The Effect of Food Preservatives on the Growth of Microorganisms.

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Abstract

Many households throw out food right away as they see mold growing. On average 150,000 tons of food gets thrown out every day in the U.S alone due to microorganisms growth. But what if there was a way to prevent it so we don't waste so much food. Previous studies have shown what are good food preservatives and what aren't. It's proved that salt is a good food preservative. The reason for that is because it limits the amount of water in food (NICB). The objective of this study is to determine whether or not salt actually works as a food preservation method. My hypothesis is that if 2.5 grams of salt is added into 50 mL of broth, then it will grow the least amount of microorganisms compared to the 0g, 1.25g, 5.0g, 10.0g of salt added. This was researched by having 5 different mason jars each with 50 mL of broth. Within each jar was different amounts of salt: 0g,1.25g, 2.5g, 5.0g, and 10.0g. Then 10 mL of each broth trial was placed into individual petri dishes that were swiped with K-12 E Coli. Each petri dish was placed in an incubator. My data showed that overall the salt did not do well preventing microorganism. The 10.0 grams of salt added provide the most consistent data while the 1.25 provided the best results. On the other hand the constant showed some of the worst results.

Introduction

Microorganisms are bacteria, fungi, and viruses. Microorganisms can grow on our food and ruin it. Which can make people sick if consumed. Microorganisms grow on a number of foods. For example, bread, cheese, fruits, vegetables and chicken. Microorganisms thrive on foods that are high in moisture (Laurence, 2022) . Are microorganisms harmful to the human body? Microorganisms can make you sick, but they are sometimes good. We have microorganisms in our body and on our skin. These microorganisms can help our body digest and can prevent infections (NIH,2017).

There are many different times of microbes and with the different types of microbes comes different temperatures they thrive at. The ideal temperature for microbes is 25- 40 degrees celsius or 77-104 degrees fahrenheit. There are microbes that are really like the heat. Therefore the ideal temperature for them is 45-100 degrees celsius or 113-212 degrees fahrenheit. The temperature at which a microorganism growth will slow down or stop is at and or below 18 degrees celsius or 64 degrees fahrenheit (Di Bello, 2015).

On average 150,000 tons of food gets thrown out every day in the U.S alone due to microorganisms growth. (Logmore, 2019) Microorganisms need nutrients and food just like us

humans. Microorganisms also need oxygen. Microorganisms prefer more acidic foods. Such as lemons, vinegars, fruits, vegetables and meat. (Hart, 2018)

Types of food preservatives

Preservatives can either be an antimicrobial or an antioxidant. Antimicrobial prevents mold, yeast and bacteria from food. Antioxidants prevent food from turning brown, becoming rancid and prevent black spots from growing on food (Foulke).

There are many different types of food preservatives. Such as benzoates, sorbates, propionates, nitrites, sulfites and more. More household friendly items are sugar, salt, cinnamon, black pepper, cummin, vinegar, lemon juice, extra virgin olive oil, salt water, et cetera.

Hypothesis

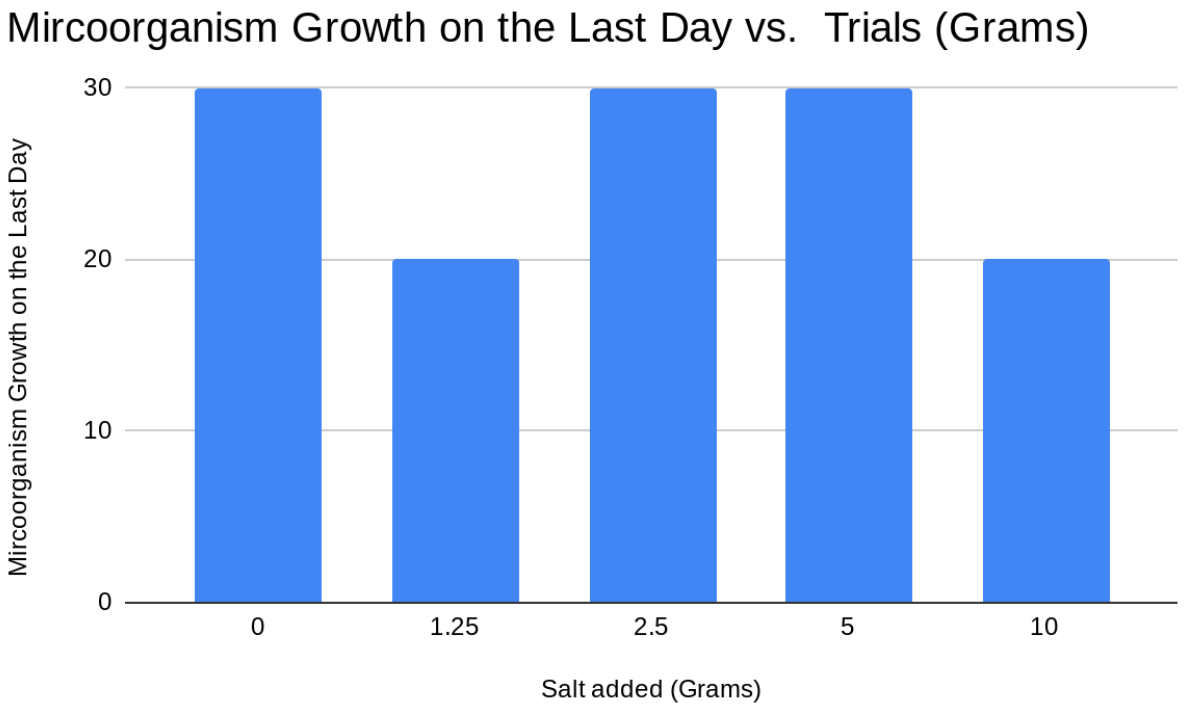
If 2.5 grams of salt is added into 50 mL of broth, then it will grow the least amount of microorganisms compared to the 0g, 1.25g, 5.0g, 10.0g.

