Changes of the plant-available soil phosphorus in the Qualiagro experiment for 13 years of cropping and repeated applications of different urban composts (poster, submitted)

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Introduction

Urban composts represent a source of nutrients to plants, but their availability to plants could vary considerably depending on origin and processing prior to application. Monitoring and predicting soil P changes under continuous cropping receiving urban composts over decades are crucial issues. The Qualiagro field experiment was carried out to investigate on many scientific and agronomic objectives associated with the spreading of urban composts in agricultural fields. One was to analyze the long term changes of the plant-available soil P in the plough layer. We will present results obtained for 13 years on (1) the effects of the 4 organic amendments and the 0P treatment on the P chemically extracted by the Olsen[1]'s method in relation with the cumulative P budgets (B_{cum}) and (2) the P fertilizer value of the different urban composts.

Material and Methods

The Qualiagro experimental site (48°90'N and 1°95'E), located in Feucherolles (Yvelines department (78), France), was initiated in 1998 (Gabrielle et al. 2005). It is cropped with a maize (*Zea mays* L.) and wheat (*Triticum aestivum* L.) rotation and includes the nil P treatment, which is the reference to assess changes in plant-available soil P, and 4 organic amendments applied in 1998, 2000, 2002, 2004 and 2006: **i)** a municipal solid waste compost obtained by composting solid municipal wastes after removal of dry and clean packaging (MSW); **ii)** a compost derived from co-composting a mix of 70 % green wastes with 30% sewage sludge (GWS); **iii)** a biowaste compost produced by co-composting green wastes with a source-separated organic fraction of municipal solid wastes (BIOW); **iv)** a cattle farmyard manure (FYM).

Two mineral N fertilization regimes (optimum and minimum mineral N fertilization) are applied on all treatments in two separate sections of the field experiment. The soil is a typic Hapludalf with a loam texture, a pH of 6.9 with negligible $CaCO_3$ content. Organic amendments were applied on an organic carbon basis, about 4 t ha^{-1}, and spread once every 2 years on wheat stubble before ploughing. By the end of 2006, the annual means of applied P were 21.8, 101.3, 42.9 and 40.0 kg P ha^{-1} yr^{-1} for MSW, GWS, BIOW and FYM, respectively. Grain yields and their P content were determined every year for all plots to calculate the annual and cumulative P budget, i.e. the added P to soil minus the P removed in grain yields. Soil samples, taken up every 2 years before each soil amendment spreading, were analyzed for plant-available soil P by the worldwide Olsen's chemical extraction.

Results

Due to highly different C/P ratio and carbon-based application, amounts of applied P highly vary between urban composts treatments. The cumulative P budgets (B_{cum}) for the optimal N fertilization were –309 kg P ha^{-1} for the 0P treatment, and -68, +1097, +298, +142 kg P ha^{-1} for the MSW, GWS, BIOW and FYM treatments, respectively, after 13 years of experimentation. Our poster will present, compare and discuss relationships that link changes in P_{Olsen} with B_{cum} for the nil treatment and the different urban composts, for the two regimes of nitrate fertilization.

Conclusion and perspectives

In conclusion, the P fertilizer value of the different organic amendment will be calculated. The next step will be to analyse and understand the eventual difference in P fertilizer value between organic amendments.

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[1] 1 g of soil mixed for 30 minutes in 20 ml of 0.5 M $NaHCO_3$ solution at pH of 8.5 before filtration