The Effects of Soil Texture on Mold Levels

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Abstract:

We decided to investigate the relationship between the drop in mold levels in site 4 compared to sites 1 and 3 and the drop in percentage of silt in the soil in site 4 compared to sites 1 and 3. We hypothesized that it was indeed the drop in silt levels that caused the decreased mold levels in site 4. We performed our experiment by collecting 12 samples from site 1, 15 samples from site 4, 13 samples from the dry areas of site 3 and 12 samples from the riverbed in site 3. We performed serial dilutions and soil jar texture tests for each sample. We counted the number of mold in each sample as well as finding the percentages of each type of soil (sand, silt, and clay). We compared results from the dry regions as well as the results from the wet regions by graphing our data and performing T-tests between conditions. From these graphs and T-tests, we can conclude that there is neither a correlation between mold levels and soil texture nor a statistical significance between soil texture or molds levels between the conditions (wet or dry). Thus we have proved our hypothesis incorrect. However, using the results of the T-tests comparing wet and dry mold populations we can also eliminate the possibility that the mold levels were affected by moisture levels in the specific sites. Although we have proved our hypothesis incorrect, we have eliminated both soil texture and water as possible causes for the drops in mold.

Methods:

We began by taking 12 samples from site 1, 15 samples from site 4, 13 samples from site 3 in the dry areas, and 12 samples from site 3 where it was wet (along the riverbed) using a soil core sampler. The soil samples were 2 cm in diameter and 15 cm deep. We tried not to take the samples too close to each other to get variety, but kept the amounts of water and sunlight the same as to not change any variables. We then performed serial dilutions on all samples, to the 10^{-3} dilution. From site 1, we plated only the 10^{-1} and 10^{-2} dilutions. From site 4 we plated 10^{0}, 10^{-1} and 10^{-2}. From site 3, we plated 10^{-1}, 10^{-2} and 10^{-3}. We plated 100 micro liters of each given solution onto a separate Yeast/Mold petrifilm plate. We let these sit for at least 48 hours before we counted the number of molds on the plates. To count mold on petrifilm plates, we looked for the plate with the least number of mold on them. To identify mold, look for the green or yellow colored dots that are fuzzy around the edges. Count the number of molds on the plate and record both the number as well as the dilution of the plate they appear on. For the soil texture tests we filled jars about ½ to 2/3 of the way full with the soil sample, then filled almost to the top with water. We then added a few drops of phosphate soap, capped and shook well so that all the contents were mixed. We left each of the samples overnight and in the morning we measured the particular layers of soil, and the total of all the layers, then calculated percentages of each type of soil layer (sand, silt and clay)

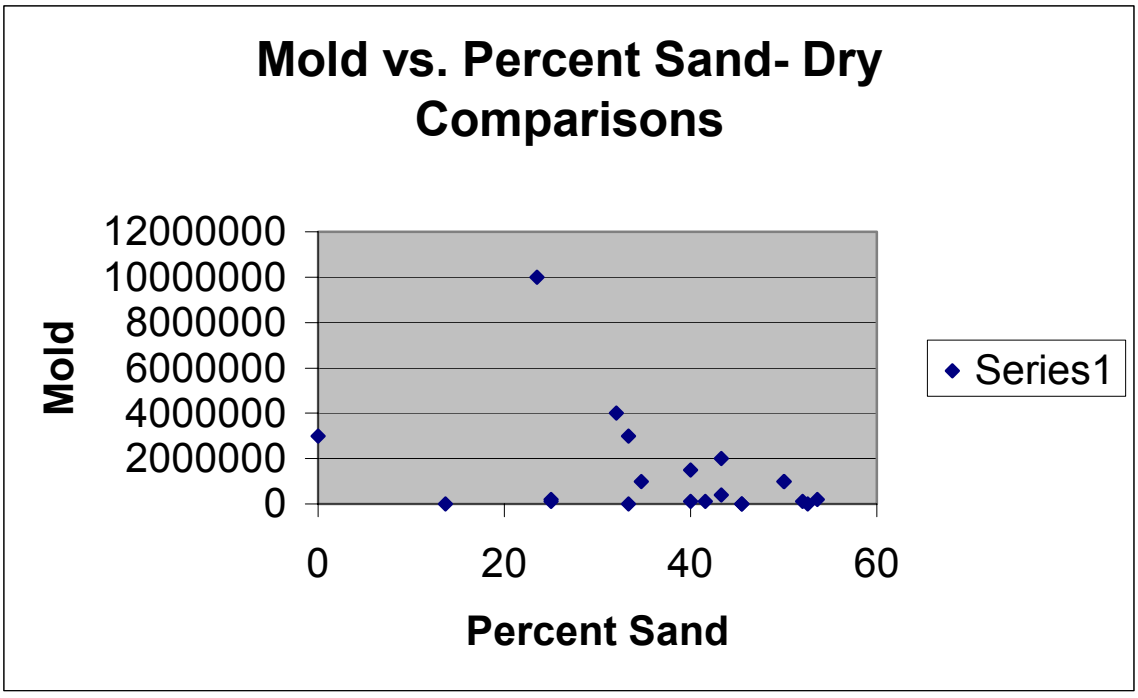
Results:

