

(2655 - 899) Analytical quality program of soil fertility laboratories that adopt Embrapa methods in Brazil – 2016/2017 results

Daniel Vidal Perez¹; Marcelo Francisco Costa Saldanha²
Embrapa Soios¹; Embrapa Meio Ambiente²

Accuracy and precision of soil fertility results is constantly questioned by customers. To promote its credibility, laboratories generally participated of external performance testing programs. The analytical quality program of soil fertility laboratories that adopt the Embrapa methods (PAQLF) is a voluntary sample-exchange program established since 1992. PAQLF is managed by Embrapa Solos and evaluate P and K extracted by Mehlich1 solution; Al, Ca, and Mg by KCl 1 mol L⁻¹ solution; H + Al by Ca Acetate 0.5 mol L⁻¹; soil pH in water; and organic C by wet combustion. Accuracy is based on a confidence interval: average \pm a.SD; where, SD = standard deviation; a = 1, when CV > 50%; a = 1.5, when 20% < CV < 50%; and a = 2.0, when CV < 20% (CV means coefficient of variation). Precision is determined by the average CV of the analytical results of two samples sent in triplicate. Inaccuracy and imprecision composes an Index of Excellency rank: A for IE > 91; B for 71 > IE < 91; and C for IE < 71. Only A and B laboratories are considered approved by PAQLF. In the 2016/2017 program, 122 laboratories from all Brazilian states had participated. The Midwest region contained the largest number of participants (37%). Southeast, Northeast, North and South regions comprises, respectively, 25%, 17%, 11% and 9% of the laboratories. Only 66% of the 122 laboratories reached the A and B ranks of IE classification. However, Midwest laboratories were by far the ones that presented the best performance, with 87 percent being approved. Northeast laboratories showed the worst results with 38% approval. These findings highlighted the different laboratories profiles of each region. The laboratories of the Midwest are in its most private and possess the greater analytical capacity, some of them exceeding 100,000 yearly analyses. The permanence in the market of soil analysis is clearly dependent on its ability to demonstrate its analytical quality to the customers. And this occurs through its results in quality programs like PAQLF. On the other hand, laboratories in the Northeast region are mostly public and, therefore, dependent on government resources. In this way, due to the weakness of the Brazilian economy in recent years, it's easy to understand why they have the lowest performance. Considering the last seven years, although the number of participants has been growing annually (34%), there is no evidence of lowering of the percentage of approved laboratories.

Keywords: Accuracy, precision, soil analysis

Financial support: Embrapa, Funarbe

(3582 - 746) Availability of phosphorus in soils amended with dairy manure, urban and industrial sludge.

Amabelia del Pino¹; Lucía Bentancur¹; Nadia Freire¹; Melina Fernández¹; Omar Casanova¹

Facultad de Agronomía - Universidad de la República¹

Dairy manure, urban and industrial sludges can provide important amounts of nutrients when used as soil amendments for pasture and crop production. However, management difficulties arise due to uncertainties regarding to the dosage of these materials. An important proportion of P in manures and sludges is in organic form, and from the inorganic fraction not all is water soluble. This study was aimed to: 1) Assess the soil P availability for crops of three amendments: dairy manure (DyM), sludge from dairy industry (SDI) and urban sanitary sludge (SU). 2) Evaluate the residual available P in soils amended with these materials. A greenhouse experiment was conducted with ryegrass as the test crop, in a soil representative of dairy production region in Uruguay (A horizon texture: silty clay loam). Two rates of each amendment were compared to P fertilizer (K₂HPO₄), plus a control without any addition. The application rates

of the amendments and fertilizer, based on total P content, corresponded to 40 and 80 mg kg⁻¹ of soil. The amendments and fertilizer were mixed with the soil, transferred to plastic pots (3 per treatment), and ten pre-germinated ryegrass seeds were planted in each pot. Three months after planting the aerial biomass of ryegrass was cut, weighed, dried and ground for P concentration analysis. Soil samples from each pot were collected to evaluate residual P availability (Bray 1). The biomass production of the treatments SDI and SU represented 2.7 and 1.6 folds the yield of the control (average of two rates). In contrast for DyM ryegrass yield was lower than control, while in the fertilized pots biomass production was slightly above the control. The absorbed P showed similar trends, with the highest values for sludge amended soils. But also ryegrass in DyM and fertilized pots more than doubled the P absorption of the control. For SDI, SU and fertilizer significant differences were found between application rates, in biomass production and absorbed P. The residual soil P was higher for SDI and fertilizer compared to SU and DM. The reasons for these results could be linked to the slow decomposition of DyM, which presented a higher C/N ratio compared to sludges. In the case of SU, higher soil P retention was attributed to the addition of FeCl₃ during sludge processing. It was concluded that the dosage of DyM and sludges should take into consideration not only total P content, but also other characteristics that affect their reaction with the soil.

Keywords: Uruguay; ryegrass; absorbed P

Financial support: Obras Sanitarias del Estado (OSE) Uruguay.

(9764 - 2852) Biosolid microbial stabilization for potential use as soil improver in Costa Rica.

Fabiola Segura¹; Andrea Quesada¹; Federico Masis¹
Costa Rica Institute of Technology¹

Phosphorus, nitrogen and potassium are key elements in plant growth. Therefore, essential to accelerate land use recovery and food security improvements. The projected increase in the demand for fertilizers in Latin America and the Caribbean, between 2005 and 2050, is estimated to be 180%. In Costa Rica, nitrogen is considered a generalized limiting factor and 74% of agricultural soils present phosphorus deficiencies. On the other hand, septic waste, depending on its origin and dewatering degree, contains varied but significant amounts of nutrients such as nitrogen, phosphorus and potassium. By 2017, domestic wastewater treatment in Costa Rica was covered using septic tanks at 75.8%, indicating an increasing generation of domestic sewage sludge, which can contain large number of pathogenic bacteria, viruses and parasites eggs. Thus, the need for appropriate disposal and treatment. Up to now, there are countries that have already attained management and disposition strategies of biosolids in soils, for example: U.S.A and Canada. So far, production of biosolids derived from domestic sewage sludge comprehend three phases: microbiological stabilization, physical-chemical stabilization and storage or final disposal of treated biosolids. From laboratory-scale to pilot-scale, this research seeks to establish three sanitary treatments to cover the first phase and to minimize potential risk of biosolids land application. Three approaches are undertaken: lactic acid fermentation, liming and biosolid solarization. To improve handling disposal and reduce public concern regarding the recycling of domestic sewage sludge in soils, this research aims to show the usefulness of "faster and unexpansive techniques" to reduce microbial pathogens during biosolids production. Therefore, in accordance with related legislation, the microorganisms of focus are intestinal nematodes and fecal coliforms. The high content of organic matter and nutrients of biosolids make them excellent substrates to produce soil improvers. Furthermore, soil physical properties like water holding capacity and total porosity are enhanced when biosolids are mixed with materials such as biochar.

Keywords: Biosolids, sanitation, soil amendments, land use recovery, domestic sewage sludge.

Financial support: Research Project: Production of carbon neutron