

# A Summary report of useful Information on Mycorrhiza fungi gathered for UK Growers

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**Eighth International Conference of Mycorrhiza (ICOM8)**

**August 3-7, 2015**

**Flagstaff, Arizona, USA**



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## Background and introduction

The 8th International Conference on Mycorrhiza (ICOM8) took place from 3-7 August 2015 in Flagstaff, Arizona, in the southwest of the United States. It was organized by Northern Arizona University (NAU) under the auspices of the International Mycorrhiza Society. The theme of this conference was "**Mycorrhizal integration across continents and scales**". The main goal of ICOM8 was to find common interests that transcend national borders and scientific disciplines, and to stimulate a productive exchange of information and ideas among mycorrhizal researchers from around the world, including physiologists, geneticists, taxonomists, ecologists, inoculum producers, and land managers.

Mycorrhiza is the most common underground symbiosis and is present in 92% of plant families studied (80% of species), with arbuscular mycorrhizas being the predominant form. This relationship consists in the colonisation of plant roots by the micro-organism and the creation of a site of nutrient exchange. Plants receive mineral nutrients such as inorganic phosphates and mineral or organic nitrogen. In return the plants provide carbohydrates to the mycorrhizal fungi. Beneficial microorganisms associations with plant roots contribute to sustainable horticulture and agriculture, including protected crops. Most agricultural crops could perform better and are more productive when well-colonised by mycorrhizal fungi. Many researches have highlighted the fact that mycorrhiza can help plants to overcome replanting stresses more successfully, to cope with conditions such as draught or high levels of salt, and to increase pest and/or disease resistance. The movements towards more sustainable forms of agriculture will result in an increased use of AM fungi and other beneficial microbes in the future. Facing the stark reality of increasing demands for food production, food security, reduction of nutrient deficiency and chemical sprays; mycorrhiza may support crop phosphorous nutrition and pest management in horticulture and agriculture.

## Attendance

ICOM8 was a truly global conference. Approximately 475 people from more than 50 countries joined together for a week of scientific and social exchanges. We could learn about exciting new discoveries and also reflect on the wisdom of “past giants” in the field of mycorrhizal science. This emersion of knowledge helped to catalyse new ways of thinking and advance our abilities to study and understand mycorrhizal symbioses across scales.

The author of this report was amongst a group of UK-based delegates that attended the conference, which included representatives from a mycorrhizal inoculum producer company (PlantWorks Ltd), East Malling Research and the University of York.

## Key topics

Presentations and workshops covered in this 5 day conference were based around 15 session themes (the most relevant themes for UK horticulture are in bold):

- Diversity and biogeography of mycorrhizal fungi
- Roles of mycorrhizal networks for individuals, communities and ecosystems
- Molecular methods for resolving the phylogenies of mycorrhizal fungi
- Bridging palaeomycology and genomics of mycorrhizal fungi
- Linking mycorrhizal genomes, transcriptomes and proteomes to their function from individuals to ecosystems
- Strategies to preserve and restore mycorrhizas for sustainable forestry
- **Inter-kingdom relationships: mycorrhizal microbiome and food web interactions**
- **Novel mycorrhizas**
- Mycorrhizal movement of matter and energy from crossing membranes to biogeochemical cycles
- Mycorrhizas and soil carbon sequestration
- **Strategies to manage mycorrhizas for sustainable agriculture**
- Mycorrhizas as mutualists - what do mycorrhizas teach us about cooperation and host specificity?
- Mycorrhizas and global change
- Diversity and biogeography of mycorrhizal fungi
- **Mycorrhizal management**

## Relevant sessions

The presentations that were of greatest interest to UK growers are outlined below:

- **Inter-kingdom relationships: mycorrhizal microbiome and food web interactions**

**AGUILAR-AGUILAR, R.** (National Autonomus University of Mexico, Mexico) presented the outcomes of his research on the response of maize mycorrhizas to fertilization, plant genotype, and insect herbivory by the fall armyworm (*Spodoptera frugiperda*). In his research insect herbivory caused total foliage damage independent of maize genotype and fertilization. The highest biomass of *S. frugiperda* larvae was found in association with fertilized plants. But no response of maize mycorrhizas to herbivory by *S. frugiperda* was reported.

