

An international workshop: mycorrhiza, a biological tool for sustainable development in Africa

Amadou Bâ • Abdala Diédhiou • Aboubacry Kane

Published online: 10 January 2012
© Springer-Verlag 2011

Although mycorrhizal symbiosis are well known on European, North American, South American, Southeast Asian, and Australian plant species from natural or anthropogenic ecosystems, data from Africa are still scarce and neglected. The international workshop on “Mycorrhiza: a biological tool for sustainable development in Africa” held in Dakar, Senegal, February 21–23, 2011, was therefore particularly timely. Eighty-seven participants from 23 countries attended the workshop, which included oral presentations, poster sessions, excursion and many free-ranging discussions. Abstracts of all the talks and posters, and details of the participants can be found on the website <http://www.ird.sn/web-mycorhizes2011/>.

The aim of the workshop was to present state of the knowledge and perspectives in mycorrhizal research on tropical and Mediterranean plant species in Africa. The contents addressed diversity and function of mycorrhiza associated with forest and agricultural plants, in Mediterranean and tropical, wet and seasonally dry ecosystems. Impacts of mycorrhiza on plant diversity and composition, regeneration and dynamics of ecosystems, and biomass production in forestry and agriculture, were topics for oral presentations

and poster sessions. The workshop was also a pretext to put in concrete form the idea of creating of a scientific network that connects researchers working with mycorrhiza in Africa.

In the opening lecture, A. Fortin (Canada) introduced mycorrhiza and their role in the evolution and functioning of plants and terrestrial ecosystems. Although symbiotic systems have provided a major impetus to plant speciation and to the development of soils and therefore to terrestrial ecosystems, all concepts at the base of modern agriculture have been developed and applied as if mycorrhiza did not exist. A. Fortin invited scientists working in the field of mycorrhiza in tropical and Mediterranean ecosystems, political deciders, and partners for development to exchange experience and to set up new strategies on mycorrhizal research in Africa. There was a large discussion about the use of mycorrhiza in agriculture and forestry in Africa.

A. Bâ (Senegal) opened a session on diversity and function of ectomycorrhizal (ECM) symbioses, illustrating that Russulales and Thelephorales dominate above- and belowground ECM fungal communities in open and rain forests in tropical Africa. Following presentations covered the role of ECM in the regeneration and functioning of tropical African forests, their potential use for ecological restoration of sites contaminated by heavy metals and the rich occurrence of edible ECM fungi in these regions (N. Onguene Awana, Cameroon; G. Kudzo Atsu, Togo; K. Sanon, Burkina Faso; M. Ducousso, France). There followed much debate about the importance of ECM fungi in forest diversity, productivity, resilience, and restoration.

V. Gianinazzi-Pearson (France) introduced a session on diversity and function of arbuscular mycorrhiza (AM) by emphasizing the ecosystem services they provide to plant productivity and survival, and the necessity, for their efficient exploitation in plant production systems, to reduce chemical inputs, evaluate in situ fungal potential and plant responsiveness

A. Bâ (✉)
IRD/LCM/LSTM,
BP. 1386, Dakar, Senegal
e-mail: amadou.ba@ird.fr

A. Diédhiou • A. Kane
UCAD/LCM,
BP. 1386, Dakar, Senegal

A. Diédhiou
e-mail: abdalagd@yahoo.fr

A. Kane
e-mail: abou@refer.sn

to inoculation, use appropriate inoculum of well-defined isolates, and monitor persistence of the introduced inocula. Presentations then focused on carbon/nutrient balance in functional AM (T.W. Kuyper, Netherlands) and missing phylogenetic data from Africa on AM fungal diversity (M. Öpik, Estonia), despite the fact that high AM fungal diversity can be found in roots of African trees, vegetable crops, cereals, and date palms (P. Houngnandan, Benin; Q. Ahmed, Morocco; F. Ndoeye, Senegal; A. Kane, Senegal; A. Tchabi, Togo). From a functional view point, several presentations reported the potential of AM fungi to use organic matter and to improve soil aggregate stability and plant growth (H. Wallander, E.C. Hammer, Sweden; J.J. Mnyazi, Kenya; D. Sidibé, Mali; E. Birhane, Ethiopia; S. Aliou, Benin; M.N. Muriithi, Kenya). Successful applied research and practical use of mycorrhiza, as well as problems associated with field testing and application were also presented with a particular focus on multifunctional effects of inoculation on food and nonfood crops in subtropical and tropical regions in Africa (M. Vosátka, Czech Republic; A. Sow, Senegal). The session concluded with discussion about and the need to evaluate the field performance of AM fungi and develop appropriate inoculum of well-defined isolates.

A short session was organized on orchid mycorrhiza because of the few studies devoted to them in African orchids. In an introductory talk, M.-A. Selse (France) showed that some tropical orchids share a broad diversity of ECM fungi with neighboring trees in contrast to most temperate orchids, and that their isotopic abundance of carbon 13 is intermediate between myco-heterotrophic and photosynthetic plants, suggesting a mixotrophic mode of nutrition. This was followed by results from a preliminary study on fungal diversity in roots of orchids belonging to the genus *Angraecum* Bory from central Africa (A. Diédhiou, Senegal). Discussion underlined the need to pursue such research.

Although the beneficial effects of several fast-growing and multipurpose exotic tree species are well established in Africa, there is a lack of information about their impact on soil symbiotic components. A session on the impact of plants on functional diversity of soil microorganisms was opened by R.

Duponnois (Morocco) who demonstrated changes induced by exotic plant species on soil-borne microbial characteristics and the potential impact on the development of native forest species in Africa. Supporting evidence of how exotic plants can change the abundance and diversity of AM fungi was then presented (A. Sanon, G. Sène, Senegal), although habitat types may have no significant effect on the diversity and types of mycorrhizal associations in some areas (B. Eneke, Cameroon). This session sparked a debate on the use of exotic plants for soil restoration due to the eventual negative impact that they may have on native symbiotic microflora.

In a session devoted to interactions between plant symbioses, L. Laplace (Senegal) first introduced observations on *CgSymRK* and *CgCCaMK* genes as elements of a signal transduction pathway shared during early root colonization of *Casuarina glauca* by *Frankia* and *Glomus intraradices*. This aspect of common genetic programs involved in both symbioses was further developed in a presentation on the global analysis of gene expression in mycorrhizal roots and nodules in *C. glauca* (A. Tromas, Senegal). The following talks focused on effects of AM/*Mesorhizobium* interactions growth and mineral nutrition of *Acacia seyal* seedlings under salt stress conditions (D. Diouf, Senegal), and the role of bacterial communities AM fungi in spore germination (E. Ngonkeu, Cameroun). The general discussion highlighted the need to better understand molecular mechanisms involved in recognition and beneficial interactions between plants and microorganisms.

The workshop terminated by the creation of an African Network on Mycorrhiza (AFRINOM). A steering committee was elected unanimously; it comprises a chairman, a representative from each region of Africa, two European and two North American representatives. Headquarters and the executive secretary of the network are based in Dakar, Senegal. The next workshop of AFRINOM will be organized in 2013 in Nairobi, Kenya. Thanks go to members of the Laboratoire Commun de Microbiologie for the organization and wonderful hospitality, and to the sponsors (CORAF/WECARD, TWAS, FORMAS, IRD and Ministry of Higher Education and Research of Senegal) for the funding.