



European Network for the durable exploitation of crop protection strategies

IA3 Activity: Human resource exchange

ENDURE - Internal Mobility

Final activity report

(The form has to be filled in and sent to the activity leader – message should be sent to his p.a. federica.piccolo@ibaf.cnr.it – within 15 days after the end of the visit)

Topic of the visit

To conduct molecular investigations of microbial community structure and function in soils

1. Information about researcher and sending partner

Name and surname: Roberto Borriello

Professional status: Post-doc

Sending partner: CNR - Consiglio Nazionale delle Ricerche

Institute/Department/Research Unit: IPP – Istituto per la Protezione delle Piante

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Supervisor name*: Valeria Bianciotto

Supervisor e-mail*: v.bianciotto@ipp.cnr.it

Supervisor phone number*: +39 011 650 2927 (ext. 51)

*Supervisor information only for PhD student, post-doc and junior researchers

2. Information about hosting partner

Hosting partner: RRES, Rothamsted Research

Institute/Department/Research Unit: Plant Pathology and Microbiology Department

Address: Harpenden, Hertfordshire, AL5 2JQ

Supervisor name*: Penny Hirsch

Supervisor e-mail*: penny.hirsch@bbsrc.ac.uk

Supervisor phone number*: +44 (0) 1582 763 133 ext 2669

* For senior scientist indicate the name of the collaborating colleague

3. Information about the visit

Starting date: 01 September 2010

Ending date: 10 October 2010

Total duration (*number of weeks*): 6 weeks

4. Description of the activities and outcomes

Background and context:

Soil microbial communities are a key factor in crop production, supporting healthy plant growth, improving soil structure, degrading organic pollutants, cycling nutrients and influencing their availability. The magnitude of these effects could vary dramatically in relation to the microbial communities' composition. The identification and quantification of microbial communities in soil could help to elucidate the effect of the different agricultural practices. Particular attention is necessary to study community variation in those microbial groups that are difficult or impossible to culture, such as arbuscular mycorrhizal fungi (AMF). This group of fungi form a mutualistic symbiosis with a large majority of vascular plants providing improved mineral nutrition and enhanced stress resistance.

Objective:

The objective of the project was to investigate fungal community variations under different agricultural management practices, in particular fertilization. We analysed the variations in community structure that occurred in the total fungal population and in arbuscular mycorrhizal fungal populations. We aimed at testing a *fingerprinting* technique such as the Terminal Restriction Fragment Length Polymorphisms (T-RFLP) to individuate which particular groups of fungi are present or absent under different fertilization regimens.

Activities carried out: *maximum 20 lines*

Activities carried out in RRES laboratory was focused on setting up a protocol for a T-RFLP analysis, therefore with the following steps:

- soil and root sampling

- DNA extraction from soil and root material
- PCR amplifications of different fungal rRNA gene regions (small subunit and ITS regions), using fluorescent marked primers
- Enzymatic digestion of PCR fragments obtained
- Preparation of the samples for the T-RFLP run

At the end of the period we processed 77 samples (soil and roots) coming from different sites. The PCR amplification revealed putative presence of AM fungi in all the samples analyzed. The PCR samples properly treated have been submitted to an external facility in order to perform the T-RFLP run and are under analysis, at the moment.

In addition has been possible for me to interrogate large soil metagenomic databases obtained from experiment conducted by researchers at RRES. The aims were to identify putative AMF sequences and to gain new bioinformatic skills.

5. Links between visit activity and ENDURE

The ENDURE Research Action 2.2 has the aim to exploit innovative technologies for implementing crop protection strategies. The institute where I am working (IPP-CNR) is involved in the R.A. 2.2, with the task of elaborate diagnostic methods to detect beneficial soil fungi by using different molecular methods. In this regard, during this short mobility we decided to evaluate the possible use of a fast molecular approach in the identifications of the variations occurring in the AMF communities' composition present in soils and roots. The AMF are considered "biofertilizers" due to the wide range of benefits that can provide to the plants, either in natural as well as in agricultural environments. Nevertheless, the magnitude of these benefits could vary depending how the different AMF species combine together to form communities. Therefore it is important to develop instrument and strategies to track the community changes and to evaluate how and how much agricultural practices could affect them, because only in this way we can maximize the benefits that these fungi can provide to the crop plants either in term of nutrition or as protection.

6. Impact

Added value for the researcher:

The period spent at the RRES allowed me to work with a scientific group with a wide research experience in soil microbiology. The collaboration enriched me with new notions about soil microbial ecology. At the same time I also had the possibility to gain new laboratory skills working side by side with the researchers in RRES laboratory.

Despite the scientific value of this experience, I would like to see this short period as a first contact toward future collaborations.

Added value for sending partner and hosting partner:

The mobility period offered the opportunity to combine the knowledge on soil bacterial ecology of the hosting research group with the experience on the fungal ecology coming from the "sending" group. This combined approach gave the opportunity to share ideas and knowledge, so improving both the involved partners and establishing scientific links between two ENDURE partners.

Date of submission

27/10/2010



Dr. Maurizio Sattin
IA3 activity leader

Approved

