

doi:<http://dx.doi.org/10.15414/afz.2015.18.si.47-49>

## The egg parasitoid *Telenomus* sp. as a novel biocontrol agent to prevent the cabbage moth

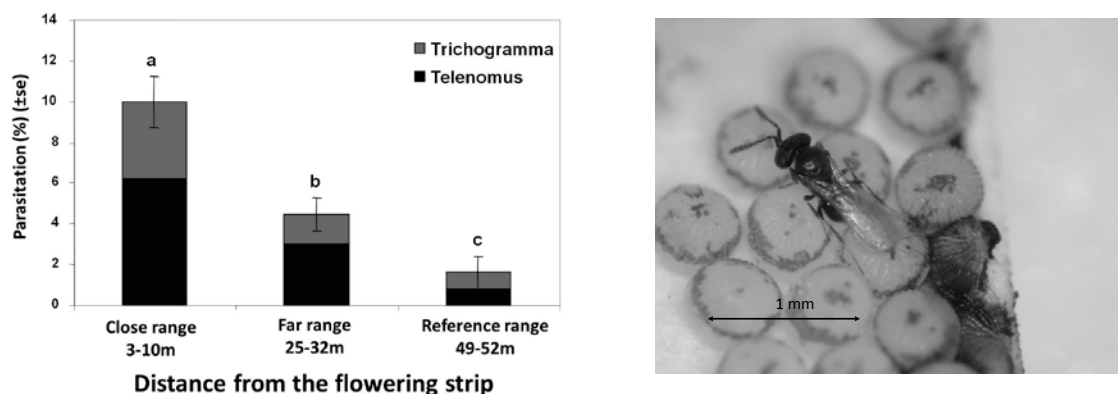
Guendalina Barloggio<sup>1,2\*</sup>, Lucius Tamm<sup>1</sup>, Thomas Oberhänsli<sup>1</sup>, Peter Nagel<sup>2</sup>, Henryk Luka<sup>1,2</sup><sup>1</sup> Research Institute for Organic Agriculture (FiBL), Frick, Switzerland<sup>2</sup> University of Basel, Department of Environmental Sciences, Basel, Switzerland

This work, which is part of a project called Biocomes ([www.biocomes.eu](http://www.biocomes.eu)), focuses on the control of the cabbage moth *Mamestra brassicae* (Linnaeus, 1758) (*Lepidoptera: Noctuidae*) through mass release of the egg parasitoid *Telenomus* sp. (*Hymenoptera: Scelionidae*). In the first year of the project we conducted different experiments to uncover aspects of the biology of this egg parasitoid that could help the creation of an efficient rearing system. Parallel we developed a species specific primer for the molecular species determination. Here we will present the most important results.

**Keywords:** *Telenomus* sp., biological control, biology, primer development

### 1 Introduction

Brassica crops are attacked by a wide pest complex, among them larvae of lepidopteran pests. In order to reduce the application of insecticides we aim to rear in the laboratory a native parasitic wasp and release it in the field as a biocontrol agent. Previous field experiment (2007-2010) conducted by Balmer et al. (2013 & 2014) showed that the naturally occurring egg parasitoid *Telenomus* sp. efficiently parasitize the eggs of the cabbage moth (*Mamestra brassicae*) compared to the released egg parasitoid *Trichogramma* spp. (Fig. 1).



**Figure 1** Parasitization of cabbage moth eggs at three distances from a flowering strip (left) and *Telenomus* sp. wasp parasitizing some cabbage moth eggs (right)

With this project we aim to develop a new biocontrol agent based on the egg parasitoid *Telenomus* sp.. At date very little is known about this parasitic wasp, so in the first project year we conducted different experiments to uncover the biology of *Telenomus* sp.. Here we present the most important results. Parallel we developed species specific primers to

\* **Correspondence:** Guendalina Barloggio, Research Institute of Organic Agriculture (FiBL), Department of Crop Sciences, Ackerstrasse 113, Box 219, CH-5070 Frick, Switzerland. E-mail: [guendalina.barloggio@fibl.org](mailto:guendalina.barloggio@fibl.org)

