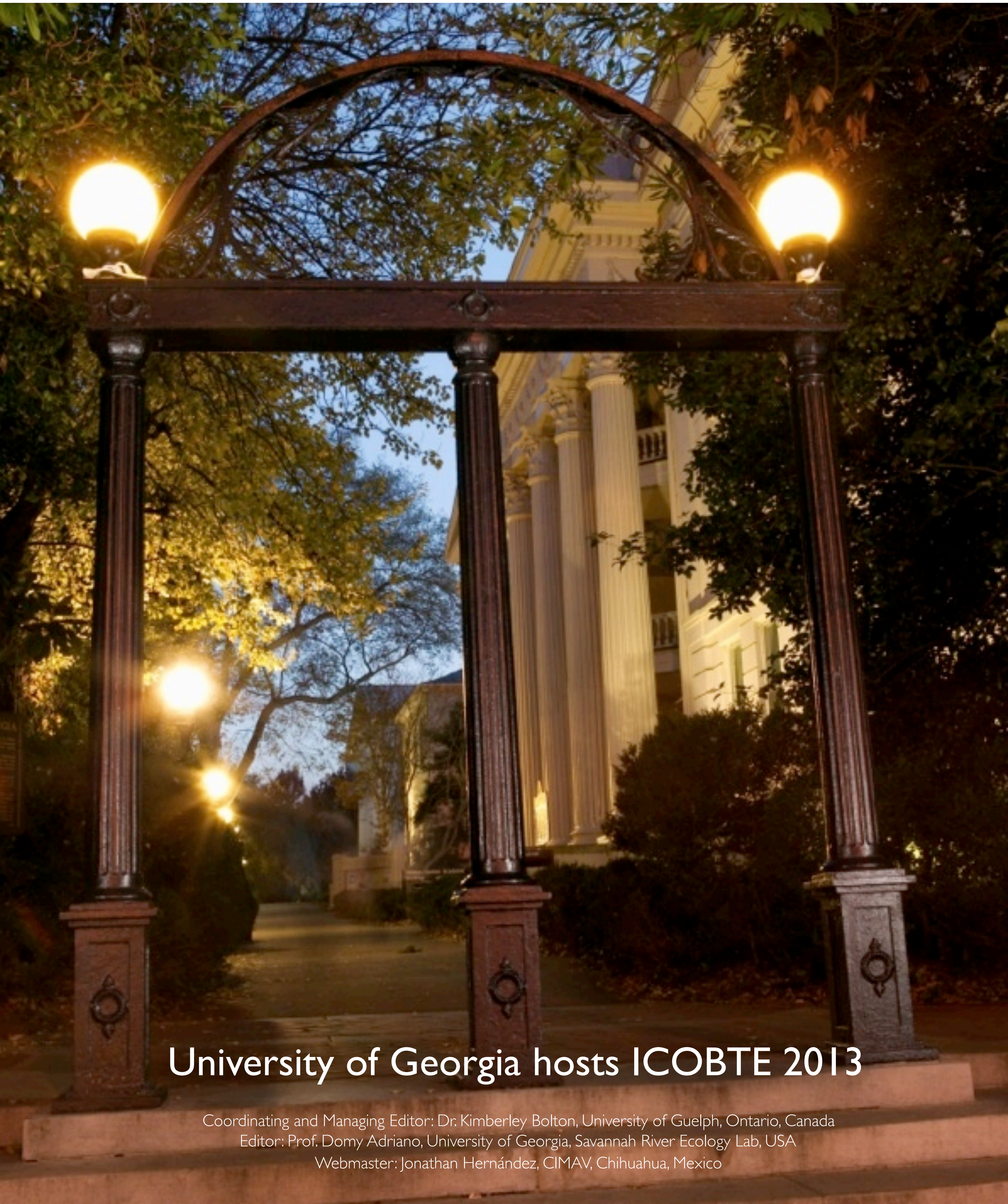
Volume 3, Issue 1 March 2013

TE News

Communication is the Language of Science

Published by The International Society of Trace Element Biogeochemistry
http://www.isteb.com



University of Georgia hosts ICOBTE 2013

Research Highlights (cont...)

Selenium-enriched Edible Mushrooms: Integrating Selenium Phytoremediation with Biofortification

Zhi-Qing Lin

Phytoremediation of selenium-contaminated agricultural soil and water can be environmentally sustainable and cost-competitive. However, the management of Se-contaminated plant materials is challenging. We proposed that Se-phytoremediation wastes could be used as a valuable source of Se for the production of Se-biofortified edible mushrooms. Selenium is an essential nutrient for humans and animals, with a recommended daily allowance of 55 µg for human adults. Concentrations of Se in commercially produced mushrooms vary significantly among different growers who use different sources of growth substrate materials in mushroom production. While the common button mushroom, *Agaricus bisporus,* has a reasonably high Se content (~2.5 mg Se kg^{-1}), most other mushrooms that are commonly produced in the U.S. contain relatively low levels of Se (<0.25 mg kg^{-1}). Thus, there was a strong need to develop and produce selenium-biofortified edible mushrooms for the U.S. market.

Growing Se-biofortified White Button and Baby Bella mushrooms (*Agaricus bisporus*) in an environmental chamber using the compost of Elephant grass (*Pennistum purpureum*) and Rye grass (*Leymus triticoides*) harvested from the San Joaquin Valley, central California. (S. Haddad)

Research was conducted to determine the ability of different mushroom species to accumulate Se from growth substrates treated with different levels and chemical forms of Se (including selenate, selenite and selenomethione (SeMet)). In addition the feasibility of producing Se-biofortified edible mushrooms using growth substrates containing different types of Se-laden plant materials (Eucalyptus wood and Rye grass (*Leymus triticoides*)) that were harvested from the phytoremediation field sites in the San Joaquin Valley of central California was evaluated. Our results showed that the accumulation of Se in mushrooms increased significantly with increasing substrate Se concentration. When the growth substrate was treated with different chemical forms of Se, the highest Se concentration in Oyster mushroom (*Pleurotus ostreatus*) was observed with the selenate treated growth substrate, followed by the SeMet and the selenite treated substrates. When the Se-laden (1.98±0.16 mg Se kg^{-1}) Eucalyptus wood and Rye grass tissues were used as the growth substrate, the Se-biofortified Oyster mushrooms accumulated 2.9±0.12 mg Se kg^{-1} in the fruit body. This is much higher than the Se content of commercially produced Oyster mushrooms in the US (0.2 mg Se kg^{-1}). The Se biofortification treatments resulted in a 13-times increase of Se accumulation in Oyster mushrooms. SeMet-like organic compounds were the dominant chemical forms of Se in the biofortified Oyster mushroom. This study demonstrates the concept of integrating the environmentally sound and sustainable management strategy of Se phytoremediation with the production of Se-enriched edible mushrooms.

For more information see:

Haddad, S. and Z.-Q. Lin. 2011. Tolerance and accumulation of selenium by White Button and Baby Bella (*Agaricus bisporus*). pp 99-100. In: G.S. Bañuelos, Z.-Q. Lin, X. Yin, and N. Duan (eds.), *Selenium: Global Perspectives of Impacts on Humans, Animals, and the Environment*. USTC Press, Hefei, China.

Dr. Z.-Q. Lin is Associate Professor in the Department of Biological Sciences and Environmental Sciences Program at Southern Illinois University - Edwardsville. His research focuses on the environmental biogeochemistry of selenium.

This study was financially supported by US EPA (SU836036).