**DAMES, J.F** (Mycorrhizal Research Laboratory, Rhodes University, South Africa) gave an overview on the effect of AM fungi and PGPR bacteria on Spekboom (*Portulacaria afra*), a suitable plant for restoring degraded semi-arid subtropical thicket in the Eastern Cape, South Africa. Inoculation of spekboom cuttings with mycorrhizal fungi and selected rhizobacterial isolates significantly improved shoot height. Spekboom cuttings challenged with *Fusarium* and inoculated with mycorrhizal fungi and two rhizobacterial isolates significantly improved plant growth. She concluded that inoculation of Spekboom cuttings in the nursery with mycorrhizal fungi and selected rhizobacteria is recommended prior to establishing Spekboom in the field.

**LINGUAI, G.** (di Scienze ed Innovazione Tecnologica, Università del Piemonte, Italy) research identified that AMF and PGPR bacteria could improve strawberry fruit quality and modulate element and volatile concentrations. In this study, three arbuscular mycorrhizal fungal species (*Funneliformis mosseae*, *Septoglomus viscosum*, and *Rhizophagus irregularis*) were used in combination with three strains of *Pseudomonas* sp. (19Fv1t, 5vm1K, and Pf4). Mycorrhizal colonization was highest in plants inoculated with *R. irregularis* followed by *F. mosseae* and *S. viscosum*. Inoculations enhanced root and shoot biomass and increased fruit yield and quality. In particular, inoculation with Pf4 increased flower and fruit production and malic acid content while decreasing the pH regardless of the fungus used. Sugar and anthocyanin concentrations were increased. Sixty volatile molecules were detected. The factor “fungus” mostly affected the parameters associated with the vegetative portion of the plant, while the factor “bacterium” was especially relevant for fruit yield and quality.

**ORRELL, P** (University of Hull, England) gave an overview about an ecological network study on above and below ground interactions in agro-ecosystems (strawberry). He investigated the influence of AMF and plant genotype on pollinator visitation rates,

community structure, and yield. Orrell used three genotypes of strawberry plants and four AMF treatments and mirrored between the field and glasshouse over two years. Plant genotype significantly affected strawberry yield with a trend for AMF to influence yield. Neither AMF community nor plant genotype affected the overall number of visits by *Bombus terrestris* in the glasshouse; however, both AMF community and plant genotype influenced foraging behaviour (number and duration of visits solely for nectar/pollen foraging). Strawberry yield and the number of pollinator visits were correlated for two of the three plant genotypes. In the field, both AMF community and plant genotype influenced the composition and structure of the plant-pollinator network with the specific combination of AMF community and plant genotype influencing the interactions between species. Plant floral traits were influenced most strongly by plant genotype with the influence of AMF depending on the combination of AMF community and plant genotype. These results indicate that plant-pollinator interactions can be influenced by the belowground community with these interactions mediated by the inherent traits of the plant genotype.

- **Novel mycorrhizas**

**TARKKA, M.T** (Helmholtz Centre for Environmental Research, Department Soil Ecology, Halle, Germany) gave a review on the protective effects of mycorrhiza helper bacterium (*Streptomyces* sp. strain AcH 505) against powdery mildew *Microsphaera (Erysiphe) alphitoides* and root nematode of pedunculate oak is mediated by induced defences. His studies show that the presence of MHB affects the structure of the microbial community, and offer novel insights into the mechanisms of the priming of plant defences by mycorrhizosphere associates.

- **Strategies to manage mycorrhizas for sustainable agriculture**

**CAVAGNARO, T.R** (School of Agriculture, Food and Wine, The University of Adelaide, Australia) talked about the role of arbuscular mycorrhizas in agriculture: “Insights from a mycorrhiza defective tomato mutant”. The work aims to give an overview on 1) formation of AM under different field conditions and its relationship to soil management and fertility, 2) effects of forming AM on plant growth, both for biomass allocation and agronomic yields, and 3) consequences of forming AM on plant nutrient uptake, soil nutrient cycling, and nutrient loss. The emphasis will be to synthesize these findings to understand AM functioning in intensively-managed agricultural systems, and how various management practices may

bolster AM communities to improve functioning. Finally, they will consider some of the limitations and advantages of using mutant-based approaches to studying AM in field soils, with a view to stimulating and guiding future work in this area.

