

Greenhouse Gas (N₂O) Production from Tropical Vertisol under the Interactive Influence of Climate Change Factors and Insecticide Chloropyrifos

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Abstract—Recently there has been intensive use of agrochemicals to meet the global food demand. This practice adds another dimension to the global changing factors like elevated CO₂ (eCO₂), temperature, moisture etc. Therefore, it is timely to understand the soil biogeochemical process under complex interaction of these factors. Experiments were carried out to explain how this interaction influences soil N₂O production in a tropical vertisol. The environmental factors were CO₂ (ambient, 800ppm), temperature (25°C, 35°C, 45°C), soil moisture holding capacity (MHC) (60%, 100%) and chloropyrifos (0ppm, 10 ppm). Production of N₂O was high (18.06 ng g⁻¹soil under normal environmental condition, while eCO₂, temperature and chloropyrifos inhibited N₂O production to 2.94 ng g⁻¹ soil. One way ANOVA analysis revealed significant influence of the factors on the variables ($p < 0.0001$). Soil enzymatic activities including fluorescein diacetate hydrolysis (FDA) and dehydrogenase (DHA) activities were significantly affected by the factors ($p < 0.0001$). Factors also significantly ($p < 0.0001$) influenced the ammonia oxidizers, heterotrophs, actinomycetes and fungal abundance in soil. Pearson product moment analysis indicated significant correlation among the variables ($p < 0.0001$). Principal component analysis (PCA) explained 48.86% and 28.49% variation by first two components. PCA biplot categorized factors (vectors) based on their level of similarity and identified linkage between the parameters. It is concluded that the use of the pesticide chloropyrifos under future global changing condition may alter soil biogeochemical process by affecting functional soil microbial groups.