Table 1-Soil Texture & Mold Density

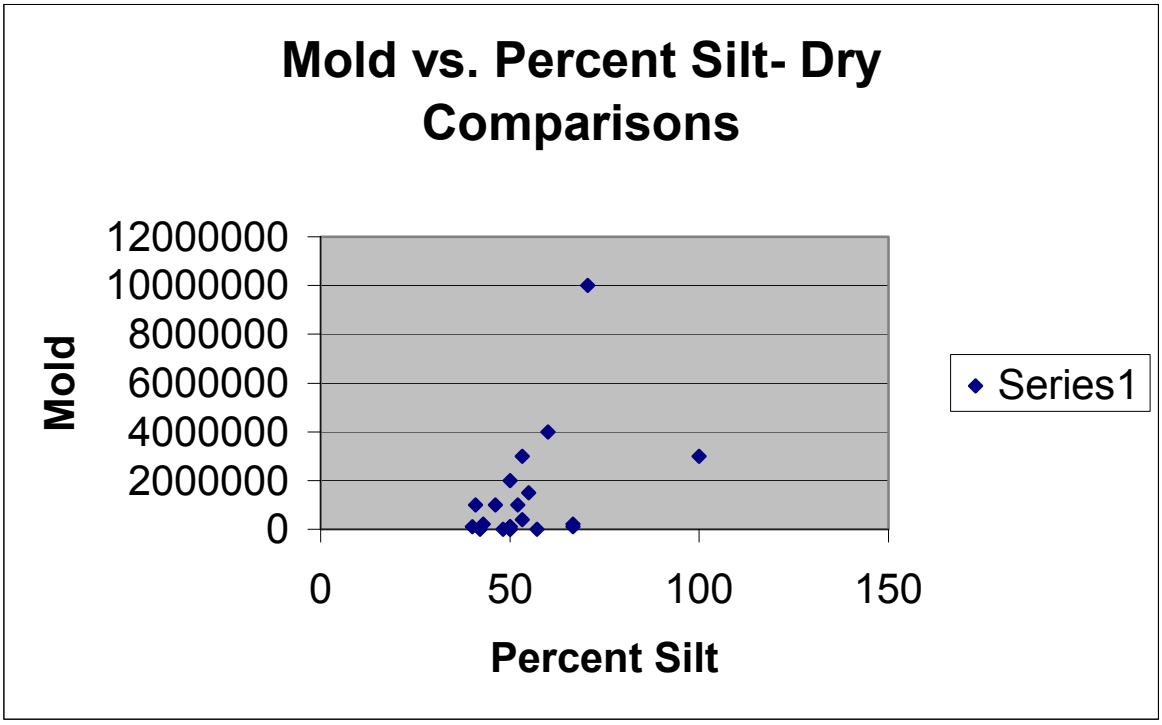
Site	Sample	% Sand	% Silt	% Clay	Total # of mold/cc
1	a	34.7	52.1	13	1.00E+06
	b	43.3	50	6.6	2.00E+06
	c	50	46.1	3.8	1.00E+06
	d				4.00E+06
	e	N/A	N/A	N/A	NO DATA
	f	N/A	N/A	N/A	NO DATA
	g	N/A	N/A	N/A	NO DATA
	h	52	40	8	1.00E+05
	I	13.7	48.2	3.4	0.00E+00
	j	41.6	50	8.3	1.00E+05
	k	40	50	10	1.00E+05
	l	33.3	57.1	9.3	0.00E+00
	m	43.3	53.3	3.3	4.00E+05
	n				1.00E+05
	o	52.6	42.1	5.2	0.00E+00
4	a	43.5	52.2	4.3	6.00E+06
	b	48.1	44.4	7.4	0.00E+00
	c	0	96.7	3.3	4.00E+05
	d	92	4	4	2.00E+06
	e	59.1	36.4	4.5	4.00E+04
	f	68.2	22.7	9.1	1.00E+05
	g	37.5	58.3	4.2	2.00E+06
	h	53.6	39.3	7.1	2.00E+05
	i	61.5	34.6	3.8	1.00E+06
	j	64.3	28.6	7.1	3.00E+05
	k	75	40	10	2.00E+06
	l	73.1	23.1	3.8	4.00E+05
	m				3.00E+04
	n				0.00E+00
	o				1.00E+04
3(wet)	a	45.8	50	4.2	1.00E+06
	b	52.2	43.5	4.3	1.00E+07
	c	45	40	15	2.00E+07
	d	25.9	70.4	3.7	3.00E+05
	e	79.1	16.6	4.2	1.00E+06
	f	43.5	50	6.5	2.00E+06
	g	44	52	4	1.00E+05
	h	28.6	54.8	16.7	5.00E+05
	i	55.6	33.3	11.1	1.00E+07
	j	75.9	20.7	6.9	5.00E+05
	k	61.9	28.6	9.5	1.00E+05

