



FA1203: Sustainable management of *Ambrosia artemisiifolia* in Europe (SMARTER)

Short Term Scientific Mission Report

Training in experimental methods in population dynamics and biological control of *Ambrosia artemisiifolia*

STSM details

COST STSM Reference Number: FA1203-210515-060947

Timing of STSM: 21-31 May 2015

Applicant details

Aleksandra Savić

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Host details

Heinz Müller-Schärer

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Summary of the STSM

In this STSM, we have started to develop a population dynamics model for *Ambrosia artemisiifolia*. We have also designed a protocol for the collection of demographic data to parameterise this model. We will use this model as a tool (i) to quantify and understand the natural variation in the dynamics of common ragweed, and (ii) to prospectively evaluate and compare the long term impact of different management strategies on the population dynamics in a wide range of environments throughout Europe.

Purpose of the STSM

On the territory of the Republic of Serbia, *Ambrosia artemisiifolia* L. is one of the most damaging weed species that threatens the growth and development of cultivated crops. In addition, large quantities of pollen produced by this plant threaten the health of people who are allergic to ragweed. Currently, agro-technical, mechanical and chemical measures are implemented, and the latter is so far most effective in suppressing ragweed on crop fields. However, despite these measures, this invasive species is expanding its frontiers. Because of the preservation of the environment and the risk of herbicide resistance, it is necessary to find new methods and solutions to control *Ambrosia artemisiifolia*.

Through this STSM, I aimed to learn about the possibilities for biological control of ragweed (as is the topic of SMARTER WG1), and, more specifically, about experimental designs to test

their impacts on the target and non-target species. I was particularly interested to learn the population dynamics approach, used by members of SMARTER WG1 and the TF Population Dynamics.

Objectives of the STSM

The objectives of this mission were to

1. Learn experimental designs on population dynamics, including soil seed bank dynamics
2. Learn to set up experimental designs to test the target impact of potential biocontrol agents
3. Learn to set up experimental designs to test risks of potential biocontrol agents for non-target plants
4. Get in touch with demographic data analysis and modelling
5. Expand my international network to initiate international collaborations on sustainable weed management

Description of the work carried out during the STSM

Week 1

- Discussing relevant literature with the host
- Attending the presentation by Caspar Hallmann on demographic modelling of ragweed
- Discussion with Melinda Leitsch-Vitalos on methods to assess the soil seed bank dynamics of *A. artemisiifolia*, demonstration of methods to extract seeds from soil samples
- Discussion with the students of the Müller-Schärer group on their work on the biological control of ragweed (2x BSc students, 2x MSc students, 1x PhD student), specifically their experimental approach
- I visited running experiments on the interaction between host plants and potential biocontrol agents of ragweed
 - a lab experiment on the performance of two species of the ragweed leaf beetle *Ophraella* on *A. artemisiifolia*, and on sunflower, on detached leaves in petri dishes in different environmental conditions (climate cabinets)
 - a lab experiment on the feeding and oviposition preference of the ragweed leaf beetle *O. communa* for different species of *Ambrosia* by a choice experiment in cages with multiple plants

Week 2

- I took part in the lab meeting of the Müller-Schärer group, with presentations of two BSc students on ragweed
- I worked a full day with the technician of Heinz Müller-Schärer on the study system (growing different host plants in the greenhouse, culturing the two different *Ophraella* species in the quarantine facilities, constructing material for lab and field experiments, setting up a lab experiment on the preference of *Ophraella* for non-target species)

- I joined Suzanne Lommen, the coordinator of the SMARTER TF Population Dynamics, one full day in preparing the field work of the population dynamics studies of fifteen populations in Switzerland, Italy, and France
- I joined Suzanne Lommen for one full day of field work, setting up and collecting data of a population dynamics study of one of the Swiss *Ambrosia* population
- I took part in digitalising the data collected on this Swiss population
- I discussed the analysis of demographic data with Suzanne Lommen and Caspar Hallmann (how to deal with errors in the data collected by the TF Population Dynamics, how to calculate vital rates from these data)
- I discussed ideas to include studies on biological control and population dynamics in my PhD research, and discussed future collaboration with the host

Description of the main results obtained

This STSM has brought me into contact with many people (students, members of the Heinz Müller-Schärer lab, guests) that work on the biological control and population dynamics of ragweed. I have been introduced to, and been taking part in, experimental designs to assess the impact of potential biocontrol agents on target and non-target plants.

I now have a good overview of the different experimental approaches with their strengths and weaknesses, including lab experiments and field experiments. I learnt how to bring such designs into practice: how to maintain cultures of the living organisms used, what facilities and material is needed, and how to prepare this. With respect to population dynamics, I learnt how a demographic study on ragweed can be set up in the field, what problems can be faced during data collection and data analysis, how to solve these, how to analyse soil seed samples, and how all these data can be analysed to obtain demographic vital rates, that are used in demographic modelling.

This STSM has hence greatly advanced my understanding of biological control and population dynamics in general, and experimental design to test the efficacy of biological control in particular. I have developed ideas to include such studies in my PhD research, and to include the knowledge obtained in my classes on weed science to undergraduate students. I have expanded my network on these subjects, that I can approach when needed in future.

Future collaboration with the host institution

I may include studies on biological control or population dynamics in my PhD research. The host and Suzanne Lommen have offered help in further developing these ideas.

Foreseen publications/articles resulting from the STSM

No publications are foreseen to result from this STSM. However, collaborative studies with joint publications may be part of the PhD studies of this applicant in future.

Confirmation by the host institution of the successful execution of the STSM

Cf. attached email by the host.

From: MUELLER Heinz

Sent: 16 June 2015 09:55

To: maurizio.vurro@ispa.cnr.it
Cc: LOMMEN Suzanne; Aleksandra Savic
Subject: STSM Savic

Dear Dr. Maurizio Vurro,

I would like to confirm that Aleksandra Savić has visited my lab in Fribourg, Switzerland, in the last two weeks of May 2015 (during the same period as Caspar Hallmann). I have read the final draft of her STSM report and fully agree with the content. She has had the chance to interact with many of my lab members that work on the biological control of ragweed, to take part in experimental studies, and to join Suzanne Lommen and Caspar Hallmann in their work on demographic modelling. I am convinced that this has been an excellent introduction into experimental methods on assessing the potential of potential biocontrol agents, and population dynamics in particular.

With kind regards,
Heinz

Acknowledgements

I greatly acknowledge the team of Heinz Müller-Schärer and his guests to introduce me to their work, and their hospitality. It was a great experience for me.

15 June 2015
Aleksandra Savić