**ADHOLEYA, A** (Energy and Resources Institute, India) summarised the advances in Seed coating by AMF with understanding challenges and evaluating potential benefits in a few major crops. Seed treatment with pesticides and biological agents is used widely to improve seed vigour and promote consistent germination. The use of AMF for seed treatment has been much less well explored. This is primarily attributed to the complexity of the interactions of AMF with other biologicals and chemicals applied to the seed coat. The impact of seed treatments with fungicides and insecticides on AMF was evaluated in a series of experiments. His research reported that chemical treatments of seeds reduced the ability of AMF to colonize emerging roots. Interestingly various formulations and application methods revealed that seed priming and encapsulation can promote AMF colonisation and increase nutrient acquisition by selected crops.

**PELLEGRINO, E** (Institute of Life Sciences, Sant'Anna School of Advanced Studies, Italy) relayed the key role of the inoculation by arbuscular mycorrhizal fungi on field crops in the Mediterranean basin. The role of single and mixed native or exotic AMF inocula in enhancing food and feed yield and in ameliorating their nutrient and nutraceutical quality was studied on bread and durum wheat, maize, soybean, chickpea, lucerne, and Egyptian clover. Field experiments of inoculation and seed coating were carried out in a Mediterranean area. Performances of the AMF inoculated field crops were compared to those from mock inoculation using a multivariate approach based on yield and yield components, macro- and micro- nutrients and nutraceutical parameters such as concentrations of free and bound phenols and flavonoids, folic and lipoic acids and polyunsaturated fatty acids in grain or shoot. Additionally, in bread and durum wheat, the interaction of AMF inoculation and nitrogen fertilization and genotypes (old versus modern varieties) was studied, while in soybean the interaction with irrigation was taken into consideration. Finally, the field persistence of the AMF inocula in crop rotations with annual and poly-annual crops was studied using molecular genetic tracing and a morphological approach.

**BOYER, L.R** (East Malling Research, UK) stated that the use of AMF could improve soft fruit production in commercial substrate growing systems. She reported the benefit of inoculating strawberry in coir substrates under commercial fertigation treatments using different water regimes and nitrogen addition. Her results showed a consistent increase in the fresh weight of strawberry plants and increase in the yield of class I fruit. Both the number of fruit produced and the average weight of fruit were increased with AMF inoculation. However, microscopic root length colonisation was low in plants grown in coir compared to different substrates (e.g., soil and Terragreen). The structure of AMF colonising strawberry and maize roots grown in coir shows some physical differences from the usual AMF structure in other substrates.

**DESALEGN, G** (University of Natural Resources and Life Sciences, Austria) explained that arbuscular mycorrhizal fungi inoculant types affect growth parameters of peas (*Pisum sativum*). This research evaluated the effectiveness of AMF inoculant types on dry matter yield, plant height, leaf greenness, and green area of peas. Overall, the AMF inoculants and the P fertilizer application equally and positively affected the growth traits of peas. In conclusion, any one of the AMF inoculants could be used to improve pea productivity as well as to replace the costly synthetic P fertilizer in low phosphorus soils. Further research is still required to verify these results for large-scale application of AMF inoculants in agronomic practices under field conditions.

**GRAHAM, J.H** (University of Florida, USA) described the effect of organic soil amendments and continuous tomato monoculture on arbuscular mycorrhizal fungal communities. He mentioned the interest in crop management alternatives to conventional high input farming increases. Therefore, studying the impacts of organic soil amendments and crop rotations on microbial components of the agroecosystem is desirable, especially for arbuscular mycorrhizal (AM) fungi. Soil amendments are thought to be more conducive for the activity of AM fungi, depending on nutrient supply. Despite high levels of soil disturbance, and excess supply of phosphorus and nitrogen to insure plant nutrient sufficiency, AM fungal colonization was not suppressed. A significant effect of tomato on the incidence of one of the phylotypes suggests a host mediated community shift, and evidence for differing AM fungal biological characteristics. High AM fungal infectivity and incidence supports previous findings of their resilience despite repeated disturbance and plant nutrient inputs. These

conditions may favour AM fungi that colonize and/or sporulate rapidly, altering community structure and functioning in the transition to an organic agroecosystem.

