

COST

Domain Committee "Food and Agriculture"

COST Action FA1103

Start Date 8.12.2011

Endophytes in biotechnology and agriculture

MONITORING PROGRESS REPORT

Reporting Period: from 8.12.2011 to 1.5.2012

This Report is presented to the relevant Domain Committee.
It contains three parts:

- I. Management Report** prepared by the COST Office/Grant Holder
- II. Scientific Report** prepared by the Chair of the Management Committee of the Action
- III. Previous versions of the Scientific Report;** i.e., part II of past reporting periods

The report is a "cumulative" report, i.e. it is updated annually and covers the entire period of the Action.

Confidentiality: the documents will be made available to the public via the COST Action web page except for chapter *II.D. Self evaluation*.

Based on the monitoring results, the COST Office will decide on the following year's budget allocation.

Executive summary (max.250 words): Plants are associated with micro- and nanoorganisms: Endophytic bacteria and fungi, which live inter- and intracellularly in plants without inducing pathogenic symptoms, interact with the host biochemically and genetically. Endophytic microorganisms (EMOs) may function as plant growth and defense promoters by synthesising phytohormones, producing biosurfactants, enzymes or precursors for secondary plant metabolites, fixing atmospheric nitrogen and CO₂ or control plant diseases as well as providing a source for new bioactive natural products with utility in pharmaceutical, agrochemical and other LifeScience applications. The use of these EMOs to control plant-pathogenic bacteria and fungi is receiving increasing attention as a sustainable alternative to synthetic pesticides and antibiotics. Furthermore, these EMOs are likely to be adapted to the presence and metabolism of complex organic molecules and therefore show useful biodegradation activities. In order to reduce the input of pesticides and fertilizers and to bring European added value to an eco-friendly agriculture.

I. Management Report prepared by the COST Office/Grant Holder



I.A. COST Action Fact Sheet

Title

Endophytes in Biotechnology and Agriculture

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Details

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Start of Action: 08/12/2011

Entry into force: 27/06/2011

End of Action: 07/12/2015

CSO approval date: 17/05/2011

Parties

Country	Date	Country	Date	Country	Date	Country	Date
Austria	15/06/2011	Belgium	11/01/2012	Bosnia and Herzegovina	07/03/2012	Czech Republic	06/02/2012
Denmark	11/11/2011	Finland	01/08/2011	France	12/08/2011	Germany	27/06/2011
Greece	21/11/2011	Ireland	11/08/2011	Israel	01/08/2011	Italy	22/06/2011
Netherlands	06/07/2011	Poland	22/06/2011	Portugal	18/10/2011	Slovakia	23/03/2012
Slovenia	05/01/2012	Spain	07/07/2011	Turkey	07/10/2011	United Kingdom	16/06/2011

Total: 20

Intentions to accept the MoU

Country	Date	Country	Date	Country	Date	Country	Date

Total: 0

Working Groups

4

Website

<http://www.endophytes.eu>

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I.C. Overview activities and expenditure

see file REP-IFR[CGA-FA1103-1](20120101-20120501).pdf

II. Scientific Report

II.A. Innovative networking

- *Innovative knowledge resulting from COST networking through the Action. (Specific examples of Results vs. Objectives)*
 - ⇒ Continuing work on fungi associated with plants endemic to the Iberian Peninsula and application of their metabolites in medicine and agriculture.
 - ⇒ Effect of fungal infection on resource allocation in the early stages of plant development and on life history traits of a plant inhabited by endophytic fungi.
 - ⇒ Identification of several new antimicrobial peptides from endophytes, and with fluorescently-tagged strains have been able to identify colonization patterns of the pine endophyte *Methylobacterium extorquens*.
 - ⇒ Study of endophytic properties of entomopathogenic fungus *Beauveria bassiana*: effect of the fungus on herbivorous insect pests using a tri-trophic model: *Aesculus hippocastanum* – *Cameraria ohridella* – *Beauveria bassiana*.
 - ⇒ Physiological response of selected plant species (maize, red oak, horse chestnut) on artificial colonisation with *Beauveria bassiana*, with a focus on the plant water regime.
 - ⇒ Survey of endophyte populations of *Beauveria bassiana* in woody plant species using traditional cultivation method.
 - ⇒ The use of an endophyte from *Polygonum cuspidatum* (Japanese knotweed) for biological control of tomato diseases
 - ⇒ *Lotus japonicus* infection pattern by the endophyte *Rhizobium* spp. strain KAW12 and *Burkholderia* spp. strain KAW25.
 - ⇒ Infection pattern and molecular response induced by *Azospirillum brasiliense* strain SP245 in *Lotus japonicus*.
 - ⇒ Isolation of new antibiotically active anthracene derivatives from endophyte *Stemphylium*
 - ⇒ In a culture-dependent approach, bacteria were isolated from surface-sterilized *Arabidopsis thaliana* growing in a variety of soils. This non-exhaustive isolation yielded a total of 56 bacterial species, the most common isolates included *Methylobacterium* and *Microbacterium ginsengisoli*.