	l	58.3	33.3	8.3	6.00E+05
3 (dry)	a	40	55	5	1.50E+06
	b	23.5	70.6	5.9	1.00E+07
	c	33.3	53.3	13.3	3.00E+06
	d	0	100	0	3.00E+06
	e	N/A	N/A	N/A	NO DATA
	f	25	66.7	8.3	1.00E+05
	g	25	66.7	8.3	2.00E+05
	h	50	40.9	9.1	1.00E+06
	I	45.5	50	4.5	0.00E+00
	j	45.5	50	4.5	0.00E+00
	k	53.6	42.9	3.6	2.00E+05
	l	N/A	N/A	N/A	MISSING
	m	N/A	N/A	N/A	1.00E+05
	n	N/A	N/A	N/A	1.00E+05

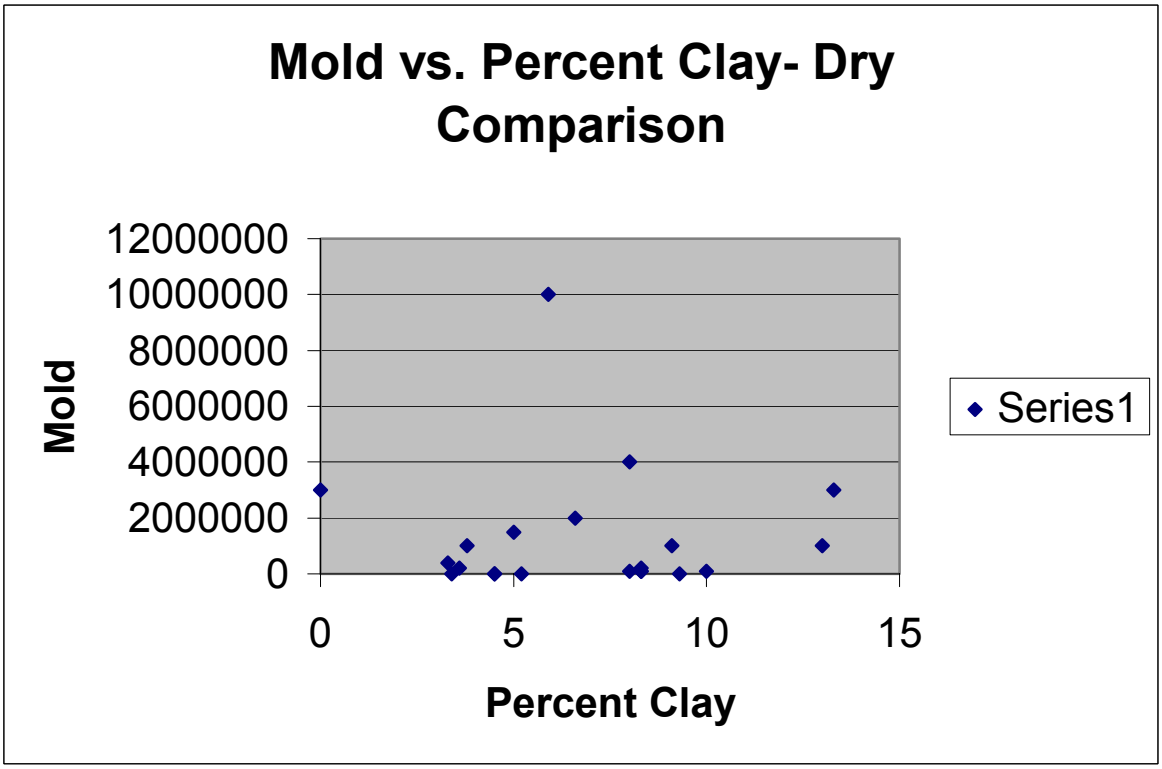
Graph 1-Mold Levels vs. Percent of Sand in Dry Conditions



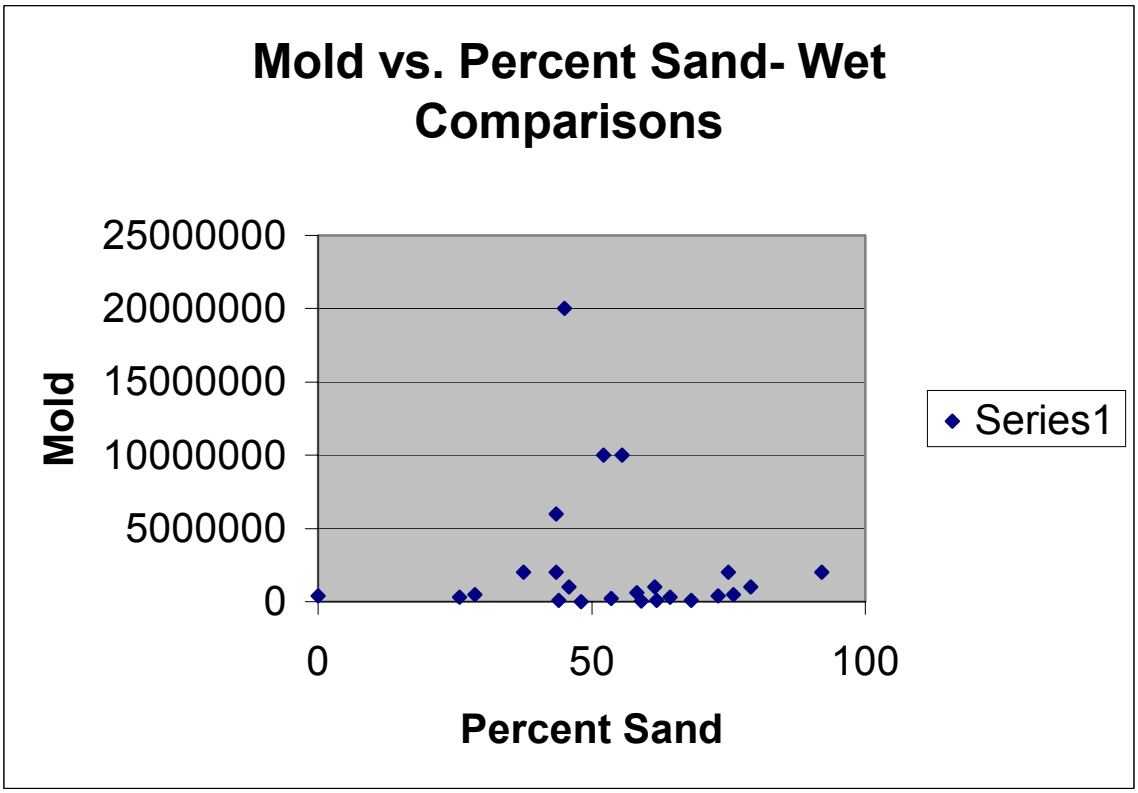
Graph 2-Mold levels vs. Percent Silt in Dry Conditions