**JACH-SMITH, L.C** (University of Wisconsin, USA) reported the effect of nitrogen fertiliser on arbuscular-mycorrhizae fungi abundance and function in a perennial grass cropping system. The results of this study indicated that high rates of applied N significantly decreased AMF abundance and function, but moderate rates may not affect AMF in these systems. However, since not fertilising supports greater AMF symbioses without yield losses in most instances, reducing N fertiliser to encourage AMF may be a more sustainable route for perennial grass cropping systems.

**KASUYA, M.C.M** (Universidade Federal de Viçosa, Brazil) explained that mycorrhizal fungi can improve the resistance of micropropagation-derived pineapple plantlets against *Fusarium subglutinans* f. sp. *ananas*. The experiment included comprising two pineapple cultivars, with or without mycorrhizal fungal (MF) inoculation (*Claroideoglossum etunicatum*, *Rhizophagus clarus*, *Piriiform indica*, a mixture of all the fungi (Mix), and the control with absence MF), and also with or without applying *F. subglutinans* f. sp. *ananas* conidia, with four replicates. Mycorrhizal colonization and activities of superoxide dismutase (SOD), catalase (CAT) and glutathione reductase (GR) were evaluated. Inoculation with MF or the pathogen affected antioxidant enzyme activity in the shoot and root system. MF increased the activities of SOD, CAT and GR, indicating that MF inoculation may increase resistance to pathogen attack. Additionally, mycorrhized plantlets developed better than the control even in the presence of *F. subglutinans* f. sp. *ananas*. MF can induce systemic resistance and mycorrhizal association is a potential strategy for managing this crop.

**LANGENDORF, B** (East Malling Research, UK) reported that the control of soil-borne pathogens is a major problem in several horticultural crops since the withdrawal of several effective broad-spectrum chemical fumigants. Pre-colonisation of plants with arbuscular mycorrhizal fungi (AMF) before trans-planting has been proposed as a method for protecting crops against biotic stresses. Strawberry (*Fragaria x ananassa*) is an ideal production system to study such control methods as planting materials (micro-propagated or runners derived plug plants) can be easily pre-inoculated with AMF. We investigated (1) whether AMF could colonise strawberry under high moisture during the weaning process, and (2) whether AMF



pre-colonised plants could reduce *Verticillium dahliae* incidence. Strawberry plants of different popular cultivars susceptible to *Verticillium* ('Elsanta', 'Malling Centenary', 'Red glory', 'Vibrant') and one new cultivar (EM-1996) were inoculated with each of the following AMF species: *Funneliformis mosseae*, *F. geosporum*, *Glomus microagregatum*, *Rhizophagus irregularis*, and *Claroideoglomus claroideum*. Controls were un-inoculated. The growth substrates used were peat/perlite mix, vermiculite or attapulgite clay. Several published studies have suggested that certain types of peat and compost had a negative effect on AMF symbiosis and that AMF colonisation may be limited under prolonged periods of damp conditions. Four experiments were undertaken in growth chambers or glasshouses at East Malling Research, UK. In all experiments, AMF colonisation was high (65-94%) in both types of strawberry planting material after 6-8 weeks. Non-specific associations were observed among the strawberry cultivars and AMF species tested. Colonisation by AMF did not however, result in a significant improvement in growth of runner tips derived plants. In contrast, AMF inoculation significantly reduced overall total fresh weight but increased crown diameter of *in-vitro* derived plantlets. These results show that AMF can colonise strawberry plants under a prolonged period of damp conditions in soil-less substrates. Further studies will be conducted to assess whether AMF pre-inoculated strawberry plug plants could reduce *Verticillium* incidence.

