Geophysical Research Abstracts
Vol. 17, EGU2015-2338, 2015
EGU General Assembly 2015

Soil Decomposition of Added Organic C in an Organic Farming System

Kokoasse Kpomblekou-A, Alassane Sissoko, and Wendell McElhenney
Tuskegee University, Tuskegee, Alabama, United States (kka@mytu.tuskegee.edu)

In the United States, large quantities of poultry waste are added every year to soil under organic management. Decomposition of the added organic C releases plant nutrients, promotes soil structure, and plays a vital role in the soil food web. In organic agriculture the added C serves as the only source of nutrients for plant growth. Thus understanding the decomposition rates of such C in organic farming systems are critical in making recommendations of organic inputs to organic producers. We investigated and compared relative accumulation and decomposition of organic C in an organic farming system trial at the George Washington Carver Agricultural Experiment Station at Tuskegee, Alabama on a Marvyn sandy loam (fine-loamy, kaolinitic, thermic, Typic Kanhapludults) soil. The experimental design was a randomized complete block with four replicates and four treatments. The main plot (54' $\times$ 20') was split into three equal subplots to plant three sweet potato cultivars. The treatments included a weed (control with no cover crop, no fertilizer), crimson clover alone (CC), crimson clover plus broiler litter (BL), and crimson clover plus NPK mineral fertilizers (NPK). For five years, late in fall, the field was planted with crimson clover (*Trifolium incarnatum* L) that was cut with a mower and incorporated into soil the following spring. Moreover, broiler litter (4.65 Mg ha^{-1}) or ammonium nitrate (150 kg N ha^{-1}), triple super phosphate (120 kg P_2O_5 ha^{-1}), and potassium chloride (160 kg K_2O ha^{-1}) were applied to the BL or the NPK plot and planted with sweet potato. Just before harvest, six soil samples were collected within the two middle rows of each sweet potato plot with an auger at incremental depths of 0-1, 1-2, 2-3, 3-5, 5-10, and 10-15 cm. Samples from each subplot and depth were composited and mixed in a plastic bag. The samples were sieved moist through a $<$2-mm sieve, and air-dried for 48 hours on a laboratory bench and stored until analysis. A 20-g (oven-dry) of each sample was placed in a 250-mL French square bottle connected to an aerobic CO_2 evolution apparatus consisting of a scrubber to remove CO_2, hydrocarbon contaminants, and ammonia from the flowing air. The CO_2-free air was then distributed to the French square bottles that are connected to test tubes containing 25 mL KOH (0.2 M) to trap the CO_2evolved. The samples and blanks were incubated for 30 days. To estimate the readily mineralizable organic pools (C_o) and the first-order rate constant (k), the non-linear regression approach for N mineralization was used. The Statistical Analysis System (SAS) computer language was used to calculate C_o and k. After five years of cultivation, organic C content of the soil increased significantly ($P < 0.05$) and the cumulative CO_2 evolved increased from 3.60 to 8.26 g C kg^{-1}soil in the crimson clover + NPK treatment. Irrespective of treatments and years of cultivation, the 3-5 cm depth showed the largest quantities of organic C accumulated and evolved as CO_2.

Please fill in your abstract text.