- *Spin off of new EC RTD Framework Programme proposals/projects. (List)*
 - ⇒ Spain: European Union FP7 KBBE.2012.3.2-01- PharmaSea "Increasing Value and Flow in the Marine Biodiscovery Pipeline" (ID 312184, Project Coordinator: Camila Esguerra (K.U. Leuven), Project Leader: Marcel Jaspars (U. Aberdeen) with 25 participating groups, Gerald Bills WP2 leader). Will investigate applications of some secondary metabolite-producing fungi in marine and estuary plants

- *Spin off of new National Programme proposals/projects. (List)*
 - ⇒ Austria: "Heavy metallophores"- Heavy metal mobilization by selected Microbacteriaceae spp. isolated from heavy metal-accumulating *Salix caprea* funded by: National Science Foundation (FWF), Angela Sessitsch, partners: Markus Puschenreiter, Stephan Hann (both BOKU), 264.000 €
 - ⇒ Belgium: Funding agency: Fund for Scientific Research Flanders (FWO): Bacterial populations associated with *Populus tremula* x *alba* wildtype and 2 lines modified for a lower lignin production: genotypic and phenotypic characterization and their potential to improve biomass production. Started: 01/01/2012; Project coordinator: Jaco Vangronsveld
 - ⇒ Finland: Fine fescue speciation and their coevolution with systemic fungal endophytes, Academy of Finland; Kari Saikkonen (responsible leader of the research project, 765.701 €.
 - ⇒ Germany: Several members of the Action have approached the German DFG for a priority Program "How can endophytes act as microbial factories of pharmaceutical compounds? Ecological Interactions" - (ENDOS); a first meeting is planned for June 29, 2012.
 - ⇒ Greece: SALTYMYC Contribution of Mycorrhizae to the Sustainability of Marginal Mediterranean Ecosystems – Development of Mycorrhizal Inocula, Programme: "Thales", Funded by the NSRF (National Strategic Reference Framework): 142,000 €

- Kalliope Papadopoulou (Coordinator of RG 3), Nektarios Kavroulakis (Member of RG 2).
- ⇒ Ireland: Feasibility study to test the commercial potential of microbial biofertilizers in Irish crops under field conditions. Science Foundation Ireland, 100.000 €, David Dowling
 - ⇒ Poland: Research Grant of the Ministry of Science and Higher Education for the years 2010-2013, No. NN 303 472 138: "Grasses of pastures and field crops inhabited by endophytic fungi: ecological and chemical effects of interactions". Project Leader M. Lembicz, 350 000 PLN
 - ⇒ Spain: Regional Government of Andalusia. Project in Scientific Excellence. Sustainable use of plants and their fungal parasites from arid regions of Andalusia for new molecules useful for antifungals and neuroprotectors (RNM-7987, 2012-2014, PI Fernando Reyes, Co-PIs Gerald Bills, Fundacion MEDINA and Manuel Casares, University of Granada). Will investigate applications of some secondary metabolite-producing fungi from plants from arid regions of Andalusia
 - ⇒ Endophytes for the improvement of *Lolium perenne* cultivars, and the effect of fungal viruses in endophytic secondary metabolism. Ref.: AGL2011-22783, Financed by CICYT, Spanish Government, 1/2012 - 1/2015, 155.000 €
Principal investigator: Iñigo Zabalgoitia
Other COST participants: Beatriz Rodriguez Vazquez de Aldana
 - ⇒ Turkey: Acronym of the Project: TUBITAK-COST 111 O 505
Title of the Project: THE USING POSSIBILITIES AS BIOFERTILIZER AND BIOPESTICIDE OF BACTERIAL ENDOPHYTES IN CUCUMBER GROWING
Starting time of the Project: February 2012, Duration of the Project: 3 years
Total Budget of the Project: 132.000-€, Leader of the Project: Hatice OZAKTAN