**OLIVEIRA, R.S** (Universidade Católica Portuguesa, Portugal) gave an overview on seed coating with inoculum of arbuscular mycorrhizal fungi as a sustainable approach for large-scale agriculture. The aim of this study was to assess whether coating seeds with AMF inoculum is a feasible delivery system for large-scale agriculture. Maize seeds were coated with inoculum of *Rhizophagus intraradices* BEG140 and germinated in agricultural soil under controlled conditions. A treatment using uncoated seeds with direct soil inoculation of *R. intraradices* was included as a positive control. Plants had root length colonization of percentages higher than 60% either after direct soil inoculation or with coated seeds, with no significant difference between the treatments. Results indicate that seed coating can be used for a targeted application of inoculum. Seed coating is an innovative approach for large-scale application of AMF, which may result in economic and environmental benefits.

**RAJ, H** (University of Horticulture and Forestry, India) explained that the conjoint application of AMF and *Azotobacter chroococcum* and *Trichoderma viride*, in solarised soil

may reduce Fusarium wilt of carnation. Fusarium wilt (*Fusarium oxysporum* f. sp. *dianthi*) of carnation is a serious disease found in different parts of India, resulting in up to 79% plant mortality. Studies were conducted to evaluate the effect of different treatment combinations of arbuscular mycorrhizal (AM) fungi, *Azotobacter chroococcum* and *Trichoderma viride*, in soil solarised for 5 weeks with transparent polyethylene mulch (25 µm thick), on the incidence of the wilt in carnation, growth of the plants, and on the quality characteristics of the flowers. Conjoint application of native isolates of AM fungi (5g of inoculum/plant, raised on *Vigna radiata*), *A. chroococcum* (5g slurry/plant as root inoculation of cuttings) and *T. viride* (0.5g talc based formulation mixed in 25g of farmyard manure/5kg of pot soil), as soil application before transplantation of the cuttings was found most effective, with 91% reduction in disease incidence in comparison to non-solarized control. This treatment combination also proved most effective in improving various plant quality parameters with an increase of 242, 45, 43, and 150% in the number of flowers per plant, flower size, length of flowering stem, and stem strength with 'A' grade flowers, respectively, in comparison to non-solarized control. The effect of conjoint application of AM fungi, *A. chroococcum* and *T. viride*, was also quite effective in non-solarized soil as it resulted in an increase of 131, 53, 43, and 130% in number of flowers per plant, flower size, length of flowering stem, and stem strength with 'A' grade flowers, respectively, in comparison to non-inoculated control. This treatment resulted in 23.8 times higher spore count of AM fungi in solarized soil in comparison to non-solarized control and also resulted in 21.6 per cent root colonisation.

**Suzuki, T** (Tohoku University, Japan) gave an overview on the effect of AMF inoculation on the growth of Welsh onions in soil rich in available phosphate. The main objective of this study was to explore the effects on Welsh onion growth of a commercial AM fungi isolate R-10 and *Claroideoglossum etunicatum* isolated from a field with high P content. In a pot trial the isolated *C. etunicatum* increased the growth of Welsh onion to a greater extent than did R-10 and also showed a high colonisation rate under high phosphate conditions. Thus, the ability of the indigenous AM isolate to colonise Welsh onion plants under high-phosphate conditions of soil was confirmed, suggesting the presence of AM fungi adapted to soil rich in phosphate. The isolated *C. etunicatum* was effective even in soils rich in available phosphate.

**TILLE, S** (University of Sheffield, Sheffield, UK) described the impact of mycorrhiza and plant growth promoting bacteria on phosphorus uptake of wheat (*Triticum aestivum*) from inorganic and organic phosphorus forms. Sustainable soil phosphorus (P) management

strategies increasingly focus on the prospective use of inoculums of beneficial soil microorganisms due to their ability to mobilize P from organic and inorganic sources naturally occurring in soil. However, many factors including nutrient type and status, plant species and the presence of other microbes have an effect on microbial fitness and activity. In this study, Tille investigated wheat responsiveness to single and dual inoculation of *Glomus intraradices* and *Pseudomonas putida* and whether both microorganisms improve P assimilation from organic (phytic acid, DNA) and inorganic P (sodium phosphate, hydroxyapatite) forms and subsequent plant tissue formation. Moreover, we examined changes in root metabolite profiles as a result of microbial colonization and due to the presence of different P forms. His results showed that root colonisation and performance of *Glomus intraradices* and *Pseudomonas putida* and wheat responsiveness was highly dependent on the prevailing P form as well as the presence or absence of the respective other microbe. Furthermore, root metabolite patterns differed between the various P and microbial treatments.

