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7. Title

Laboratory Testing, Chemistry, and Bioavailability of Nutrients in Soils and Soil Amendments

12. Investigator Name(s) (Last Name and Initials)

Wang, J. J.; Gaston, L. A.; Henderson, R. E.; Stevens, J. C.

20. Termination Date 06/30/2012

40. Period Covered (mo/da/year): 01/01/2011 TO 12/31/2011

Outputs:

The Soil Testing and Plant Analysis Laboratory (STPAL) analyzed 15,393 routine soil samples, 6,278 plant samples, and 385 water samples. In addition, the lab performed 6557 optional soil tests. The results were transmitted to producers with formulated fertilizer and lime recommendations. The project generated six refereed research publications, one book chapter, and 11 presentations at national and international meetings. The significance and impact of the research project was discussed with peer researchers at national and international meetings. The research results also were disseminated in two articles through Louisiana Agriculture magazine.

Outcomes/Impacts:

There was an increase of 2,223 routine soil samples (17%), over the previous year. This increase was primarily from home consumers as the Soil Testing Plant Analysis Laboratory (STPAL) implemented a box sampling kit for garden crops. There also was an increase of 1510 plant samples over the previous year. Research was focused on conversion of sugarcane and rice residues to biochar as a soil amendment. Biochars of different crop residues were produced at different temperature and characterized. Biochar produced from crop residues generally had different nitrogen contents. As temperature increased, biochar material analyses showed more aromatic molecular structure and less surface functional groups. Treating soils with sugarcane biochar increased sorption of atrazine, a commonly used herbicide in sugarcane production. In addition, further research evaluated water extracts of organics from animal manures on dairy farms using pyrolysis-GC/MS. Results showed the possibility of hormone compounds occurring in animal manures of conventional dairy farm as compared to organic dairy farm, and a method is being developed for identifying these compounds. In addition, research investigated factors controlling the behaviors of tylosin antibiotic in soil and manures. Tylosin sorption in soil and manure was greatly affected by matrix pH, organic matter, ionic strength, redox potential, and clay type. Increasing pH and ionic strength generally decreased tylosin adsorption by clay minerals. The kinetic behavior of tylosin sorption was examined in forest and corn field soils. The change in tylosin concentration in the soil solution was rapid during the initial stages of the sorption reaction followed by slow and continued reactions in the control and soil with 1% hardwood biochar. However, tylosin concentration significantly declined in 5% and 10% biochar-treated soils after 4 hrs. Hardwood biochar-amended soils had higher sorption capacity of tylosin than softwood biochar-treated soils. Applying biochar amendment to antibiotics and pesticide-contaminated soils can reduce the transport of these contaminates in soils. The results are import to understanding environmental consequence of various amendment applications as well as the fate of contaminants in manure-impacted soils.

Publications:

Wang, J.J., S.K. Dodla, R.D. DeLaune, W.H. Hudnall, and R.L. Cook. 2011. Soil carbon characteristics in two Mississippi river deltaic marshland soils. Wetlands 31:157-166. DOI 10.1007/s13157-010-0130-y.

Wang, J.J. H. Zhang., J. L. Schroder, T.K. Udeigwe. Z.Q. Zhang, S.K. Dodla, and M.H. Stietiya. 2011. Reducing Potential Leaching of Phosphorus, Heavy Metals, and Fecal Coliform from Animal Wastes Using Bauxite Residues. Water Air Soil Pollut. 214:241-252. DOI 10.1007/s11270-010-0420-2.

Viator, H. and J.J. Wang. 2011. Effect of residue management on yield after three production cycles of a long-term sugarcane field trial in Louisiana. J. Am. Soc. Sugar Cane Technologists 31:15-25.

Stietiya, M.H. and J.J. Wang. 2011. Effect of organic matter oxidation on the fractionation of copper, zinc, lead, and arsenic

in sewage sludge and amended soils. J. Environ. Qual. 40:1162-1171. doi:10.2134/jeq2011.0008.

Stietiya, M.H., J.J. Wang, and A. Roy. 2011. Macroscopic and extended X-ray absorption fine structure spectroscopic investigation of ligand effect on zinc adsorption to kaolinite as a function of pH. Soil Sci. 176:464-471. doi: 0.1097/SS.0b013e3182285b46.

Kang, J., Z. Zhang, and J.J. Wang. 2011. Influence of humic substances on bioavailability of Cu and Zn during sewage sludge composting. Bioresource Technology. 102:8022-8026. doi:10.1016/j.biotech.2011.06.060.

