i>	Introduced and naturalised
	Coreopsideae	9			BIDENS	
					<i>Bidens pilosa</i>	Introduced and weed
	Neurolaeneae	10			ENYDRA	
					<i>Enydra woollsii</i>	Native
	Tageteae	11			TAGETES	
					<i>Tagetes erecta</i>	Introduced and ornamental
	Bahieae	12			SCHKUHRIA	
					<i>Schkuhria pinnata</i>	Introduced and naturalised
	Heliantheae	13			HELIANTHUS	
					<i>Helianthus annuus</i>	Crop
	Millerieae	14			GUIZOTIA	
					<i>Guizotia abyssinica</i>	Introduced and naturalised
	Eupatorieae	15			ADENOSTEMMA	
					<i>Adenostemma lavenia</i>	Native
	Madieae	16			CENTROMADIA	
					<i>Centromadia pungens</i> ³	Introduced and naturalised

¹: Bracketed number alongside tribe indicated on phylogenetic tree in Appendix.

²: Cultivation information as indicated in Randall (2007) and Australian Plant Names Index (APNI).

³: Difficult to source due to restricted distribution in Australia. Eventual inclusion in host-specificity testing is not guaranteed and will depend on the ability to source plant material.

⁴: Several species are present in Australia that could be accessed for inclusion in host-specificity testing. The chosen species will depend on the ability to source plant material.

References

- Briese, D. T. (2003) The centrifugal phylogenetic method used to select plants for host-specificity testing of weed biological control agents: can and should it be modernised? In H. S. Jacob, and D. T. Briese, eds. *Improving the Selection, Testing and Evaluation of Weed Biological Control Agents*. Technical Series #7, pp. 22–33. CRC for Australian Weed Management, Glen Osmond, Australia.
- Funk, V. A., Susanna, V., Stuessy, T. F., Bayer, R. J. (eds) (2009) *Systematics, evolution, and biogeography of Compositae*. International Association for Plant Taxonomy, Vienna, Austria.
- Brouillet, L., Lowrey, T. K., Urbatsch, L., Karaman-Castro, V., Sancho, G., Wagstaff, S., Semple, J. C. (2009). Astereae. In: *Systematics, evolution and biogeography of Compositae*. V. A. Funk, V. Susanna, T. F. Stuessy and R. J. Bayer (eds). pp: 589-629.
- Fu, Z-X., Jiao, B-H., Nie, B., Zhang, G-J., Gao, T-G., China Phylogeny Consortium (2016). A comprehensive generic level phylogeny of the sunflower family: Implications for the systematics of Chinese Asteraceae. *Journal of Systematics and Evolution*, **54**: 416-437.
- Gilbert, G. S., Magarey, R., Suiter, K., Webb, C. O. (2012) Evolutionary tools for phytosanitary risk analysis: phylogenetic signal as a predictor of host range of plant pests and pathogens. *Evolutionary Applications*, **5**: 869–878.
- Li, W-P., Yang, F-S., Jivkova, T., Yin, G-S. (2012) Phylogenetic relationships and generic delimitation of Eurasian *Aster* (Asteraceae: Astereae) inferred from ITS, ETS and *trnL-F* sequence data. *Annals of Botany*, **109**: 1341-1357.
- Randall, R. P. (2007) *The introduced flora of Australia and its weed status*. CRC for Australian Weed Management. Department of Agriculture and Food, Western Australia.
- Stevens, P. F. (2001 onwards). Angiosperm Phylogeny Website. Version 14, July 2017 [and more or less continuously updated since]. <http://www.mobot.org/MOBOT/research/APweb/>.
- Wapshere, A. J. (1974) A strategy for evaluating the safety of organisms for biological weed control. *The Annals of Applied Biology*, **77**: 201-211.