- **Mycorrhizal management**

**PANWAR, V** (Indian Institute of Wheat and Barley Research, India) reported the efficacy of AMF as a bio-fertiliser and biocontrol agent in wheat crop. This study was conducted to find an effective and eco-friendly strategy to control the *Fusarium* head blight (FHB) and enhance the yield of wheat. In pot study, used two AMF species [*Glomus intraradices* (Gi) and *Gigaspora margarita* (Gm)] single and integrated with *Trichoderma harzianum* (Th), *Pseudomonas* sp. (pf) and low doses (0.05% and 0.03%) of fungicide (Tebuconazole) for managing FHB of wheat. All treatments significantly increased 100 grain weight as compared to control (uninoculated). Nevertheless, the combinations of Gi+Th and Gi+pf with low dose of fungicides (0.05% and 0.03%) significantly reduced the disease severity nearly equal to the recommended dose of fungicides (0.075%) and there was no negative effect on the growth promoting activity of bioagents. In conclusion, integrated bioagents like AMF and low dose of fungicide reduced the disease severity and improve the yield of wheat.

**QIN, H** (School of Environmental and Resource Sciences, China) explored the long-term fertiliser application effects on the soil, root arbuscular mycorrhizal fungi, and community composition in rotation agriculture. The trials results suggested that high soil organic C content benefits AMF growth, while soil pH and available K concentration strongly influence

AMF community. The root AMF community was much more resilient to the changes caused by long-term fertilizer application than the soil community.

**ORTAS, I** (University of Çukurova, Turkey) reported the effect of different mycorrhizae species with and without biochar application on plant growth. *Eucalyptus*- and *Phragmites*-derived biochar were used with three mycorrhizae species, *Glomus mosseae*, *G. etunicatum*, and *G. intraradices*, on sorghum (*Sorghum bicolor*) host plants to investigate the effects of biochar and mycorrhizae inoculation on plant growth. *Eucalyptus* biochar produced more dry matter than *Phragmites* biochar. In general, the contribution of mycorrhizae seemed to be higher than that of biochar. In particular, *G. mosseae*-inoculated plants produced more shoot dry weight than other *Glomus* species. The combined mycorrhizae and biochar application increased sorghum plant growth. These findings are very important for future agricultural applications.

**HAGE-AHMED, K** (University of Natural Resources and Life Sciences Vienna) gave an overview on the interaction between arbuscular mycorrhiza and *Fusarium oxysporum* f.sp. *lycopersici* in intercropping systems. The intercropping partner affected the arbuscular mycorrhizal (AM) root colonization of tomato. Tomato intercropped with leek showed a 20% higher AM colonisation rate than tomato intercropped with tomato. Positive effects of AMF expressed as an increase of tomato biomass compared to the untreated control treatment could be observed in root as well as in shoot weights. The intercropping partners leek, cucumber, basil and tomato had no effect on *F. oxysporum* f. sp. *lycopersici* disease incidence or disease severity. Nonetheless, bioprotective effects of AMF resulting in the decrease of *F. oxysporum* f. sp. *lycopersici* disease severity were evident in treatments with AMF and *F. oxysporum* f. sp. *lycopersici* co-inoculation in the tomato/leek and tomato/basil combination. In conclusion, the effects of the intercropping partner on AMF colonisation of tomato are of great interest for crop plant communities and for the influences on each other. The outcome of the bioprotective effects of AMF resulting in the decrease on *F. oxysporum* f.sp. *lycopersici* disease severity and/or compensation of plant biomass does not depend on the degree of AM colonization but more on the intercropping partner.

## Comment on basic state of knowledge

As might be expected from an international symposium, both global and local issues were presented, some of which were relevant to UK horticulture, and some not. There seemed to be very little work addressing the role of mycorrhizal fungi on drought tolerance and water uptake to plants. The effects of horticultural practices such as chemical treatments, heavy fertilisation regimes or soil-less substrates on the formation and functioning of mycorrhizal symbiosis were under investigated. More investigations on host/AMF/artificial substrate combinations would be of great interest for the English horticultural industry. Instead there seemed to be an emphasis on the study on forests, grasslands or field crops mycorrhizal and microbial community structures using a metagenomic approach to characterise agro- and eco-system properties.

