

# Air Quality on the Farm Testing Strategies to Minimize Ammonia Release

Isaac Hefty

DeKalb High School

Waterloo, IN

# Introduction

- The reason for my Environmental Engineering experiment was to find the most economical solution to reduce ammonia in chicken manure to keep chickens and people healthy. However, this solution had to be cheap so that all farmers can use this on their chicken manure.
- Experimental Question: Can I Reduce ammonia in chicken manure to keep people and animals healthy and save money?
- My Hypothesis is that the 100% Zeolite variable will decrease the ammonia the most compared to the control and maintain a level that is healthy for people and chickens.

# Methods

- Gather all materials
- Wear proper safety equipment
- Mark airtight containers with which variable and control it is and which trial
- Add 1 pound of chicken manure to each container
- Test starting ammonia of all 21 trials
- Add half a cup of variable to its correct container
- Test again at 1 hour, 7 hours, 1,2,3,4,5, and 6 days after starting test

# Pictures



Adding 1 pound of fresh chicken manure to container.



Adding half a cup of Ammosorb to its respective container.



Using my NH3 tester to test one of the trials.

# Data

Day	Control % change over start	Ammosorb vs. Control	Coop Recupera te vs. Control	Coop N Compost vs. Control	Zeolite vs. Control	Lime vs. Control	Ammoni um Sulfate vs. Control
Start							
1 hour	-34%	-3%	32%	25%	17%	-14%	30%
7 hours	-68%	-64%	-1%	-1%	15%	-23%	13%
Day 2	-64%	-76%	7%	2%	18%	-22%	-15%
Day 3	-66%	-14%	15%	15%	20%	-32%	-70%
Day 4	-59%	10%	26%	28%	31%	-28%	-95%
Day 5	-50%	24%	30%	26%	42%	-33%	-116%
Day 6	-21%	-21%	0%	34%	64%	-15%	-117%
Day 7	-13%	7%	17%	65%	73%	-11%	-109%

These percentages were all averaged from each variable. Each column shows the percentage change over the start, and each variables column is compared to the Control.

# Data Analysis

- Zeolites had all eight of its average percentage changes from the start better than the control while none of the other variables did
- The main ingredient in Coop N Compost is also zeolite. However, there<sup>3</sup> was added ingredients that resulted it in not being more effective at reducing ammonia and costing more money than raw zeolite
- An ingredient in Coop Recuperate is Yucca Schidigera and this ingredient with the combination of others resulting in it not being more effective than zeolite
- In all individual tables, the trials for each variable and control had similar results. The room they were in was also temperature controlled

# Discussion

- The test proved to be highly effective in finding the best variable to reduce ammonia in the chicken manure. By having three trials for each variable and control and taking multiple tests across the time of a week, the charts show reliable and accurate data
- When testing, I made sure to test each trial in the same order and at the same time as the previous test. I also made sure to keep the ammonia tester in each container for the same time and keep the lids open for the same minimal amount of time each time I opened them to test
- The airtight containers also worked great by not releasing any ammonia unless I opened them. All of this collectively made sure that all trials had fair measurements of ammonia every time.

# Concluding data

- This data shows that Zeolite would be the solution to reduce ammonia in chicken barns but also to save money, keep the chickens and people exposed to the air healthy, and entice farmers to use a natural fertilizer. This data shows that if adequate amount of zeolite is applied per square foot in a chicken barn, the ammonia levels can get very low to keep the chickens healthy.
- Zeolite can be effectively applied for as little as 1-2 cents per square foot when buying it in bulk.
- The next step would be to inform all farmers about the benefits of using zeolite to reduce ammonia or to go directly to the chicken barns where the manure gets contracted out.

# Conclusion

- In conclusion, my **hypothesis** was correct that Zeolite was the most effective at decreasing the  $\text{NH}_3$  levels. Zeolite got the lowest PPM measurement of 10 PPM on day 5 in trial 3, as shown in Table 5. It was also the only one to have all positive results when compared to the Control. Zeolite came out on top because it is a great mineral that absorbs moisture but also absorbs the ammonia in the air. When it takes in  $\text{NH}_3$ , it binds and collects it into its honeycomb structure, making lots of room for more  $\text{NH}_3$  to be absorbed.
- This can have a huge impact on the poultry industry since it offers a cheap way to reduce ammonia from chicken manure, but it also helps with soil longevity and retention when it gets spread with chicken manure onto fields. This can save farmers over 10,000 a week by keeping the chickens healthy.

# References

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For full list of References please see my Written Report.