Biological control of broad-leaved dock (*Rumex obtusifolius* L.*)* in grasslands with fiery clearwing moth *Pyropteron chrysidiformis* (Esper, 1782)

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Rumex obtusifolius L. (broad-leaved dock) is a troublesome perennial weed species widely spread on grasslands and pastures, but also frequently found in a wide range of habitats and cropping systems.

R. obtusifolius has an extensive root system and repeated herbicide and mechanical treatments are needed to obtain a long term control

Within the IWMPRAISE project, a promising native biological control candidate fiery clearwing moth *Pyropteron chrysidiformis* (Esper, 1782) (Lepidoptera: Sesiidae) was selected for a 3-year field study at two contrasting climatic conditions in Slovenia.

Larvae of the moth feed on *R. obtusifolius* roots and if present in sufficient quantity, high mortality of plants is expected.

Materials and methods

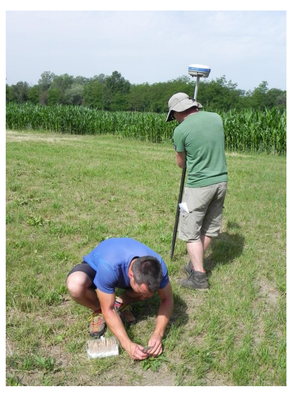
The method is based on *P. chrysidiformis* eggs application on *R. obtusifolius* plants in late spring / early summer.

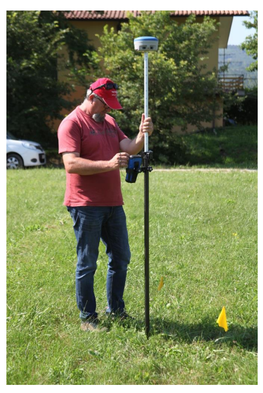
Insect rearing was done in cooperation with CABI, Delemont, Switzerland. Pupae were brought to AIS laboratory where mating of emerged adult insects was done.

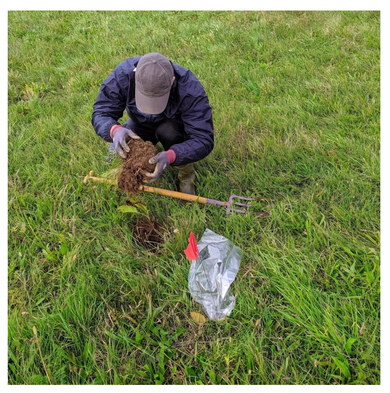
Eggs were collected and glued to toothpicks for field inoculation.

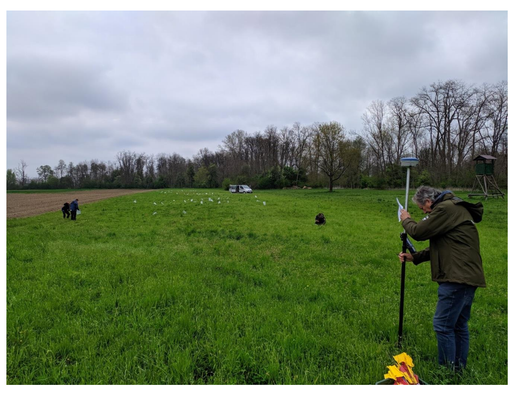
Field trial

- Duration: 3 years
- 2 locations with contrasting climatic conditions – Ajdovščina and Murski Črnci
- 4 treatments: **1** - inoculation with *P. chrysidiformis* in year 1; **2** - inoculation in years 1 and 2; **3** - inoculation in years 1, 2 and 3; **C** - control (natural level of attack).
- 50 plants/treatment– Toothpicks with *P. chrysidiformis* eggs were attached to *R. obtusifolius* crown/rosette.
- Plant's positions were marked using high precision GPS/GNSS station (Stonex S9i) for subsequent inoculations and final assessment.









Results

- Environmental conditions and the of the *R. obtusifolius* plants were the most important factors infldevelopment stage uencing plant mortality.
- **Plant mortality** and establishment rate on site with **cooler climatic conditions** (Murski Črnci) were significantly **lower**.
- On location Ajdovščina with warmer climate the **majority (85 %) of inoculated plants were completely controlled after one or two years** of *P. chrysidiformis* eggs application.
- A larger number of treated plants found dead or infested with *P. chrysidiformis* in Ajdovščina suggests that **warmer and drier climate facilitates the establishment of *P. chrysidiformis***.

Table 1: Mean values for *R. obtusifolius* mortality on two locations following inoculation with *P. chrysidiformis*

Inoculation treatment	Site Ajdovščina	Site Murski Črnci
	Plan mortality (%)	
1	78,0	40,0
2	88,0	54,2
3	96,0	63,3
C	24,0	28,0

Inoculation treatments with *P. chrysidiformis i*ncluded*;* **1** - inoculation in year 1; **2** - inoculation in years 1 and 2; **3** - inoculation in years 1, 2 and 3; **C** - control (natural level of attack).

Conclusions

The biological control method tested here showed considerable potential for *R. obtusifolius* management, especially in warmer climate, where a single season of *P. chrysidiformis* release resulted in a significant reduction in the number of *R. obtusifolius* plants.

Pictures 1-2: Larvae of *P. chrysidiformis* inside of *R. obtusifolius* root (left) and emty spot with complete control of marked *R. obtusifolius* plant (right)

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