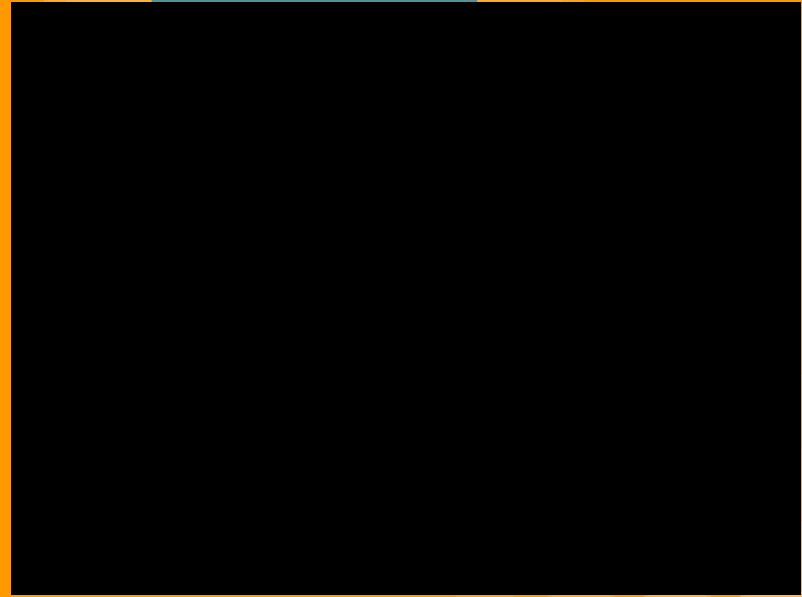


Volcanoes

By Ava and Simone



Testable Question

How does changing the type of vinegar affect how long the lava flows for?






Hypothesis

We think Distilled White Vinegar will make the volcano erupt for the longest, because it's the strongest vinegar, and has the most acetic acid. It has 5% to 20%. Acetic Acid is a type of chemical, it's not a strong acid compared to others. But for this experiment a lot can still probably make it more powerful.



Procedure



Materials: 1 empty plastic bottle with cap, water, flour, 6 hefty plastic party cups, sheets of newspaper ripped up into stirps, baking soda, glue, spray varnish, tablespoon, 354 $\frac{3}{4}$ ml each of Apple Cider Vinegar, White Wine Vinegar, Red White Vinegar, Malt Vinegar, and White Distilled Vinegar, a stopwatch, paint and paintbrush (optional), red food coloring, masking tape, means for data collection, stiff cardboard, a bucket, and a funnel.

Methods:

1. In the empty bottle put 354 $\frac{3}{4}$ ml of the first vinegar that you are using. Use a funnel to minimize spills. Add red food coloring and put the cap over the bottle. Label the bottle “lava.”
2. Place one of the cups in the center of the cardboard and attach it with a bit of glue.
3. Tear the masking tape into strips and use the strips to make a tent around the bottle.
4. Mix flour and water in a bowl to make a thick paste. Dip the newspaper strips into the paste, and cover the “tent” with the strips.
5. Let the volcano dry. Paint it to look like a mountain if using the paint and paintbrushes. Coat it with spray varnish.
6. Get a stopwatch and your means for data collection ready. Put a cup that already has 4 tablespoons of baking soda in it inside the cup that is glued onto the cardboard. Make sure that the volcano is in a bucket so that the lava doesn't get everywhere.
7. Quickly pour the vinegar into the cup and set the timer. Watch until the lava is at the bottom of the bucket and has semi-dissolved. Record any observations.
8. Repeat steps 1 and 6-7 with the remaining vinegars. Make sure to put a different cup inside the one that is glued onto the cardboard each time.