- *Significant scientific breakthroughs as part of the COST Action. (Specific examples)* not yet applicable.

- *Tangible medium term socio-economic impacts achieved or expected. (Specific examples)*
COST FA1103 works on tangible socio-economic impacts for the European Community by linking interdisciplinary scientific expertise together with industry stakeholders. 5 industry partners (both SME and Large Companies) took part in the first Workshop, among them the international market leader in the field of biological crop protection and natural pollination, Koppert B.V. Participation of industry is very much appreciated and will be further encouraged, because the main objective of FA1103 is to identify bottlenecks limiting the use of endophytes in biotechnology and agriculture and to provide solutions for the economically and ecologically compatible exploitation of endophytes. Another goal of the COST Action is to generate new and innovative plant/microbial technologies, helping to raise new interest and possibilities (i.e. to stimulate investment and innovations).

II.B. Inter-disciplinary networking

- *Additional knowledge obtained from working with other disciplines within the COST framework. (Specific examples)*
- *Evaluation of whether the level of inter-disciplinarity is sufficient to potentially provide scientific impacts. (Specific examples)*
- *Evaluation of whether the level of inter-disciplinarity is sufficient to potentially provide socio-economic impacts. (Specific examples)*

In the reporting period the inter-COST work started with the participation of the Action Chair in a joint meeting of COST Action FA0807 (Integrated Management of Phytoplasma Epidemics in Different Crop Systems) and COST Action FA0701 (Arthropod Symbioses: from fundamental studies to pest and diseases management) at University of Milan, Faculty of Agriculture, Italy, March 5, 2012: "Phytoplasmas, insect vector symbionts and plant endophytes". The Chair was able to work on both, scientific network and organisational hints from experienced Core Group Members of the 2 Actions.

At the first workshop of FA1103 in Reims, two members of FA0807 took part, one of them WG Leader and expressed the close cooperation interest between FA0807 and FA1103.

Further inter-COST activities can be seen also with FA1105, Towards a sustainable and productive EU organic greenhouse horticulture and FA1104, Sustainable production of high-quality cherries for the European market

One of the challenges and strenghts of FA1103 is the interdisciplinary approach of the Action. The results derived from the Action will be targeted to farmers, plant breeders, food and seed industry, pharmacy, medicine, public consumers and local and national governments. The interdisciplinary approach unites biologists, analytical chemists and phamacologists, many of whom will be active in other projects creating a high level of synergy. Several members have decades of experience in microbial natural product research, including experience with EMOs and maintain close collaborations with companies that are active in various sectors of the Life Science and biotechnology industries (Pharma, Agro, Food, Cosmetics). For that the frame of a COST Action is ideal.

II.C. New networking

- *Additional new members joining the Action during its life.*
- *Total number of individual participants involved in the Action work. (Number of participants. Give % of female and of Early Stage Researcher participants)*

One of the main successes was the large interest of the scientific community towards FA1103: 48 founders from 15 countries worked together for the proposal, including 2 Non-COST Participants, 20/49 are female. From the start of the Action in December 2011 until now (May 2012), the MC grew to 66 MC Members and Substitutes from 20 countries, 32/66 are female. 115 scientists are Member of the four Working Groups, 58/115 are female (50,4%), approx. 50 % are ESR.

