Long-term Application of Inorganic Fertilizer and Organic Manures on Carbon Dioxide Emissions in Wet Land Rice Soils

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ABSTRACT

Long term impact of mineral fertilizers and manures on the emission of carbon dioxide was investigated in laboratory incubated soils with varying temperature and moisture regimes from wet lands soils under rice-rice cropping system.Thesoil samples were collected from experiment of intensive rice cropping for 23 years and treatments consisted vi., control, inorganic N (60 kg/ha), inorganic fertilizer (NPK @ 60-40-40 kg ha^{-1}), FYM @ 10 Mg $ha^{-1}$and inorganic fertilizer NPK @ 60-40-40 kg $ha^{-1}$and FYM @ 5 Mg ha^{-1} as treatments with three replications and days of incubation. A general decreasing trend of CO_2 production corresponding with decrease in total organic carbon (TOC) under different fertilization treatment was noted for all moisture and temperature regimes. Higher cumulative CO_2 production (2.25 mg CO_2-C g-1 dry soil) at 90 days of incubation in FYM + NPK treatments was presumably due to high TOC (1.39%) and POC (888.6 mg Kg-1) content and higher biological activity. Higher microbial biomass carbon (MBC) (250.7 mg g-1) and acid hydrolysable carbohydrates (AHC) in FYM treated soil caused considerable amount of cumulative CO_2 production at 90 days (1.90 mg CO_2-C g-1 dry soil)possibly acted as a source of bio-energy for higher amount of exogenous micro organisms.Temperature is a prime factor regulating microbial activity, soil respiration and hence CO_2 evolution regardless of fertilizer treatments. Mean cumulative CO_2 production increased by 8% at 35^oC (from 1.09 mg to 1.18 mg CO_2-C g-1 dry soil) than at 25^oC. Similarly, mean cumulative CO_2 production increased by 15% at 60% WHC (from 1.05 to 1.21 mg CO_2-C g-1 dry soil) than at submergence and was influenced by different fertilizer treatments.

Keywords: *Carbon dioxide production, Incubation, Moisture, Temperature, Pools of carbon*