A review of the biocontrol of groundsel-bush (*Baccharis halimifolia* L.) in Queensland

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SUMMARY

Insects introduced from North America against *Baccharis halimifolia* L., a rangeland weed on the eastern coast of Australia cause severe defoliation and probable loss in seed viability at a limited number of sites but have not given adequate control. South American insects collected from other *Baccharis* species have been recently imported. They developed on *B. halimifolia* and were released in the field but it is too early at present to comment on their efficacy.

INTRODUCTION

Groundsel-bush (*Baccharis halimifolia* L.) is a shrubby perennial weed of rangelands on the eastern coast of Australia. It occurs over an area of approximately 30,000 square km of southern Queensland and northern New South Wales. A native of the east coast of the United States of America it was probably introduced into Australia in the latter part of the last century as an ornamental (Bailey, 1900).

In 1951 it was declared a noxious weed under Queensland law principally because of its superior competitive ability over more useful plants in pastures. It is a non-preferred plant of little nutritional value to livestock (White, 1936).

Attempts are being made to suppress the plant by cultural, chemical and biological control methods. Spraying with chemicals such as 2,4-D has been, and is, the major method of control.

The cost of chemical control is estimated to be in excess of $1,000,000 per year in Queensland in 1977. This sum is based on the estimated cost of $500,000 in 1971 (McFadyen, 1972) and the escalation in herbicide and labour costs for the continuing control program in the 6 years to 1977.

Although control with chemicals such as 2,4-D is the most effective method at present, its continuing high cost emphasizes the need to find cheaper methods of control.

Biological control is regarded as one such alternative and investigations have been made in North and South America to collect and introduce insects into Australia for the control of the weed.

RESULTS AND DISCUSSION

North American insects - In 1969 the six species of insects listed hereunder were introduced into Queensland from Florida but of these only the leaf webber *Aristotelia* sp. and the foliage feeder *Trirhabda baccharidis* became established in the field.

Trirhabda baccharidis Weber	(F. Chrysomelidae)
Rhopalomyia californica Felt.	(F. Cecidomyidae)
Phalonia sp.	(F. Phaloniidae)
Oidaematophorus balanotes Meyrick	(F. Pterophoridae)
Cecidomyia sp.	(F. Cecidomyiidae)
Aristotelia sp.	(F. Gelechiidae)

Although *Aristotelia* sp. is found throughout many of the groundsel-bush infestations its populations do not reach densities sufficiently high to cause any significant damage to the plant and attack is generally confined to young growth during spring and summer.

T. baccharidis on the other hand can reach very high densities in the field and larvae hatching in autumn can cause complete defoliation at anthesis. Field trials with larvae placed on caged plants have indicated that more than 40% defoliation during anthesis is required to reduce seed viability significantly (McFadyen, 1972). This loss in viability is assumed to be due to insufficient seed fill caused by reduced photosynthesis and wounding. On the basis of these cage trials the complete defoliation observed in the field would lead to a significant reduction in the proportion of viable seeds produced by these plants.

Although these beetles appear to be able to cause severe damage to the plant, establishment problems have precluded their colonisation at most of the groundsel-bush infestations. Over 100,000 beetles have been released at 44 sites but establishment has been recorded at only four sites. At sites where they are established the following life-cycle occurs: the adults emerge in spring and oviposit in cracks on the stems; the larvae hatch in autumn and reach final instar in about a month before entering the soil and leaf litter to overwinter as prepupal larvae.

At sites where they did not establish adults had been released in the spring and larvae resulting from their eggs hatched in autumn but the adult emergence in the next spring was very poor or non-existent. The mortality factor must act either on the feeding larvae in autumn and/or the overwintering prepupal larvae in the ground.

The reason for failure to establish at the majority of release sites is not known and the only obvious common factor between the four sites where establishment is recorded is that they all occur just above the high-tide level.

The area infested by the beetle at the four sites is small in relation to the total area infested with groundsel-bush. Population increase is estimated at threefold per annum (McFadyen, 1972) and dispersal is relatively slow, the largest colony now covering an area of approximately 1 km^2 since the initial release in 1970.

T. baccharidis may assist in reducing seed viability and potential rate of spread in semi-tidal areas but it is not anticipated that it will effect any significant reduction in the groundsel-bush infestations outside such areas.

South American insects - As the North American insects did not give the desired degree of suppression of the weed further investigations were pursued in South America. *B. halimifolia* does not occur in that continent and insects were collected from other species of *Baccharis* and a closely related genus *Baccharidastrum*. Pimental (1963) argues on theoretical grounds that better results are obtained with insects from hosts related to the pest species rather than insects from the pest species itself. Although concepts arising from this theory have been disputed by Huffaker et al (1971), the practical effectiveness of this method for biocontrol is well known especially in weed biocontrol, e.g. the classic control of the North American prickly pear *Opuntia* spp. by the South American *Cactoblastis cactorum* Berg. in Australia.

Between 1974 and 1976 the following species were introduced from South America and all except *Anacassis cribrum* have bred on *B. halimifolia*.

Metallactus patagonicus Suff.	(F. Cryptocephalidae)
Megacyllene mellyi Chev.	(F. Cerambycidae)
Lioplacis elliptica Stal.	(F. Chrysomelidae)
Anacassis phaeopoda Buzzi	(F. Cassidae)
Anacassis dubia Boh.	(F. Cassidae)
Anacassis cribrum Klug	(F. Cassidae)
Anacassis fuscata Klug (Curitiba population)	(F. Cassidae)
Anacassis fuscata Klug (Paraguay population)	(F. Cassidae)
Anacassis fuscata var *univolor* Burmeister	(F. Cassidae)

Small releases of five of these have recently been made but at present it is too early to know if they will establish and provide control of the weed.

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