inundative releases at the time of Orobanche emergence. The larvae of P. orobanchia mine in Orobanche shoots and capsules and intervene at the sensitive reproductive stage of Orobanche. Hence, the reduction of Orobanche seed production prevents supplementary infestation and dissemination. The advantage of this control approach is its compatibility to all crop/Orobanche associations and that it can easily be combined with other control methods. In northern Morocco, the application of P. orobanchia in biocontrol of Orobanche spp. has been tested from 1995 until 1999. Under natural conditions, 48.9% of Orobanche seed capsules are infested by P. orobanchia. P. orobanchia is parasitized by nine hymenopterous species, but the total parasitization rate does not exceed 8.9% on average. For field releases of P. orobanchia adults, a formula for the calculation of the fly number per hectare based on the Orobanche infestation level has been developed. Inundative releases of P. orobanchia in field cages have shown that the natural efficiency of P. orobanchia can be increased considerably. Only 5.3% of viable seeds have been produced in comparison to 62.0% without inundative releases. Seeds are directly destroyed by the mining activity of P. orobanchia larvae as well as indirectly by the feeding damage to shoot tissues causing a degeneration of seed capsules. In highly infested fields (> 200 Orobanche shoots per m²), an increase of the Orobanche seed bank in the soil could be still observed after inundative releases. In low to medium infested fields, releases of P. orobanchia alone are sufficient to reduce the Orobanche seed population to an acceptable level. An integrated control approach with tolerant and/or resistant cultivars, combined with mycoherbicides or other control methods is proposed.

Progress on the introduction, rearing and release of the ragwort plume moth, Platyptilia isodactyla, for the biological control of ragwort, Senecio jacobaea, in Australia

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Ragwort, Senecio jacobaea L. (Asteraceae), is a herbaceous, biennial plant native to Europe and western Asia. It was introduced into Australia during the mid 1800s and now occupies more than 820,000 ha in the high rainfall areas of southern Victoria and at least 160,000 ha in Tasmania. Ragwort is an extremely invasive weed in pastures, particularly those grazed by cattle and horses, forestry plantations and natural ecosystems. Biological control of ragwort commenced in Victoria in the 1930s with the release of the cinnabar moth, Tyria jacobaeae L. (Lepidoptera: Arctiidae), and in the 1950s, the seed fly, Botanophila jacobaeae (Hardy) (Diptera: Anthomyiidae), was released. Neither of these insects established, despite repeated release attempts, probably due to disease, predation by native insects or an inability to adapt to the Australian environment. The flea beetles, Longitarsus flavicornis (Stephens) (Coleoptera: Chrysomelidae) and Longitarsus jacobaeae (Waterhouse), were introduced into Australia in the late 1970s and 1980s, respectively. In Tasmania, L. flavicornis is now widely established on ragwort and has caused significant reductions in plant vigour and density at many sites. In Victoria, flea beetle establishment has been less successful, with populations of L. flavicornis persisting only within the Strzelecki Ranges. The ragwort crown-boring moth, Cochylis atricapitana (Stephens), introduced in 1987, has established in both Victoria and Tasmania and has been shown to kill ragwort rosettes during autumn. The ragwort plume moth, Platyptilia isodactyla Zeller (Lepidoptera: Pterophoridae), is the latest biocontrol agent to be imported and was first released in Victoria in December 1999. This paper describes the release and establishment of P. isodactyla in south-eastern Australia.