Piao, C., C.J. Monlezun, J.J. Wang, and L.H. Groom. 2011. Recycling of pentachlorophenol-treated southern pine utility poles. Part I: Preservative retention and mechanical properties. Forest Prod J. 61(1):1-8.

Wang, J.J. and L. Gaston. 2011. Land-applied animal waste and water quality. Louisiana Agriculture 54(4):16-17.

Tubana, B., J. Wang., J.C. Stevens, and D.J. Boquet. 2011. Soil testing and calibration research in soybeans. Louisiana Agriculture 54(2):30-31.

Wang, J.J., S.K. Dodla, and Z. He. 2011. Application of analytical pyrolysis-mass spectrometry in characterization of animal manures. P. 2-24. In Z. He (ed.) Environmental chemistry of animal manures. Nova Publishers.

Wang, J.J. R. DeLaune, and M. Ali. 2011. Runoff Characteristics and Redox Control of Veterinary Antibiotics in Manure, Soil and Water. National Water Conference and USDA Project Director Meetings, January 31-February 2, Washington DC (Abstract).

Wang, J.J., S.K. Dodla, and R. DeLaune. 2011. Relationship between carbon gas emission and soil organic carbon transformation along a salinity gradient in coastal wetland soils. AmeriFlux Science Meeting and The Third North American Carbon Program All Investigators Meeting. January 31- February 4, 2011, New Orleans, LA (Abstract).

Wang, J.J., Z.Q. Zhang, and R.E. DeLaune. 2011. Physico-chemical forms of Copper in water and sediments of Lake Pontchartrain, USA. Proceedings of 11th International Conference on the Biogeochemistry of trace elements, Florence, Italy, July 3-7, 2011, pp. 405-406. Wang, J., S. Dodla, and R. DeLaune. 2011. Characteristics of organic carbon in coastal wetland soils along a salinity gradient. The 3rd International Symposium on soil organic matter dynamics. Leuven, Belgium, July 11-14, 2011, pp 216.

Wang, J.J., Z. Zhou, J. Du, J. Yang, M. Ali, C.Y. Jeong, D. Seo, R. DeLaune, L. Gaston, A. Roy, and S. Dodla. 2011. Behavior characteristics and environmental control of tylosin in soil and manure. ASA-CSSA-SSSA International Annual Meetings, October 16-19, San Antonio, Texas (Agronomy Abstr).

Jeong, C.Y., J.J. Wang, and S.K. Dodla. 2011. Sorption of tylosin by humic acid-like substances. ASA-CSSA-SSSA International Annual Meetings, October 16-19, San Antonio, Texas (Agronomy Abstr).

Jeong, C.Y., J.J. Wang, and S.K. Dodla. 2011. Characteristics and environmental impact of thermal biochar from sugarcane and rice residues. ASA-CSSA-SSSA International Annual Meetings, October 16-19, San Antonio, Texas (Agronomy Abstr).

Zhang, Z.Q., J.J. Wang, and R.DeLaune. 2011. Biogeochemistry of copper in Lake Pontchartrain water and sediments. ASA-CSSA-SSSA International Annual Meetings, October 16-19, San Antonio, Texas (Agronomy Abstr).

Wang, J.J., R. DeLaune, S. Dodla, and C.Y. Jeong. 2011. Mobility characteristics and redox influence in controlling degradation of oil hydrocarbons in wetland soils. ASA-CSSA-SSSA International Annual Meetings, October 16-19, San Antonio, Texas (Agronomy Abstr).

Dodla, S.K. , J.J. Wang, C.Y. Jeong, S.D. Mudi, R. DeLaune, S. Viator, R. Sheffield, A. Hiscox, and T. Hymel 2011. Effect of Nitrogen Fertilization, Harvesting and Residue Management Practices on Greenhouse Gas, Ammonia and Particulate Matter Emissions in Sugarcane Production. ASA-CSSA-SSSA International Annual Meetings, October 16-19, San Antonio, Texas (Agronomy Abstr).

Participants:

Jim Wang (PI), R. Henderson, S. Dodla, C. Jeong, M. Ali, and S. Mudi, LSU AgCenter.

Target Audiences:

Agricultural and environmental professionals.

Project Modifications:

Nothing significant to report during this reporting period.

Approved (Signature)	Title	Date