- *Involvement of Early Stage Researchers in the Action, in particular with respect to STSMs, networking activities, and Training Schools. In addition, justification should be provided if less than 4 STSMs were carried out during the year.*

The ESR in FA1103 are very involved as WG Leader, STSM Committee Member and Session Chairs. The first approved STSM is with an ESR as well: STSM Applicant: Dr Constantina Nasopoulou, National and Kapodistrian University of Athens, STSM Topic: Study of strawberry (*F. ananassa*) and *M. extorquens* cells for the biosynthesis of strawberry flavour, Host: Anna Maria Pirttilä, University of Oulu, Department of Biology, Oulu (FI)

- *Involvement of researchers from outside of COST Countries. (Number of participants from non-COST Countries approved by the CSO. Give % of such participants from countries with reciprocal agreements. Specify their contribution)*

The following non-COST countries have expressed their interest to join the Action: Argentina (ID 963, status: Template completion), Algeria (ID 959, status: Template completion), India (ID 961, status: Template completion), Tunisia (ID 960, status: SO validation), Ukraine (ID 932, status: SO Validation) and US (ID 958, status: Template completion).

- *Advancement and promotion of scientific knowledge through publications and other outreach activities. (Number of publications and other outreach activities that resulted from COST networking through the Action. Complete list should be given in an annex)*

Publication list with 30 publications in Annex A2, Dissemination list in Annex A3.

- *Activities and projects with COST network colleagues. The capacity of the Action members to raise research funds.*

see II.A.

III. Previous scientific report(s)

Part II of past periods' reports are to be found here.

n.a.

Annex

A1. Scientific report of the Local Organizer Dr. Essaid Ait Barka: Workshop "Current aspects of European endophyte research", 28-30 March 2012, University of Reims, France.

During the period from 28 to 30 March 2012, Reims held the first Workshop of the COST Action FA1103: Endophytes in biotechnology and agriculture. During this meeting, scientists from eighteen countries tried to increase understanding on hidden associations between plants, bacteria and fungi, and to identify bottlenecks in the development and implementation of technologies using endophytes. Consequently, thirty-nine talks were scheduled scanning all aspect of the interaction between plant and endophytes (see the attached abstract book). The oral presentation were divided equally in four successive session 1) Ecology of endophytes, 2) Identification of new competent endophytes, with sub session dedicated to Biocontrol, 3) Development of new microbial inocula, and finally 4) New industrial products in life sciences. Further, thirty posters were presented during the workshop.

During the last day, the participants were devised in four Parallel Work plan workshops groups according to their interest: WG1: Ecology of endophytes; WG2: Identification of new competent endophytes; WG3: Development of new microbial inocula, and WG4: New industrial products in life sciences. Following their discussion, a plenary meeting was held with whole participants to present the coming out from the separate workplans WGs 1-4 and to inform the other WGs participants on the outlines decided during the Work plan workshops.

Several points were raised during the plenary meeting from the different WGs, they includes

The WG1 pointed out the necessity to identify bottlenecks for the utilization of endophytes and metadata for analyses. Thus, they suggest an exchange tool for sequence data searchable for host (source plant), and the establishment of a shared library (possibly through the Endophytes.eu website). They also suggest the establishment of bioinformatic tools for the analysis of metadata specific to their usage in metagenomics of endophytes. It was also recommend a joint WG1/WG2 workshop to define the endophytes for fungi and bacteria with an opinion paper outlining the current definitions and a suggestion for a consensus definition as deliverables.

The WG2 released the need to the isolate and characterize bacterial and fungal endophytes that are beneficial to host plants following re-inoculation. Consequently, these microorganisms will be analyzed with regard to their antagonistic activities against other microorganisms, their impact on plant performance under various conditions, and their metabolomic profiles. Different tasks will be carried out in order to identify new competent endophytes: 1. Different methods for efficient isolation of EMOs from plant tissues will be compared among the participants of the COST Action. This should result in a high throughput technology for establishing an initial collection of potentially useful bacterial and fungal endophytes. They will be identified according to their structural and molecular characteristics. 2. Standard systems using selected model plants (and pathogenic MO) will be set up to test the bacterial and fungal isolates of this initial collection for their establishment inside plant tissues and their capacities to confer beneficial effects. 3. Proteomic and genomic analyses will clarify the mechanisms responsible for beneficial attributes of colonization. The consensus will be a catalogue of standardized methods, with a list of endophytes that are competent for practical applications, and which can be used for the development of new inocula (WG3).

