

PS-7.3-03

In the Search for Innovative Agroecological Farming Practices in Irrigated Landscapes of North Africa: Case of Kairouan Plain in Central Tunisia

Koladé Akakpo¹, Cryste Leauthaud¹, Nadhira Ben Aissa², Sami Bouarfa³, Akiça Bahri²

¹CIRAD, France, ²INAT, France, ³IRSTEA, France

Abstract: Irrigated agriculture is instrumental for the economy and employment in North Africa countries. However, farmers in the Maghreb region face, on the one hand, multiple environmental and climatic risks, and on the other, economic constraints that, combined together, can lead to the vulnerability of these rural populations. Assuming that strong capacities of adaptation and innovation potentials exist within small-scale irrigated farming systems, this study aimed to identify and characterize existing eco-efficient and resilient farming practices in the Kairouan irrigated plain in Central Tunisia. The latter is entirely cultivated, with a wide variety of crop types such as market gardening, arboriculture and cereals. Representative of small-scale family farming systems in the irrigated plains of Tunisia, this study site lends well to work on the characterization of agroecological practices in a semi-arid irrigated environment. Semi-structured interviews were conducted with farmers, first, to identify low-input practices at the plot and farm scale, second, to apprehend the determinants and the objectives of these practices. The sampling procedure sought to explore the wide range of existing practices, and was thus partly based on the farmers and the local agricultural administration knowledge and networks. The study shows that farmers usually combined different cropping systems, mostly for economic reasons (improved water and land use, increased monetary income by reducing chemical inputs). Low chemical-input or water-use practices, related to agroecology, were observed, especially for watermelon and pepper, which are commonly associated with leguminous species. Agroforestry practices, associating different tree species (mainly olive trees) to other crops, or intercropping (market gardening, cereals), were also common. Some farmers integrated animals in “a no lost integrated farming system”. Furthermore, a little-known, but very innovative practice observed, was irrigation using water coming from organic fermentation, leading to a significant reduction in the need of chemical inputs. All these practices, which are particularly present in small rural farmers, who represent the great majority of the farmers in Tunisia and in Maghreb, show the existence of knowledge on which an agroecological transition could be initiated. Identifying such local agroecological practices is a first step in their adoption and promotion, as decision makers increasingly seek to take into account the environmental impacts of agriculture in the Maghreb.

Keywords: Agroecological practices, agroecology, farming system, irrigated plains, Kairouan, Maghreb, transition.

PS-7.3-04

Metagenomics of Asparagus Field Soils Treated with Biostimulants

François Lefort¹, Julien Crovadore², Ali Asaff Torres³, Jorge Verdin Ramos⁴, Bastien Cochard², Romain Chablais², Raúl Rodríguez Heredia⁵

¹Hepia, Switzerland, ²HES-SO University of Applied Sciences and Arts Western Switzerland, Switzerland, ³Centro de Investigación en Alimentación y Desarrollo A.C. / Innovak Global S.A. de C.V, Mexico, ⁴CIATEJ-Centro de Investigación y Asistencia en Tecnología y Diseño del Estado de Jalisco A.C, Mexico, ⁵Innovak Global S.A. de C.V, Mexico

Abstract: Metagenomic studies of soils allow to reveal different microbiota compositions in various organic or conventional agricultural systems. The present study combined biostimulants trials and metagenomics, with the expectation that a potential yield increase could be linked to a microbiota variation. The tests were carried out in a perennial cropping system of asparagus, on a sandy and silty soil, which has been treated with 2 commercial biostimulants, Exuroot (T1) and Exuroot added with Cérés (*Pseudomonas fluorescens* and *Trichoderma harzianum*) (T2). Biostimulant treatments were applied 4 times between mid-July and mid-September 2016, on experimental units (EU) of 800 m² (3 repetitions) Asparagus shoots were harvested from March to April 2017, counted every two days in each EU and ranged in 4 group size groups. Results were then grouped into two time spans; corresponding to the 4 first collections and the 4 following collections. ANOVA and TUKEY KRAMER tests were applied to infer statistical differences. The total numbers of collected shoots per experimental unit were 182, 185 and 199 shoots, for the control, T1 and T2 respectively, equivalent to 2279, 2317 and 2492 shoots per ha, respectively, representing an increase of 9.34 % in T2 when compared to the control. The main contribution to this increase was due to lower size shoots, considered as second quality products. For the metagenomics analysis, for each of the 3 modalities and their repetitions, 50 g of rhizosphere soil were sampled from 10 points at depths between 20 and 40 cm and the control modality was sampled at the beginning and at the end of the experiment. Pooled sampling points were homogenized and DNA was extracted from 10 g subsamples. Whole metagenome shotgun sequencing was carried out with an Illumina MiniSeq using 2x150-bp paired-end reads. Sequencing yielded between 3,360,000 reads (0.5 Gb) and 12,350,000 reads (1.85 Gb) per sample. Bioinformatic analysis and identification of operational taxonomic units (OTUs) were performed using One Codex. A wide diversity of OTUs was retrieved from these soil samples, in which the classes Alphaproteobacteria and Actinobacteria were dominant. The 10 most abundant genera, representing between 29.43% and 42.8% of all species in all samples, were *Bradyrhizobium*, *Mesorhizobium*, *Microbacterium*, *Mycobacterium*, *Nocardioides*, *Pseudomonas*, *Rhizobium*, *Sphingomonas* and *Streptomyces*. Most of these genera showed important diversity, with dozens of different OTUs in each sample. Differences between microbiota of the three modalities were little and analysis should be refined to explain the yield increase of T2 modality.