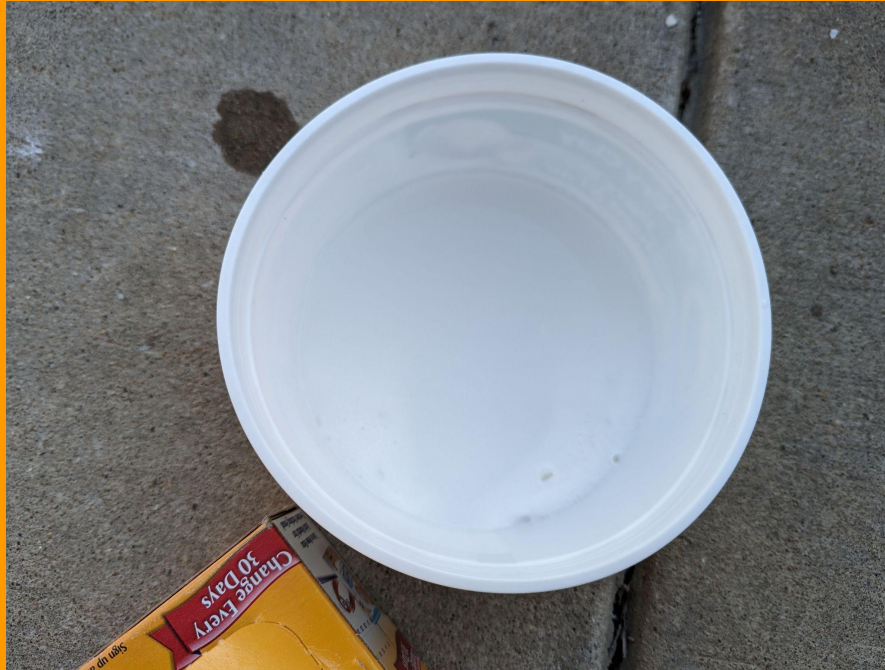


Background

We chose this project because both of us were interested in volcanoes. At first, we wanted to make a volcano and see what would happen if we used different soaps. However, that was for a Lava Flow volcano, When we saw the Shooting volcano we decided to switch, since this one includes vinegar, and we wanted to see what happens if we change the type of vinegar.

In the research we learned that there are so many types of vinegars. We also learned that the ph of a vinegar is a measure of how strong it is. Additionally, we learned that Rice Vinegar is the weakest of all vinegars, while Spirit Vinegar is the strongest.

Test



Experiment 1# Apple Cider Vinegar

We used Apple Cider Vinegar. It took about 55 seconds for the vinegar to finish flowing and semi-dissolve. It smelled bad and it looked pink with the bubbles, but then it started to dissolve.



Experiment 2# Distilled white vinegar

In this one we used Distilled White Vinegar. It took about 32 seconds for the vinegar to reach the bottom of the bucket and semi-dissolve. The foam turned to red liquid after a while. The second the vinegar and baking soda touched, it turned into bubbles.



Note: The video is in Slow Motion



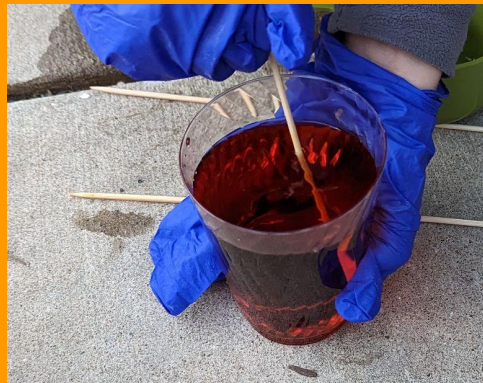
Experiment 3# White Wine Vinegar

In this one we used White Wine Vinegar. It took about 46 seconds for the vinegar to be done flowing and semi-dissolve. The vinegar made a big bubble on the top, like the Red Wine Vinegar and the Malt Vinegar.



Experiment 4# Red Wine Vinegar

In this one we used Red Wine Vinegar. When food coloring was added, it turned deeper red, almost black. It took about 34 seconds for the vinegar to be done flowing and semi-dissolve.









Experiment 5# Malt Vinegar

In this one we used Malt Vinegar. It looked and smelled like the Red Wine Vinegar did. Unlike the other vinegars, it was brown, not pink when it was flowing. It took over two minutes for it to flow and semi dissolve.





Data

Type of vinegar	Apple Cider Vinegar 	White Wine Vinegar 	Red Wine Vinegar 	Malt Vinegar 	Spirit/White Distilled Vinegar 
How long it took for the vinegar to get to the bottom of the bucket and semi-dissolve 	About 55 seconds	About 46 seconds	About 34 seconds	Over 2 minutes	About 32 seconds
	5% to 6% acetic acid	5% to 7% acetic acid	6% to 7% acetic acid	4% to 5% acetic acid	5%-20% acetic acid

Rarely 10% (not ours)



Variables

Independent Variable: What kind of vinegar we use.

Dependent Variable: How long the lava flows for.

Constant Conditions: The amount of vinegar, the amount of baking soda, the size of the volcano, the size of the cup, the type of baking soda, the volcano,



Reflection/Conclusion

We tested different vinegars and baking soda reactions by making a papier mache volcano, to see how long it would each vinegar to dissolve. The White Distilled Vinegar took the shortest amount of time to reach the bottom of the bucket and semi dissolve, whereas the Malt Vinegar took the longest amount of time.

Our hypothesis was not supported by the evidence. We predicted that the White Distilled Vinegar would take the longest to reach the bottom of the bucket and to semi-dissolve. However, it took the shortest amount of time.

We think we did good with safety and data but we could have done more research and maybe then we could have made a more accurate prediction. Also it turns out that all the vinegars have the same acetic acid 5%, so something else in the vinegars made them react differently.

If you need to make something blow up or if you want to trap a lot of gas, you might want to use a vinegar that creates more bubbles or flows faster than others. A possible experiment in the future could be filling balloons with vinegar and baking soda and see which one becomes the biggest.



Bibliography

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- What is malt vinegar? Flower city Flavor company
- In the wash: Is white vinegar same as white wine vinegar?
- Vinegar Acidity 101: The essential breakdown. Flower city Flavor company
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[Blooket link](#) (let's see if you were paying attention)