The 11th Dahlia Greidinger Memorial Symposium: Advanced Methods for Investigating Nutrient Dynamics in Soils and Ecosystems

A Collection of Papers from “Advanced Methods for Investigating Nutrient Dynamics in Soils and Ecosystems”

David D. Myrold*
Dep. of Crop and Soil Science
Oregon State University
Corvallis, OR 97331

Avi Shaviv
Dep. of Environmental, Water, and Agricultural Eng.
Technion-IIT, Haifa
Israel

The 11th Dahlia Greidinger Memorial Symposium on Advanced Methods for Investigating Nutrient Dynamics in Soils and Ecosystems was held from 4–7 Mar. 2013 at the Technion in Haifa, Israel, with the generous support of the Dahlia Greidinger fund and BARD (Binational US-Israeli fund for Agricultural R&D). Approximately 100 scientists from around the world gathered to address knowledge gaps and priorities for research and development related to the need to quantify nutrient dynamics and reaction mechanisms, particularly those of nitrogen (N) and phosphorus (P) in crop/food production systems. There was a focus on advanced and novel tools and approaches (including those developed in other disciplines) that enable real time/online investigation and quantification of processes and on options to observe and model changes at various scales (from microscopic up to field scales). Sessions were devoted to new approaches for understanding N and P cycling in soils, organic matter and interactions between carbon (C) and N, and advances in measurement methods at multiple scales. Manuscript based on symposium presentations were solicited, of which seven are published in this issue of the *Soil Science Society of America Journal*. The full proceedings of the symposium are available at: http://dgsymp13.technion.ac.il/.

Two papers emphasize recent developments in measuring microbial taxonomic and functional diversity. Rapid advances in DNA sequencing technology now makes it possible to sequence entire communities of microorganisms, or at least their collective genes. Myrold et al. (2014) review the status of the application of metagenomics, and related approaches, to determine the genetic potential of soil microbial communities. Microbial activities are the realization of this genetic potential and have often been measured as enzyme activities. Baldrian (2014) focuses on how these enzyme activities vary in soils, with an emphasis on variation across spatial scales.

Soil P was the focus of three papers (Cade-Menun and Liu, 2014; Tamburini et al., 2014; Liu et al., 2014). Cade-Menun and Liu (2014) review recent advances in the use of 31P-NMR. Tamburini et al. (2014) review the application of 18O for understanding P transformations in soil and its effectiveness in providing information on biological processes influencing the P cycle and for tracing the origin and fate of P in soil–plant systems. These approaches are yielding new insights into the forms and cycling of P in soils, as illustrated by the final paper by Liu et al. (2014), which explores molecular speciation of P associated with soil colloids.

The applications of different operating modes of FTIR spectroscopy to study N cycling were highlighted in two papers. Kira et al. (2014) found that FTIR-ATR (attenuated total reflectance) can be used with minimal disturbance to determine the 15N abundance of inorganic N in soil pastes, which may pave the way to real-
time measurements of N dynamics in incubated soils. Dubowski et al. (2014) demonstrate that the FTIR can be used to measure on-line gaseous emissions of N$_2$O from incubated soils under various conditions. Combing the FTIR technique with $^{15}$N labeled mineral N allows direct determination of N$_2$O isotopologues and isotopomers released from the soil.

Collectively, this set of papers documents the interplay between methods development and experimental work necessary to enhance our understanding of soil processes.

REFERENCES


