The Combined Effects of Soil Type and Acid Rain on *Tagetes erecta*

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With worldwide commercial exploitation and agricultural uses, especially as a natural pesticide, marigolds (*Tagetes erecta*), experience acid rain in most places where they grow. This study tested the combined effects from acid and soil type on marigolds' growth and biomass yield. With 21 different soil mixes, 336 plants were planted herein. Half the plants in each group got 10.0 ± 0.1 mL/day/plant of tapwater, while the rest got the same volume of 0.001 M HNO_3 to simulate acid rain (i.e., pH = 3.0) applied to the soil surface. Into each pot, 200.0 ± 0.1 g of mixes of pure fine quartz sand, kaolinite clay, and organic compost was added in two phases compressed to 8.0 ± 0.1 cm, with one seed placed at 4.0 ± 0.1 cm depth. After measuring plant heights for 30 days, group means and standard deviations were calculated, while plant longevity, daily growth rates, fresh live and bio-mass were also measured. Using tertiary clay-sand-organic matter plots, plant heights, growth rates, sprouting ratios, mean sprouting times, mean longevity, mean fresh mass, and biomass were graphed vs. soil type for both water and acid rain groups. Under water or acid, plant groups in high clay concentrations produced few or no sprouts, hinting that kaolinite may lack (a) nutrient(s) vital for marigolds growth. Soils containing > 60 wt% organic matter produced higher plant sprouting ratios. In groups treated with water, growth rates were fastest with 60 wt% sand 40 wt% organic matter, while among the groups treated with acid, plants in 80 wt% sand 20 wt% organic matter had the fastest growth rates. Interestingly, the life expectancy for many groups did not change dramatically by adding acid rain. When getting water, a mix of ≥ 60 wt% organic matter ≤ 40 wt% clay produced the best fresh mass. In acid, groups with ≥ 40 wt% organic matter relatively higher fresh mass and biomass, but also in those with ~ 40:60 clay:sand ratios. In water, groups with ≥ 60 wt% organic matter produced more biomass. Future tests will grow marigolds in other simulated acid rain mixtures and pH's.