



Searching for new potential agents for an old problem: field bindweed (*Convolvulus arvensis*)

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Introduction

Field bindweed (*Convolvulus arvensis*) is a perennial vine of Eurasian origin that was introduced into North America and Australia. It has an extensive root system, can harbour plant diseases and is toxic to horses. In the 1980s two biological control agents, the gall mite *Aceria malherbae* and the bindweed moth *Tyta luctuosa* were released in North America. While establishment of the moth has not been confirmed, the mite is established in several US states and in Canada, but its impact is variable.

In 2009, investigations on additional potential biological control agents started including the stem-mining agromyzid fly *Melanagromyza albocilia* and the root mining flea beetles *Longitarsus pellucidus* and *Longitarsus rubiginosus*. The original test plant list is being revised, emphasizing native North American species and ornamental and crop plants in the family *Convolvulaceae*.

Melanagromyza albocilia

The larvae of this bivoltine fly mine the stems and roots of field bindweed. In 2009, 124 larvae and pupae were collected in Slovakia and between 2009 and 2010 over 550 pupae were collected in Germany. A total of 71 females and 43 males emerged, with a parasitism rate of about 72%. We tried different methods to establish a rearing colony and develop methods for host specificity tests. Adult flies were exposed to potted bindweed plants either covered with sleeves, transparent plastic cylinders, or in screen cages. All plant material was then dissected, but unfortunately we were not able to obtain attack. Subsequently, we observed the behaviour of the flies using transparent plastic tubes, petri dishes and cylinders offering cut plant material with or without additional food sources such as wild flowers, yeast, milk powder, sugar or honey water. Several adults were observed feeding on the flowers. However, no mating has been observed and oviposition behaviour was only recorded once. We are currently synchronising emergence of male and female flies and try once more to obtain oviposition in captivity.



Longitarsus pellucidus on *Convolvulus arvensis*

Longitarsus pellucidus and *L. rubiginosus*

Between 2009 and 2011, 24 plant species, 17 native to North America, were exposed in various host specificity tests.

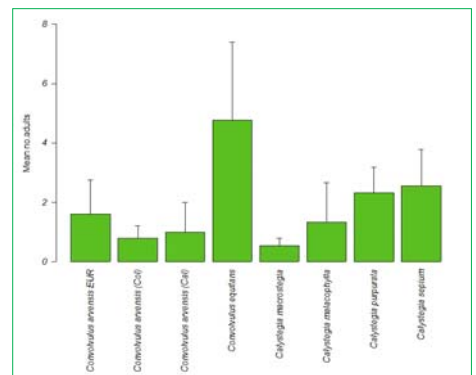
In no-choice larval transfer tests, adults of both species emerged from the native North American *Convolvulus equitans* and several native *Calystegia* species apart from field bindweed and the closely related European *Calystegia sepium*. No adults emerged from two other genera tested (*Dichondra* and *Ipomea*).

Most of the native test species from which adults emerged were exposed under multiple-choice conditions with *L. pellucidus* in 2011. Emergence is still ongoing. Preliminary results indicate that the three *C. arvensis* populations exposed (Europe, California and Colorado) were equally well attacked. However, adults also emerged from *C. equitans* and the three native *Calystegia* species exposed.

An open-field test was set up with the same species on a site where both *L. pellucidus* and *L. rubiginosus* occur. Results will be available in 2012.



Convolvulus arvensis in a corn field, Germany



Preliminary results of a multiple-choice cage test established with *Longitarsus pellucidus* in 2011

Conclusion

The fly proves to be difficult to rear in the lab. If additional attempts fail we might have to discontinue work with this species.

Both flea beetle species include several *Convolvulus* and *Calystegia* species in their physiological host range. At least *L. pellucidus* also attacks these species under multiple-choice cage conditions. Results of the open-field test will determine whether we will dismiss or continue working with the two flea beetles.

There are at least five additional insects with potential for biological control of field bindweed: two defoliating leaf beetles, one leaf feeding moth and two root-mining sesiid moths.



Female of the shoot-mining fly *Melanagromyza albocilia*



Set up of behavioural feeding and oviposition experiments

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