The WG 3, pointed out the need to the development of new fungal and bacterial inocula for *in vitro* and in field applications and establishing of new inoculation technologies for plant. These inocula should improve the plant growth and quality (including biomass, development, survival rate, tolerance/resistance against pathogens, heavy metals) *in vitro* and in the field under different environmental conditions and reduce the input of chemicals (pesticides, fertilizers) in agriculture by focusing on major bottlenecks concerning plant cultures in the EU. Further, the "fundamental research" should also create a bridge to companies for commercial applications of endophytes.

A2. Publication list in reporting period (COST FA1103 members underlined)

- Afzal, M., S. Yousaf, T.G. Reichenauer and A. Sessitsch. 2012. The inoculation method affects colonization and performance of bacterial inoculant strains in the phytoremediation of soil contaminated with diesel oil. *Int. J. Phytoremed.*, 14:35-47.
- Baffoni, L., M. Accorsi, F. Gaggia, S. Bosi, I. Marotti, B. Biavati, D. Di Gioia, G. Dinelli (2012). Inoculation with "effective microorganisms of *Lolium perenne* L.: evaluation of plant growth parameters and endophytic colonization roots. Publication in Environmental and engineering and management journal 11, S144.
- Becerra-Castro, C, Kidd, P.S, Prieto-Fernández, A., Weyens, N., Acea, M.J., Vangronsveld, J. (2011) Endophytic and rhizoplane bacteria associated with *Cytisus striatus* growing on hexachlorocyclohexane-contaminated soil: isolation and characterisation. *Plant and Soil*, 340, 413-433, DOI:10.1007/s11104-010-0613-x
- Bills, G.F., A.W. Dombrowski & M.A. Goetz. 2012. The FERME X method for metabolite-enriched fungal extracts. *Methods in Molecular Biology* (in press).
- Bills, G.F., V. Gonzalez-Menandez & G. Platas. 2012. *Kabatiella bupleuri* sp. nov. (Dothideales), a pleomorphic epiphyte and endophyte of the Mediterranean plant, *Bupleurum gibraltarium* (Apiaceae). *Mycologia* (in press).
- Compant, S., A. Sessitsch, F. Mathieu. 2012. The 125th anniversary for the first proof of endophytic bacteria colonizing plants – a tribute to MLV Galippe. *Plant & Soil*, accepted.
- Cueva, C., V. Moreno-Arribas, B. Bartoloma, O. Salazar, M.F. Vicente & G.F. Bills. 2011. Antibiosis of vineyard ecosystem fungi against food-borne microorganisms. *Research in Microbiology* 162:1043-1051.
- Cueva, C.; A. Garcia Ruiz; E. Gonzalez-Rompinelli, B. Bartoloma, P.J. Martana Ivarez, O. Salazar, M.F. Vicente, G. Bills & V. Moreno-Arribas. 2012. Degradation of biogenic amines by vineyard ecosystem fungi. Potential use in winemaking. *Journal of Applied Microbiology* 112:672-682.
- Czarnoleski M., Olejniczak M., Górzyńska K., Kozłowski J., Lembicz M. Altered allocation to roots and shoots in the endophyte-infected seedlings of *Puccinellia distans* (Poaceae). *Plant Biology* (after revision, accepted for print)
- Debbab A, Aly AH, Edrada-Ebel RA, Wray V, Pretsch A, Pescitelli G, Kurtan T, Proksch P (2012) New Anthracene Derivatives - Structure Elucidation and Antimicrobial Activity *Eur. J. Org. Chem.* 2012, 1351-1359.
- Döring, M.; Schneider, C. (2011): Inoculation of arbuscular mycorrhizal fungi with micropropagated plants during acclimatization. In: Pirttilä, A. and Sorvari, S (eds.): Prospects and applications for plant-associated microbes. A Laboratory Manual. Part B Fungi. ISBN 9789529930265.
- Drage, S. D. Engelmeier, G. Bachmann, A. Sessitsch, B. Mitter, F. Hadacek. 2012. Combining microdilution with MicroResp™: microbial substrate utilization, antimicrobial susceptibility and respiration. *J. Microbiol. Meth.* 88:399-412.
- Gundel, P.E., M. Helander, C. Casas, C.E. Hamilton, S.H. Faeth and K. Saikkonen (in press) *Neotyphodium* fungal endophyte in tall fescue (*Schedonorus phoenix*): A comparison of three Northern European wild populations and the cultivar Kentucky-31. *Fungal Diversity*
- Hamilton, C. E., P. E. Gundel, M. Helander and K. Saikkonen (2012) Endophytic mediation of reactive oxygen species and antioxidant activity in plants: a review. *Fungal Diversity* DOI 10.1007/s13225-012-0158-9.
- Helander, M., Vesterlund, S.-R. & Saikkonen, K. 2011: Responses of foliar endophytes to pollution. In: *Endophytes of Forest Trees: Biology and Applications*. Pirttilä, A.M. & Frank, A.C. (eds.) *Forestry Sciences*, Vol. 80, Springer, pp. 175-188. DOI: 10.1007/978-94-007-1599-8_11.
- Herath, K., H. Jayasuriya, D.L. Zink, J. Sigmund, F. Vicente, Â M. de la Cruz, A. Basilio, G.F. Bills, J.D. Polishook, R. Donald, J. Phillips, M. Goetz & S.B. Singh. 2012. Isolation, structure elucidation and antibacterial activity of methiosetin, a new tetramic acid from a tropical sooty mold (*Capnodium* sp.). *Journal of Natural Products* 75:420-424.
- Hussain, Z., R. Wiedner, K. Steiner, T. Hajek, M. Avi, B. Hecher, A. Sessitsch, H. Schwab. 2012. Characterization of two bacterial hydroxynitril lyases with high similarity to cupin superfamily proteins. *Appl. Environ. Microbiol.* 78: 2053-2055.