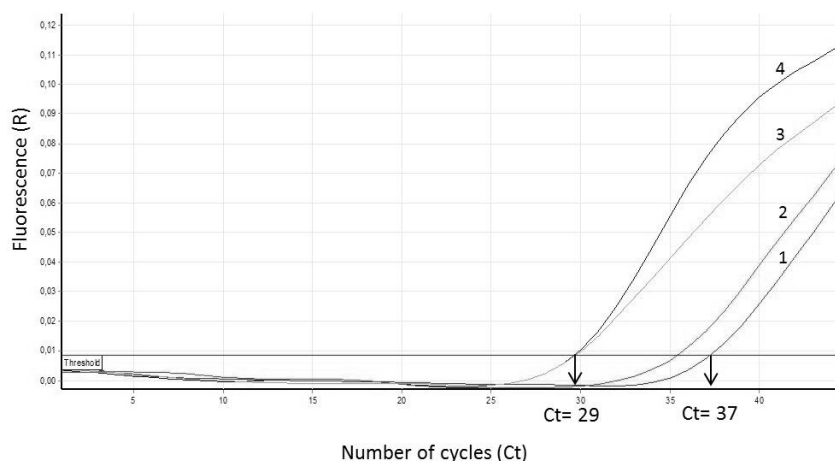
easily determine the species. We will use this primer to determine *Telenomus* sp. between parasitoid sampled across Europe (Italy, Sweden and Spain). This step is important to evaluate the potential use of *Telenomus* sp. as biocontrol agent at the European scale.

## 2 Material and Methods

The rearing was started from wild *Telenomus* sp. wasps sampled in organic cabbage field in Switzerland. Every year new parasitoids are collected to refresh the laboratory population. Among all we conducted experiment to undercover the longevity, fecundity and developmental rate at different temperatures of *Telenomus* sp.. The parameters measured were: duration of the development, parasitization rate, sex ratio of the progeny and longevity of the adult wasps. These are all important parameters to evaluate the efficacy of a rearing. The species specific qPCR-TaqMan-marker (primer and Probe) was developed based on the COI sequence of *Telenomus* sp.. After sequencing the gene, we compared it *in silico* to homologous insect sequences, to find regions unique to our parasitoid. The specificity of this qPCR-Method was then tested towards different insect species.

## 3 Results

Egg deprived females (ca. 10 days old) live significantly less in the presence of eggs than in their absence. This is not true for younger females (< 24 hours old and not egg deprived). In this case we found no differences between the two treatments (presence/absence of eggs). Compared to females males' longevity (of both age classes) is not influenced by the presence or absence of host eggs. The number of parasitized eggs is dependent on the egg deprivation state. Egg deprived females parasitized approximately 140 eggs, while the younger one only 60 eggs, this difference is significant. The same is true for the hatching rate of the progeny as well as of their sex ratio. The sex ratio produced by the egg deprived females was 68 % while that of the not egg deprived 17 %. The newly developed primer was proved to be highly specific for *Telenomus* sp., in the way that the parasitoid DNA can also be detected in parasitized eggs of different developmental stages (Fig. 2).



**Figure 2** Results of a qPCR reaction, where different developmental stages were tested: 1) 7 days, 2) 8 days and 3) 10 days after parasitierung; 4) an adult wasp. The Ct-values are inversely proportional to the quantity of DNA present in the sample. The detection limit lies between Ct37 and 40

## 4 Conclusions

The results presented above give a first overview on the biology of *Telenomus* sp.. and can be used to build an efficient rearing. Further experiment will be conducted to better

understand the role of the egg deprivation state in the determination of the sex ratio, particularly to determine the lowest period needed to produce the highest sex ratio. This is important for a further use in the field of this parasitoid as a biocontrol agent. The fact that the parasitoid need a certain period of time before to be able to efficiently parasitized eggs, make necessary the development of a specific formulation to allow the parasitoids to survive the time necessary to become efficient. In addition it will also be important to release the parasitoid in a preventive manner, namely before the beginning of the infestation through the cabbage moth. In the years 2015-2017 we will conduct field experiments to first, test and chose the right formulation and right density of parasitoids and then to conduct efficacy trials where we will evaluate the effect of the release of *Telenomus* sp. on the yield. The developed primer will be used to determine *Telenomus* sp. between the egg parasitoid sampled in Italy, Spain and Sweden. Understanding the distribution of this parasitoid at the European level is important in the light of a further use of *Telenomus* sp. as biocontrol agent outside of Switzerland.

## 5 Acknowledgements

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 612713.

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