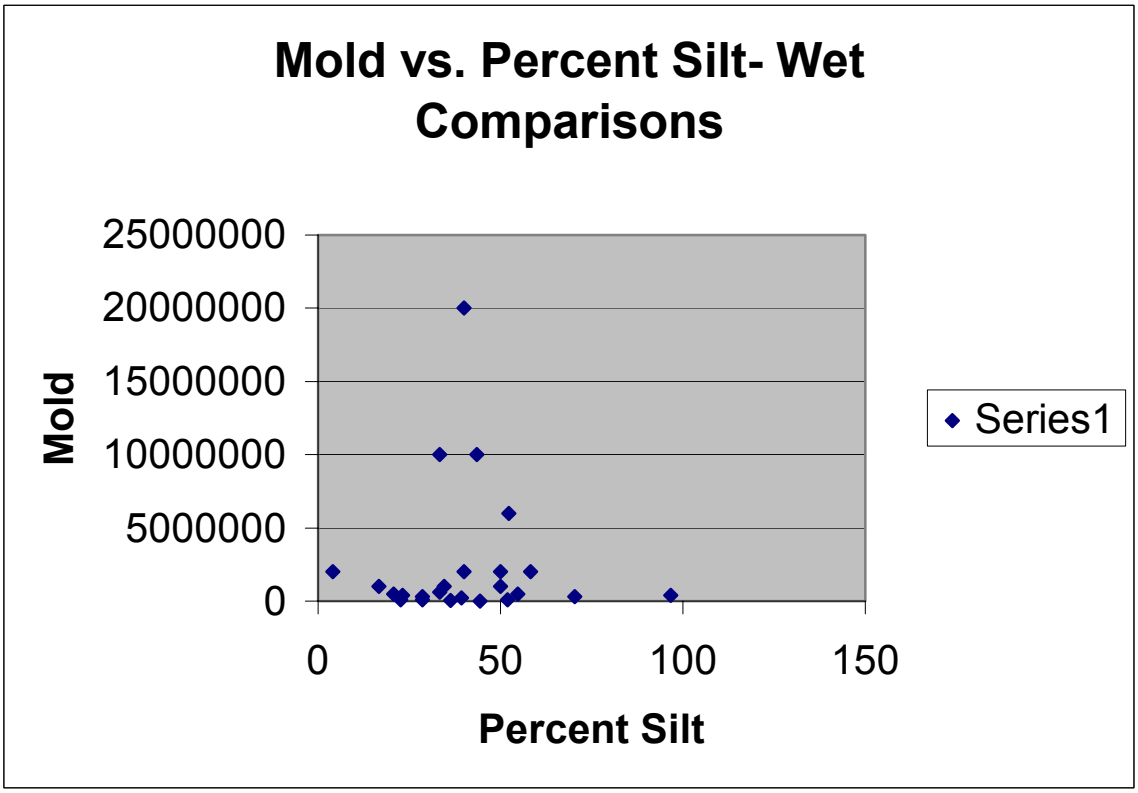
Graph 3-Mold levels vs. Percent Clay in Dry Conditions