- Lembicz M., Górzyńska K., Olejniczak P., Leuchtman A. 2011. Geographical distribution and effects of choke disease caused by *Epichloë typhina* in populations of the grass *Puccinellia distans* in Poland. *Sydowia* 63(1): 37-48.
- Power B, Liu X, Germaine KJ, Ryan D, Brazil D and Dowling DN (2011). Alginate beads as a storage, delivery and containment system for genetically modified PCB degrader and PCB biosensor derivatives of *Pseudomonas fluorescens* F113. *J. Appl. Microbiol.* 110 1351-1358.
- Prischl, M. E. Hackl, M- Pastar, S. Pfeiffer, and A. Sessitsch. 2012. Genetically modified Bt maize lines containing cry3Bb1, cry1A105 or cry1Ab2 do not affect the structure and functioning of root-associated endophyte communities. *J. Appl. Soil Ecol.* 54:39-48
- Redondo-Nieto,R., Barret,M., Morrissey,J., Germaine,K., Martínez-Granero,F., Barahona,E., Navazo,A., Sánchez-Contreras,M., Moynihan, J., Giddens,S., Coppoolse,E., Muriel, C., Stiekema,W., Rainey,P., Dowling,DN., O’Gara,F., Martín,M. and Rafael Rivilla. (2012) Genome sequence of the biocontrol strain *Pseudomonas fluorescens* F113. *J. Bacteriol.* 2012, 194(5):1273.
- Sánchez Márquez S, Bills GF, Herrero N, Zabalgoceazcoa I. 2012. Non systemic fungal endophytes of grasses. *Fungal Ecology* 5: 289-297.
- Sessitsch, A., P. Hardoim, J. Döring, A. Weilharter, A. Krause, T. Woyke, B. Mitter, L. Hauberg, F. Friedrich, M. Rahalkar, T. Hurek, A. Sarkar, L. van Overbeek, L. Bodrossy, D. Brar, J.D. van Elsas and B. Reinhold-Hurek. 2012. Functional characteristics of an endophytic community colonizing rice roots as revealed by metagenome analysis, *Mol. Plant-Microbe Interact.*, 25:28-36
- Taghavi, S., Weyens, N., Vangronsveld, J., van der Lelie, D. (2011) Improved Phytoremediation of Organic Contaminants through Engineering of Bacterial Endophytes of Trees. In: Pirttilä, A.M., Frank, A.C. (Eds.) *Endophytes of Forest Trees. Biology and Applications.* Forestry Sciences Series, Vol. 80. Chapter 13, pp. 205-216. Springer Science + Business Media B.V., ISBN 978-94-007-1598-1. DOI: 10.1007/978-94-007-1599-8_13
- Tejesvi M.V., Sauvola T., Pirttilä A.M., Ruotsalainen A.M. (2012) Culture-based analysis indicates that endophytic community associated with roots of *Deschampsia flexuosa* and *Trientalis europaea* living in close proximity differs by diversity and richness. *Mycorrhiza*, accepted
- Tormo, J.R., F.J. Asensio & G.F. Bills. 2012. Manipulating filamentous fungus chemical phenotypes by growth in nutritional arrays. *Methods in Molecular Biology* (in press).
- Vázquez de Aldana BR, Zabalgoceazcoa I, García Ciudad A, García Criado B. 2012. An *Epichloë* endophyte affects the competitive ability of *Festuca rubra* against other grassland species. *Plant and Soil.* *In press.*
- Vázquez de Aldana BR, García Ciudad A, Álvarez A, Zabalgoceazcoa I, García Criado B. Efecto del estrés salino en la interacción entre *Festuca rubra* y el hongo endofítico *Epichloë festucae*. *Tierras* 189: 96-98
- Vesterlund, S.-R., M. Helander, S. H. Faeth, T. Hyvönen and K. Saikkonen (2011) Environmental conditions and host plant origin override endophyte effects on invertebrate communities. *Fungal Diversity* 47: 109-118.
- Wäli, P.R., M. Helander and K. Saikkonen (2011) Manipulation of *Epichloë/Neotyphodium* - endophyte infection in grasses: elimination of endophytes by heat treatment from seeds and inoculation of seedlings with endophyte hyphae. Pages 64-67. In: Pirttilä, A.M. & Sorvari, S. (eds.) *Prospects and Applications for Plant-Associated Microbes. A Laboratory Manual, Part B: Fungi.* BioBien Innovations (BBi)(Finland). ISBN 978-952-99302-6-5