Methods

I used a glass of 500mL of hot water to dissolve two chicken bouillon cubes into the hot water. The chicken broth was distributed into 10 jars. Each jars contained the same amount of chicken broth which was 50mL. Each jars had different amounts of salt to go with the broth. 0g, 1.25g, 2.5g, 5.0g, 10g. I placed 10 mL of each solution in individual petri dishes. Then each petri dish was smeared with the K-12 E-Coli. I took pictures of the progress on the 1st, 5th, 10th, 15th days.

Results

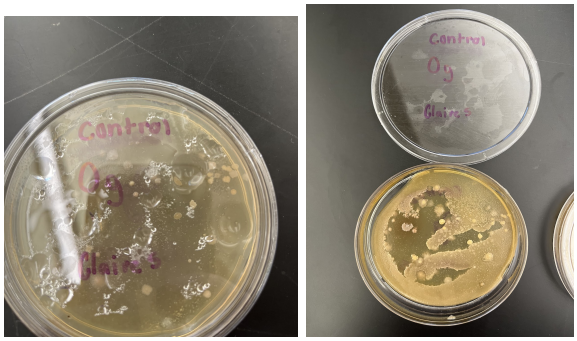
Days	Control (0g)	1.25g	2.5g	5.0g	10.0g
1	None	None	None	None	None
5	Very Slight Amount of Microorganisms	None	Very Slight Amount of Microorganisms	Very Slight Amount of Microorganisms	Slight Amount of Microorganisms
10	Lots of Microorganisms	Slight Amount of Microorganisms	Lots of Microorganisms	Lots of Microorganisms	Slight Amount of Microorganisms
15	Lots of Microorganisms	Slight Amount of Microorganisms	Lots of Microorganisms	Lots of Microorganisms	Slight Amount of Microorganisms



This graph represents the amount/growth of the microorganism on day 15. 30- Lots of Microorganisms, 20- Slight Amount of Microorganisms, 10- Very Slight Amount of Microorganisms, 0- No Microorganisms.

10g:

0g:



These pictures show the before and after. The first two pictures show the first day there was growth and the second pictures show the last day of growth. The 10g of salt added had the least amount of microorganism growth. On the other hand the control had some of the most amount of growth of microorganisms.

Discussion

From day 1-5 there was a surprising amount of microorganism growth. Day 5-10, the microorganisms just kept growing. Since then, days 10-15 not much more visible growth, but a definite color difference. Although the salt failed and did not work the best, the 1.25 grams of salt proceeded to show the best results. Days 1-5 zero microorganisms were visible. From then on to day 15 only a slight amount of microorganisms were visible. The 10 grams of salt provided the most consistent data. With only showing a slight amount of microorganisms grow throughout the 15 days. Overall, my results and data proved my hypothesis was not supported by my data.

Limitations

Some limitations I faced were that I did this experiment in school due to not having some of the equipment I needed. Therefore the days available for taking data were limited. In order to take my pictures I needed to take off the lids of the agar plates because of the condensation affecting the lid. That could have altered the results.

Future Studies

Future studies may include testing out different types of food preservatives. If I tried the same experiment but used sugar or vinegar instead of salt. I could also use a different food base, as for this experiment I used chicken bouillon cubes. Finally, I could use different measurements to see what follows suit for the best preservative amount or food base amount.

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