MEGACYLLENE MELLYI- A BIOLOGICAL CONTROL AGENT FOR GROUNDSEL BUSH, *BACCHARIS HALIMIFOLIA* , IN QUEENSLAND

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Summary. The stem boring beetle *Megacyllene mellyi* is the only insect of 17 species introduced from Brazil to become permanently established in Queensland. Populations giving useful control are restricted to one particular habitat type because of the physiology of the host plant peculiar to those areas.

INTRODUCTION

Groundsel bush, *Baccharis halimifolia*, is a woody shrub from North America which has been a weed in coastal mid eastern Australia for almost a century. The Brazilian stem boring beetle *Megacyllene mellyi* is one of 35 separate introductions made by the Queensland Department of Lands over the last 23 years. Of this group, only 5 species including *M. mellyi* are permanently established in the field. *M. mellyi* is thus the only insect out of 17 species introduced from Brazil to become permanently established.

HOST SPECIFICITY

The natural hosts of *M. mellyi* are *Baccharis microdonta* and *B. dracuncufolia*. There were no records in Brazil of it attacking any economically important plants(1). Host specificity tests carried out in Brazil and in Australia showed that *M. mellyi* was highly specific, and on the basis of this work approval for field release was given by the Australian quarantine authorities, with the first release being made in 1978(1).

LIFE CYCLE

According to McFadyen(1983) *M. mellyi* has only a single generation with a partial second generation each year in the Curitiba region in Brazil. Field observations in South East Queensland show that the insect commonly has two generations per year, and sometimes a partial third, depending on the severity of winter conditions(2). The life-cycle of the insect in this region is set out in Fig. 1.

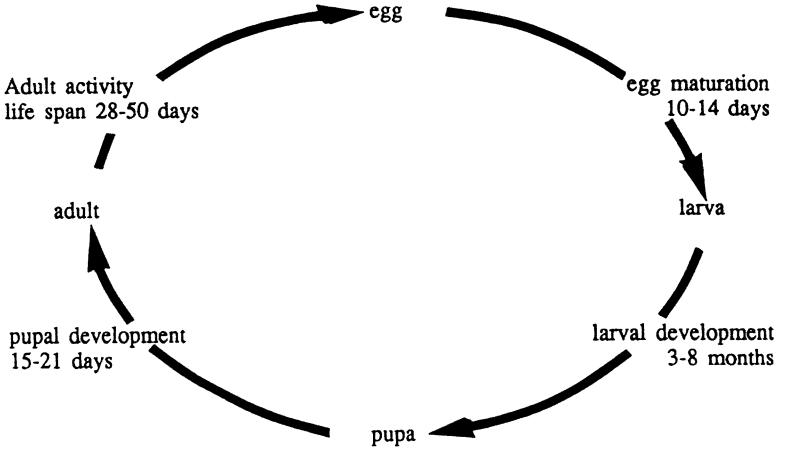

Figure 1. Life cycle of *Megacyllene mellyi* in south-eastern Queensland.

BIOLOGY

The eggs are ca. 4-5mm long and are laid singly in crevices in the bark. For this reason young plants and /or those with smooth bark are not a good choice for release sites as egg predation is high. Larvae, on hatching, burrow into the sapwood just under the bark and begin feeding. As the larvae develop, feeding is mainly restricted to the sapwood. However some tunnels are made deeper, and this is more frequent where populations are high. Also, while the larvae often inflict considerable damage to the crown of the plants, they seldom burrow into the roots. The larvae pupate within the tunnels protected by frass plugs. On emergence the adults chew their way out leaving a characteristically rounded emergence hole.

MASS REARING PROGRAMME

In the early stages of the mass rearing programme the output of beetles for release was comparatively low (McFadyen, 1979 unpub rept). Examination of the system being used showed that egg mortality was unacceptably high, and that if this could be improved, output would increase.

The insect was successfully reared by obtaining oviposition on cut sections of groundsel bush stem ca 50mm dia. x 450mm long. These were wound spirally with tape to provide extra oviposition sites and the ends were dipped in melted paraffin wax to seal the vessels thus prolonging the life of the stems. These stems were placed into oviposition cages with the appropriate numbers of insects, and were changed 3 times per week.

The stems were then held for a period of 4-5 weeks while the larvae hatched and developed to a size suitable for transfer to artificial diet for "finishing off". Initially, to keep the stems alive as long as possible, they were packed in moist peatmoss. However, excess moisture in this system was found to be the cause of the high egg mortality. By keeping the stems in plastic bags at ambient temperatures it was found that the stems could still be kept alive and egg survival improved dramatically. The artificial diet used was a modified Harley/Wilson formula with less water, and powdered groundsel bush stem replacing the normal cellulose component. Larvae were held in individual glass vials, and the diet was changed every 14 days. Development time varied between 10 weeks in summer and 20 weeks in winter at a constant temperature of 24^{o}C.

FIELD RELEASE PROGRAMME

A total of 46,500 beetles were released at 46 separate sites between 1980 and 1984 (Tomley,1984 unpub rept). These sites were located in various environments ranging from marine plains to mountain slopes. Concurrent observations showed that viable colonies only survived on the host where it was growing on shallow saline soils close to the coast. Further investigation showed that the reason for this was the relationship between sap flow and survival of neonate larvae(2). In plants growing on better soils, neonate larvae were frequently drowned by sap flowing from severed vessels as they burrowed into the sapwood. This was not observed to occur in plants growing on saline soils; therefore, later releases were restricted to these soils.

EFFECTIVENESS OF CONTROL

The most spectacular results have occurred on the small islands of Southern Moreton Bay, with marine plains supporting the grass *Sporobolus virginicus* and the tree *Casuarina glauca*. In this situation, groundsel bush forms dense thickets as a sub-storey to the detriment of native species. Here the weed is important not only as a cause of environmental degradation, but also because the seed produced is carried by the wind to adjacent agricultural areas. Over a period of 6 years, damage caused by expanding populations of the insect have reduced the plant density by 50%. *M. mellyi* shows a preference for plants growing in the sun or lightly shaded

situations. As the population pressure increases, plants in the more shaded situations are attacked.

CONCLUSION

While the activity of this insect is restricted ecologically, the high degree of control it will ultimately provide in the environmentally sensitive areas which are components of marine ecosystems is an important contribution to the overall control programme.

REFERENCES

1. McFadyen, P.J. 1983. Entomophaga 28(1) 65-72.
2. Tomley, A.J. 1989. Proc. 5th. Biennial Noxious Plants Conf. Lismore, July, pp. 73-75.