A3. Dissemination list in reporting period

Who disseminates	Where was disseminated	When (email)
Marc Stadler	VAAM	22. Jan 12
	DGfM	
	BMS	
	David Hawksworth, who runs the IMA fungus	
	Pedro Crous to the CBS website	
Gerald Bills	Mycological Society of America's newsletter (Inoculum)	23. Jan 12
	American Phytopathological Society's newsletter (Phytopathology News)	
David Ezra	Israeli Phytopathological Society (IPS) conference (February 14-15, 2012)	07. Feb 12
Polona Kogovsek	Slovenian society of plant biology,	07. Feb 12
	Slovenian society of plant protection,	
	Slovenian microbiological society	
	http://www.nib.si/eng/	
Who disseminates	Where was disseminated	When (email)
Carolin Schneider	ADIVK (Arbeitskreis Deutsche In Vitro Kulturen = German Society for Micropropagation)	09. Feb 12
	IBMA International Biocontrol Manufacturer's Association	
	DPG (Deutsche Phytomedizinische Gesellschaft = German Phytomedical Society)	
	1-day inter-COST meeting "Phytoplasmas, insect vector symbionts and plant endophytes"	17.02.2012
Bruno Biavati	Italian Society of Plant Pathology (SIPaV)	23.02.2012
	Society of Agro-environmental and Food Microbiology (SIMTREA)	
Carolin Schneider	Newsletter of the German Coordinator of LifeSciences in EU	24.02.2012
Andrea Campisano	L'Adige	13.03.2012
	ADNKRONOS	
	ANSA.IT	
	Quotidiano Libero.it	
	Agricoltura Italiana	
	TV news broadcaster (Tg2) http://goo.gl/WJYxx	
Gerald Bills	Inoculum- Supplement to Mycologia vol 63(1)	31.03.2012
Simona Radutoiu	Plant Biotech Denmark- Annual meeting 2012	02.02.2012
	Plant Biotech Denmark- mailing list	12.03.2012