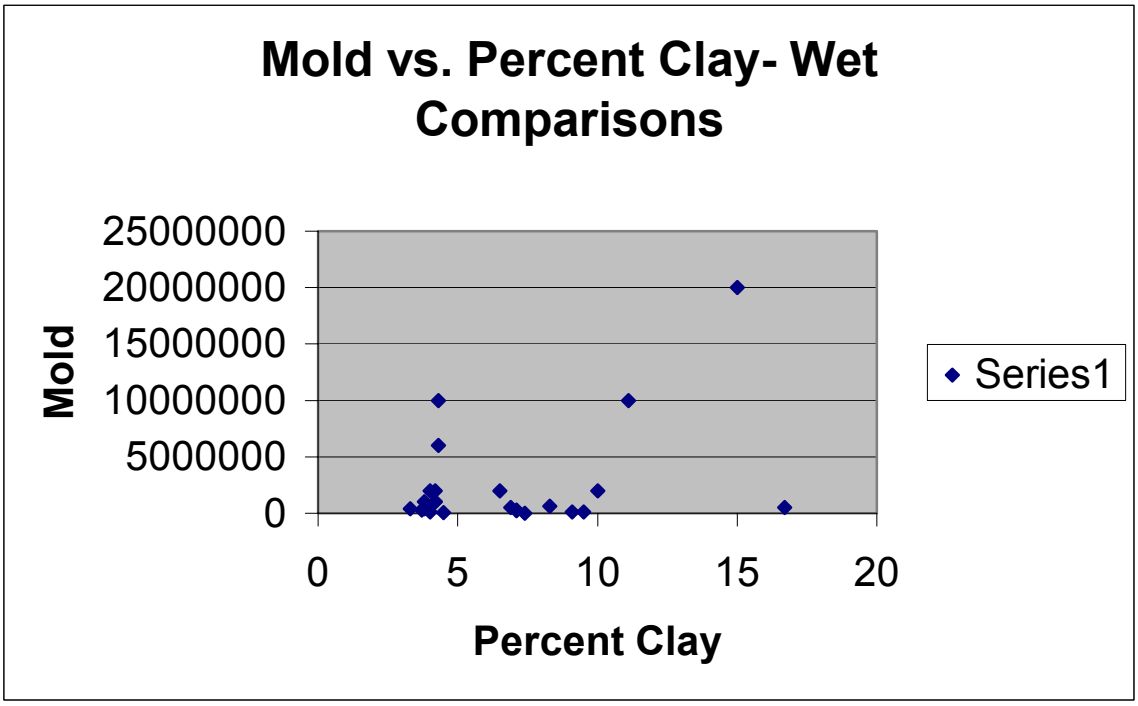
Graph 4-Mold levels vs. Percent Sand in Wet Conditions



Graph 5-Mold Levels vs. Percent Silt in Wet Conditions



Graph 6-Mold vs. Percent Clay in Wet Conditions



For our analysis, we organized our data collected into tables and graphs. Table 1 shows the percentages of each sand, silt and clay in each soil sample along with the mold counts for each soil sample. Graphs 1-3 show in the dry conditions the relationships between mold levels and each of the percentages of sand, silt and clay in the soil. Graphs 4-6 show in the wet conditions the relationship between mold levels and each of the percentages of sand, silt and clay.

In all graphs there is obviously no correlation between percentages of sand, silt or clay and mold levels in either wet or dry conditions. To make sure that we weren't missing anything in our analysis, we performed t-tests comparing the mold levels in each of the wet places to each other. This t value, 1.55 compared to the t alpha value of 2.179 shows that our data for mold counts in wet areas was not significant. We also performed t-tests for the soil texture in each wet

area to see if there was a significant difference in soil texture between the wet sites, but these t-tests showed no significant difference as well.

Discussion:

After reviewing our data and analysis, we have discovered that we did not prove our hypothesis with our experiment. The lack of a significant difference between wet sites, and wet and dry sites show that our hypothesis was completely wrong. To see if perhaps the drop in mold levels was because of the water differences in site 3 and 4, we performed a t-test between all of the wet sites mold levels and all of the dry sites mold levels. With a t value of 1.053 and a t alpha value of 2.021 we found no statistical significance. Although this proves our hypothesis wrong, we can now rule out two possible reasons for the mold drop in site 4-soil texture as well as moisture. This means that this drop must be due to another environmental conditions observed in the biota survey such as levels of Magnesium, Algae, Phosphorous, Manganese, Iron, Aluminum, Worms, Bacteria, pH, yeast or plant diversity. Perhaps there were variables beyond our control that could have affected our experiment, thus causing these results. However, further research could help prove what causes this drastic drop in mold population in site 4 compared to sites 3 and 4.

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