Geophysical Research Abstracts
Vol. 13, EGU2011-2678, 2011
EGU General Assembly 2011

Physicochemical indices for N mineralization from vegetable cultivated soils Flanders Belgium

Kanagaratnam Jegajeevagan, Steven Sleutel, and Stefaan DeNeve
Unversity of Ghent, Faculty of Bioscience and Engineering, Department of Soil Management, Gent, Belgium
(pkjesi@yahoo.co.uk, fax +32 9 2646247)

Physicochemical indices for N mineralization from vegetable cultivated soils Flanders Belgium

K. Jegajeevagan, S. Sleutel, S. De Neve
Department of Soil Management, Ghent University, Coupure 653, Gent, Belgium
Email: Pkjesi@yahoo.co.uk; Steven.Sleutel@UGent.be; Stefaan.DeNeve@UGent.be;
tel. +32 9 2646061; fax +32 9 2646247

In Flanders, Belgium, intensive field vegetable production is often accompanied with excessive use of organic fertilizers and high soil N mineralization rates and consequently high mineral N levels. Predictors for nitrogen mineralization were investigated for vegetable growing soils in Flanders, covering three crop rotation groups: arable vegetable, alternating arable vegetable, and strictly vegetable production from twenty different fields. Soils were aerobically incubated at an average temperature of 20oC over a 14-week period. Microbial biomass C (MBC) beta-glucosidase and dehydrogenase enzymes activity were measured at the end of 4th and 14th week of incubation. Soil organic matter quality was further investigated by a physico chemical fractionation procedure that firstly separates sand (>53μm) from silt+clay (<53μm). The silt+clay fractions are then chemically fractionated into 6% NaOCl-oxidation resistant N and OC, [10% HF extractable (mineral bound) N and OC (MN and MOC)] and 10% HF resistant (recalcitrant) N and OC (RN and ROC).

The initial total N contents of the different fields range from 0.55 to 1.62 g N kg-1 with C:N ratios between 9 and 14. Soil N mineralization (72.4 – 175 kg N ha-1 year-1- at 20cm depth layer) was high in all studied soils and no significant differences were observed among the different cropping groups. However, the relative N mineralization (% of soil N year -1) was significantly (P<0.05) higher in the arable vegetable cropping group (4.08 ± 1.02 %) than in the strictly vegetable cropped soils (2.6 ± 0.8 %). This was unexpected, given the common application of organic fertilizers on the strictly vegetable cropped fields. Since both SOC and N contents and C:N ratios did not correlate to N mineralization. Other factors such as SOM quality may explain the variation in observed N mineralization.

The physico- chemical fractionation procedure delivered useful predictors for % N mineralization with a (P<0.01) positive correlation with NaOCl oxidisable N (r = 0. 645) and the Sand OM C:N ratio (r = 0.566) and negative correlations (P<0.05) with the NaOCl resistant N (r = - 0.513), whole soil C:N ratio (r = - 0.535) and silt+clay C:N ratio (r = - 0.552). The NaOCl oxidisable N, MN and MOC fractions were significantly (P<0.01) different between the strictly vegetable cropping group and the arable and alternating arable cropping groups.

The % N mineralization was positively (P<0.01) correlated with dehydrogenase activity (μg TPF g -1dry soil 24 hour) at the 4th (r = 0.598) and 14th (r = 0.605) weeks of incubation. A stepwise linear regression between relative N mineralization (% of soil N year-1) and the relative proportions of SOC and N of the isolated fractions (in % of N or SOC) along with their C:N ratios yielded following model: (R2 = 0,416; P<0.01, N = 20).

Yearly % N Mineralization=0,071*NaOCl Oxidisable (silt+clay)N-1,088

In conclusion differences in NaOCl oxidisability and HF extractability of the silt+clay N appear to relate to differences in relative N mineralization between cropping groups. For the studied set of soils, oxidation by NaOCl seems to mimic biological degradation of organic N.