Keywords: soil metagenomics; biostimulants: asparagus culture; *Pseudomonas fluorescens*; *Trichoderma harzianum*



ESA2018

XV^e European Society for Agronomy Congress

August 27-31, 2018 - Geneva, Switzerland

www.esa-congress-2018.ch

ABSTRACT BOOK



INNOVATIVE CROPPING AND FARMING SYSTEMS FOR HIGH QUALITY FOOD PRODUCTION SYSTEMS

**CICG, GENEVA SWITZERLAND
27 - 31 AUGUST 2018**

COMMITTEES

ORGANIZING COMMITTEE

- Christoph Carlen (president), Agroscope, Conthey, Switzerland
- Alice Baux, Agroscope, Nyon, Switzerland
- Raphaël Charles, FiBL, Lausanne, Switzerland
- Emmanuel Frossard, ETH, Zürich, Switzerland
- Bernard Jeangros, Agroscope, Nyon, Switzerland
- Fabio Mascher, SSA/SGPW and Agroscope, Nyon, Switzerland
- Monique Schwartz-Seale, Agroscope, Nyon, Switzerland
- Sokrat Sinaj, Agroscope, Nyon, Switzerland

SCIENTIFIC COMMITTEE

CORE SCIENTIFIC COMMITTEE

- Emmanuel Frossard (president), ETH, Zürich, Switzerland
- Alice Baux, Agroscope, Nyon, Switzerland
- Christoph Carlen, Agroscope, Conthey, Switzerland
- Raphaël Charles, FiBL, Lausanne, Switzerland
- Bernard Jeangros, Agroscope, Nyon, Switzerland
- Fabio Mascher, Agroscope and SSA/SGPW, Nyon, Switzerland
- Sokrat Sinaj, Agroscope, Nyon, Switzerland

EXTENDED SCIENTIFIC COMMITTEE

- Bernard Belk, Federal Office of Agriculture, Switzerland
- Jan Bengtsson, University of Agric. Sciences, Sweden
- Else Bünemann, FiBL, Switzerland
- Nathalie Colbach, INRA Dijon, France
- Branco Cupina, University of Novi Sad, Serbia
- Philippe Debeake, INRA Castanet-Tolosan, France
- Antonio Delgado, University of Sevilla, Spain
- Maria Finckh, University of Kassel, Germany
- Felix Herzog, Agroscope, Switzerland
- Jürg Hiltbrunner, Agroscope, Switzerland
- Eric Justes, CIRAD, France
- Andreas Keiser, HAFL, Switzerland
- Samuel Knapp, Techn. University of München, Germany
- François Lefort, Hepia, Switzerland
- Frank Liebisch, ETH, Switzerland
- Thomas Nesme, Bordeaux Sciences Agro, France
- Astrid Oberson, ETH, Switzerland
- Elisa Pellegrino, Sant'Anna University of Pisa, Italy
- Didier Pellet, Agroscope, Switzerland
- Pirjo Peltonen-Sainio, MTT Agrifood Research, Finland
- Caroline Rémond, University of Reims Champagne-Ardenne, France
- Evan Rocco, University of Tirana, Albania
- Mariana C. Rufino, Lancaster University, United Kingdom
- Meagan Schipanski, Colorado State University, United States of America
- Urs Schmidhalter, Techn. University of München, Germany
- Fred Stoddard, University of Helsinki, Finland
- Roberto Tuberosa, University of Bologna, Italy
- Marcel van der Heijden, Agroscope, Switzerland
- Christine Watson, SRUC, United Kingdom
- Jacques Wery, Montpellier Supagro, France
- Philip White, James Hutton Institute, United Kingdom
- Judith Wirth, Agroscope, Switzerland
- Noura Ziadi, Quebec Research and Development Centre, Canada