## Highlights and recommendations

- More than one researcher reported the protective effect of AMF against *Fusarium* on different crops during ICOM8. Previous studies reported the fact AMF could suppress or at least reduce incidence of different soil-borne pathogens. Nevertheless, it is important to note that the protective effect of AMF against soil-borne diseases is not absolute. The beneficial effect can vary with the pathogens targeted; it is not expressed in all substrates or in all growing system conditions. Therefore, the use of mycorrhizas against pest or diseases has to be taken into consideration by the horticultural industry.
- Several researches presented at ICOM8 highlighted the fact that co-inoculation of AMF and PGPR bacteria have showed to be a good combination to increase yield, resistance to pathogens and even increase fruit quality or nutraceutical value of grains. Specific types of PGPR bacteria can cooperate with AMF resulting in further plant growth promotion and health than a single inoculation of AMF or PGPR alone. In conclusion, the right AMF/bacteria combinations are critical to improve plant fitness under horticultural systems.
- Strawberry plants were several times cited as a model study in several experiments. This is precious information for the horticultural industry. I address the possibility of using strawberry as a plant model to study the interaction between AMF and a fruit crop belonging to the Rosaceae family. Strawberry (*Fragaria x ananassa*) is an ideal production system to study the degree to which cultivar or growing practices affect

the formation of the symbiosis or its functioning as planting materials (micro-propagated or runners derived plug plants) can be easily pre-inoculated with AMF.

- New seed coating by AMF can promote AMF colonisation and increase nutrient acquisition by selected crops which was presented by two different research teams. Such biotechnology is feasible and very promising for horticultural plants that often need to be produced in nurseries or containers. Generally speaking the earlier the AMF symbiosis is formed at the right seedling stage the greater the benefit.

## **Acknowledgments**

I am grateful for the contribution from AHDB, GCRI, RHS and the SCI Horticulture Group that enabled me to attend ICOM8. It was particularly important for me to experience an international conference of this kind since I have decided to orientate my research on the interaction between beneficial microbes against soil borne pathogens in horticultural crops. Attending this conference enabled me to network with key researchers in the relevant areas and to keep abreast of latest development in mycorrhiza research.

## Appendix – ICOM 8 scientific program

Please visit the following link for the detailed scientific program:

[http://www.nau.edu/uploadedFiles/Centers-Institutes/Merriam-Powell/ICOM8/Forms/ICOM\\_program\\_for%20web.pdf](http://www.nau.edu/uploadedFiles/Centers-Institutes/Merriam-Powell/ICOM8/Forms/ICOM_program_for%20web.pdf)

### Sunday, August 2, 2015

- Afternoon • Registration
- Evening • Welcome Reception

### Monday, August 3, 2015

- Morning •
  - Registration
  - Opening Ceremony
  - Plenary Lecture 1
  - Plenary Symposium 1
- Afternoon • Poster Session 1
  - Lightning Talks 1
  - Concurrent Oral Sessions 1
- Evening • Reception
  - Public Talk: Tom Bruns, UC Berkeley

### Tuesday, August 4, 2015

- Morning •
  - Plenary Lecture 2
  - Plenary Symposium 2

Afternoon • Poster Session 2

- Lightning Talks 2
- Concurrent Oral Sessions 2

Evening •

**Wednesday, August 5, 2015**

All Day • Off-site Excursions and Free Time

**Thursday, August 6, 2015**

Morning •

- Plenary Lecture 3
- Plenary Symposium 3

Afternoon • Poster Session 3

- Lightning Talks 3
- Concurrent Oral Sessions 3

Evening • Wines of the World (chuck wagon dinner and dance; drinks available for purchase)

**Friday, August 7, 2015**

Morning •

- Plenary Lecture 4
- Plenary Symposium 4

Afternoon • Poster Session 4

- Lightning Talks 4
- International Mycorrhiza Society Business Meeting
- Closing Ceremony