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Perapion and the doublegee

by J. Moulden*

Of the many plants introduced by this State’s early settlers, and later to become weeds, the doublegee. Emex, is undoubtedly one of the worst. Like many of our present weeds, doublegee was introduced intentionally as a cultivated food plant. Later, its potential to invade agricultural land became obvious.

Doublegee is one of the most serious weeds of agriculture in this State. The heaviest infestations occur in the northern wheatbelt, but in recent years it has appeared in southern areas, seeds having been transported in hay and with livestock. The challenge to entomologists is to find biological agents to control it.

Weevil predator introduction

The weevil Perapion antiquum is native to South Africa. In 1956/57 weevils were collected from Emex australis near Durban in Natal and consigned to Hawaii for investigation of their suitability as biological control agents. After host specificity testing indicated that commercially valuable plants would not be attacked, entomologists made releases of Perapion in Hawaii in 1957. The weevil established quickly and since has exerted a strong degree of control over its host.

CSIRO introduced Perapion antiquum into Australia in 1974, and kept and reared it in quarantine in Queensland. Entomologists conducted further host specificity trials involving 38 species from 17 plant families before the insect could be considered for field release in Australia. The family Polygonaceae to which Emex belongs, contains several economically important plants including rhubarb and buckwheat. Minor feeding was observed on these but the weevil did not complete a life cycle in them.

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The first Australian releases of CSIRO material were made in 1974. In Western Australia, insects were released at Wongan Hills and Chapman Valley in the same year. The Western Australian Department of Agriculture started a mass rearing programme in August 1975.

The first collection of *P. antiquum* introduced into Australia originated at Franskraal on the south-coastal region of South Africa. This biotype was not able to survive the long harsh summers of Australia, so a subsequent collection was made at Ladysmith, a more arid location in South Africa. Both these biotypes have been reared in Western Australia and both have been released in the field.

Adult weevils feed extensively on the leaves of doublegee plants, cutting characteristic small circular holes. The females deposit eggs in feeding scars on the stems or fruits and the plant may react to this by producing callus tissue which grows and protects the eggs.

On hatching, the larvae tunnel actively along the stems and tap root. Their heavy feeding kills the plant. The larvae pupate within the stems and the adults emerge through circular holes cut in the stem wall.

The life cycle takes 32 to 34 days to complete and the reproductive rate is high. The insect can build up numbers very quickly.

Although the Department has reared and released about 12,750 adult weevils in Western Australia, there is no sign that the insect has survived on any release site. It became apparent early that the summer conditions in the northern wheatbelt were too severe for the insect. Entomologists made later releases further south in an attempt to achieve establishment. Unfortunately, the only site on which over-summering seemed to have occurred, at Yallingup, was badly disturbed and all hope of success there was lost.

So far, *Perapion* has failed to become established in Western Australia. There remains the possibility that in the future it may be found to have survived in some areas, but experience so far suggests that it will never be a particularly effective control agent for doublegee in Australia.

The *Perapion* project in Australia illustrates one of the basic concepts of biological control, one which in this instance resulted in the failure of the attempt. A biological control agent must be so specific to its host that damage to other organisms will not occur, with the agent becoming a pest itself.

*Perapion* is so dependent on the weed *E. australis* and *E. spinosa* that it is unable to survive the period of the year when these plants are not in their vegetative phase. Had it been able to continue its lifecycle in another plant which was growing actively in summer, or had it had an inactive stage over summer itself, then it may have been able to survive the summer months and become active again the following year.

Dock control is subject of overseas study

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Weeds of the dock and sorrel family (*Rumex*) will be the subject of an intensive biological control study over the next three years.

Dr J. K. Scott, a Western Australian science graduate who majored in zoology and botany before joining the Department of Agriculture's Entomology Branch, will go to France to seek insect predators to destroy these weeds. The funding is provided mainly by the Australian Meat Research Committee, and Cattle Industry Compensation Fund.

He will be based with the CSIRO Biological Control Unit at Montpellier, in the region where the docks and sorrel originated.

His assignment started with a careful survey of *Rumex* weeds in Western Australia. With the assistance of the Weed Agronomy Branch, he has identified the species which occur in Western Australia, to ensure that the same weeds are examined in the search for suitable predatory insects in southern France.

In his first year overseas, Dr Scott will concentrate on locating plants of *Rumex* species which are weeds in Western Australia, and collecting any promising insects.

In the second year of the project he will study the biology of these insects and devise methods of rearing them in the laboratory.

He will devote the third year to 'screening' the insects against a range of plant species, including those of agricultural importance in Australia, and any native plants of related species. The purpose of this work will be to ensure that there is no likelihood of introduced insects causing harmful effects in Australia.

Before he returns to Western Australia, Dr Scott will send insects of selected species to the Department's new quarantine insectary for further testing, rearing and 'bulking up'.

This pre-release stage could represent another two years of work. But it reflects the entomologists' concern that no biological control agents should be released until stringent safeguards have cleared them of any potential threat to agriculture or the environment.