

ICOM2 shows that mycorrhiza research is strong!

The Second International Conference on Mycorrhiza (ICOM2) was held from July 5–10, 1998 at the Ultana Campus of the Swedish University of Agricultural Sciences (SLU) in Uppsala with over 600 participants. The location was very convenient for the plenary sessions, workshops and posters, and the provision of lunch (great food!) at nearby cafeterias allowed meetings with colleagues for informal discussions and time to view posters.

The ICOM2 web-site set up well in advance of the meeting facilitated planning for the trip to Uppsala and made it possible to preview the abstracts before the meeting. The web site (<http://www-icom2.slu.se/loc-com.html>) will be maintained for a year and the proceedings can be downloaded and printed from this web site. The overall organization of the meeting was excellent and, on behalf of all in attendance, I thank Roger Finlay and the local organizing committee (Ulla Ahonen-Jonnarth, Anders Dahlberg, Eva Damm, Eric Danell, Tia Eriksson, Petra Fransson, Lena Jonsson, Ola Kårén, Monica Kling, Björn Lindahl, Ignacio Rangel, Elna Stenström, Andy Taylor, Torgny Unestam) for their hard work in making the meeting such a success.

The scientific portion of the meeting began with two pre-conference workshops: “DNA-based methods for identification of ectomycorrhiza” organized by Ola Kårén, Lena Jonsson and Maria Martin and “Development and function of the mycelium of arbuscular mycorrhizal fungi” organized by Monica Kling, Peter Schweiger and Iver Jakobsen. The First International Meeting on Ecology, Physiology and Cultivation of Edible Mycorrhizal Mushrooms, organized by Eric Danell, Carlos Colinas and David Pilz, was also held in association with ICOM2, with participants from 30 countries. The main meeting was organized with plenary sessions, a variety of workshops in the afternoon and time through the week for viewing posters. This made it possible for all participants to learn of recent advances in mycorrhiza research at the plenary sessions and then to participate in more specialized topics. The format was much appreciated and should perhaps be followed for subsequent meetings.

The first plenary session “Gene expression and metabolic regulation”, organized by Vivienne Gianinazzi-

Pearson and Francis Martin, included overviews of the genetic control of development of arbuscular mycorrhizas (VG-P) and ectomycorrhizas (FM), followed by four speakers on various aspects of gene expression during mycorrhiza formation. This area showed considerable progress since ICOM1 in that interesting genes are being isolated from a number of systems, and novel approaches are being taken to determine the roles of plant and fungus in various mycorrhizal types.

Of the four speakers in the second plenary session “Ectomycorrhizal fungi for forestry and food”, organized by Mark Brundrett and Bernie Dell, three stressed the importance of edible ectomycorrhizal fungi in the economy of various regions of the world. Mark Brundrett described work conducted in *Eucalyptus* plantations, particularly in China.

The third plenary session “Diversity and structure of communities and populations”, organized by Tom Horton and Randy Molina, covered ericoid mycorrhizas, arbutoid mycorrhizas, arbuscular mycorrhizas and ectomycorrhizas. The six speakers showed how methods of analysis ranging from molecular to morphological reveal the immense diversity in fungal communities. In the case of arbuscular mycorrhizal fungi, John Klironomos showed that this diversity can influence plant diversity and productivity. One of the major lessons from ectomycorrhiza research using molecular approaches is that fungal diversity on roots of many species is much higher than revealed by morphotyping or surveys of reproductive structures. The number of research laboratories using molecular methods in population studies has increased dramatically over the past few years.

The fourth plenary session “Climate, elevated CO₂ and global change” was organized by Mike Allen, who summarized the work by his group using FACE facilities and elevated CO₂ levels on a Mediterranean-type ecosystem. They noted an increase in ectomycorrhizas over time and a decrease in nitrogen-use efficiency. Following speakers reported on changes in ectomycorrhizal types on Douglas-fir with increased temperature and CO₂ using morphotyping and PCR-RFLP techniques, and the lack of direct effects of elevated CO₂ on colonization of two plant species by arbuscular mycorrhizal fungi. This shows that plant phenology must be

considered as a covariate when assessing treatment effects on mycorrhizal morphology.