Appendix

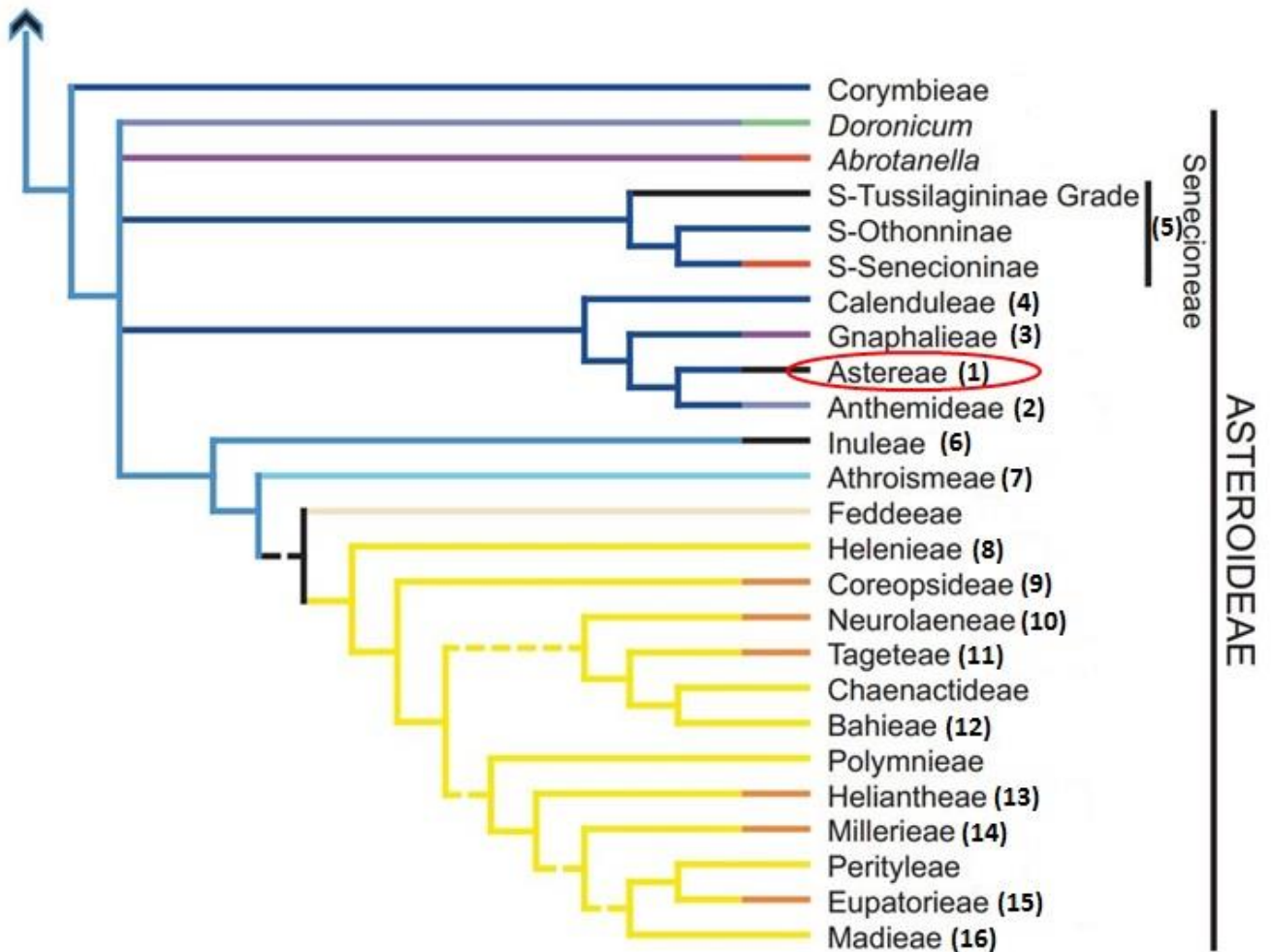


Figure 1: A portion of a summary metatree for Asteraceae as depicted in Funk et al. (2009) indicating the phylogenetic relationship of tribes within the Asteraceae subfamily Asteroideae. The phylogenetic position of *Conyza* within tribe Astereae is circled for reference and bracketed numbers next to tribes correspond to the numbering in Table 1.

CONTACT US

t 1300 363 400
+61 3 9545 2176
e csiroenquiries@csiro.au
w www.csiro.au

AT CSIRO, WE DO THE EXTRAORDINARY EVERY DAY

We innovate for tomorrow and help improve today – for our customers, all Australians and the world.

Our innovations contribute billions of dollars to the Australian economy every year. As the largest patent holder in the nation, our vast wealth of intellectual property has led to more than 150 spin-off companies.

With more than 5,000 experts and a burning desire to get things done, we are Australia's catalyst for innovation.

CSIRO. WE IMAGINE. WE COLLABORATE.
WE INNOVATE.

FOR FURTHER INFORMATION

Health & Biosecurity

Gavin Hunter
t +61 2 6218 3658
e gavin.hunter@csiro.au
w www.csiro.au

Michelle Rafter
t +61 7 3833 5549
e michelle.rafter@csiro.au
w www.csiro.au

Raghu Sathyamurthy
t +61 7 3833 5762
e raghu.sathyamurthy@csiro.au
w www.csiro.au

Louise Morin
t +61 2 6246 4355
e gavin.hunter@csiro.au
w www.csiro.au