In the fifth plenary session "Microbial interactions in the mycorrhizosphere", organized by Robin Sen and Jonathan Leake, four speakers summarized the complex interactions between bacteria and ectomycorrhizas, and bacteria and arbuscular mycorrhizas using a variety of methods. Interactions between ectomycorrhizal fungi and saprotrophic wood-decomposing fungi were also elegantly demonstrated. This session, and the many posters dealing with this topic, indicates increased interest in the interactions between mycorrhizal fungi and other organisms. With some of the newer techniques it is possible to get a clearer picture than previously of how these organisms are spatially related in the mycorrhizosphere.

The sixth plenary session "Physiology of mycorrhizal associations", organized by Sally Smith and Eric Dannel, included two papers describing cell/molecular biology approaches to the transport of nitrogenous compounds in ectomycorrhizal fungi and hexose sugar uptake from the interface of ectomycorrhizas. Also considered were a whole-plant look at the effects of mycorrhizal fungi on transpiration and the effect of various ectomycorrhizas on weathering of minerals.

The seventh plenary session "Identification" was organized by Monique Gardes and Peter Young. Three papers showed the importance of molecular methods for identification of mycorrhizal symbionts, and one presented conclusive evidence for inter- and intranuclear polymorphism of the internal transcribed spacer in *Scutellospora castanea* spores.

The final plenary session of the meeting "New methods in mycorrhizal research", organized by Larry Peterson and Andrew Smith, emphasized approaches not covered in other plenary sessions or workshops. These included: (1) new ways of determining pH in the interface between symbionts in ectomycorrhizas, (2) laser scanning confocal microscopy coupled with image analysis for determining the surface area of arbuscular mycorrhizal structures, (3) an update on the complexity of the vacuolar system in *Pisolithus tinctorius* hyphae, and (4) the usefulness of the *Daucus carota* transformed root system in studying carbon transport and metabolism in arbuscular mycorrhizas.

Workshops differed in their format, some being a series of invited papers and others being mostly discussions. There was a wide choice of topics ranging from molecular or cell biology and physiology to ecology. Participants were encouraged to select one workshop in a particular session, rather than move from one to another. This worked very well and helped to keep the discussions on track.

Posters were displayed through the week, which made it possible to space out the viewing. Because of the large number of posters it was somewhat difficult to get a good overview of the topics covered. It would have been helpful to arrange the posters according to topic. The quality of most of the posters was very high

and they showed the broad range of research topics world-wide.

The final afternoon of the meeting was devoted to summaries of the workshops, a brief closing statement by both David Read and Sally Smith and a business session. After showing some "historical shots" of various eminent mycorrhizal researchers, David Read emphasized the need to encourage researchers from other disciplines to collaborate on projects in which their expertise would enhance studies on mycorrhizas, and to strengthen research at all levels of hierarchy from molecular to ecosystem. He also emphasized the importance of input from mycorrhizal researchers at meetings of other societies. Sally Smith acknowledged the organizing committee for their hard work in hosting the meeting, stressed the importance of collaboration and the spirit of cooperation among mycorrhiza researchers and gave a brief "pitch" for having ICOM3 in Adelaide, Australia in the year 2001.

Mike Allen chaired the business session where the main items for discussion were the formation of an international association of mycorrhizal researchers (exact name to be decided), the adoption of "Mycorrhiza" as the official journal of the proposed association, and plans for ICOM3. After considerable discussion, it was agreed to form an official organization for the association with an executive, a committee to draw up a constitution and a nominating committee. It was further agreed to accept the offer made by Sally Smith to hold ICOM3 in Adelaide, Australia in 2001. This makes an interval of 3 years before the next meeting but avoids overlap with the summer Olympics in Sydney and several other meetings that many mycorrhiza researchers attend.

No meeting would be complete without an opportunity to enjoy the local ambience and to sample the local spirits (not wine in this case). The welcome on Sunday night primed everyone for the week ahead; the barbeque on Monday gave everyone an opportunity to socialize; the concert at the cathedral on Tuesday featured Swedish traditional music and "Wines of the World" on Thursday continued the tradition started at Berkeley (the brown bags, however, were novel!). After tallying the results, the grand winner was Sweden (figure that!) and the distinction of having a product that probably should not have been entered as "wine" went to Bengt Söderström. Wednesday was set aside for a variety of outings and, as planned, the sun came out. The outings were well organized and from all reports very enjoyable. The banquet on Friday was truly memorable for its setting (Uppsala Castle), the meal and the guest appearance of "Linnaeus". A great evening.

Again, on behalf of the mycorrhiza community, I thank the group at Uppsala for making this meeting outstanding scientifically and socially, and thank Sally Smith and the group at Adelaide for generously volunteering to host ICOM3.

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