

# Mold Growth on Organic versus Non-Organic Wheat Bread

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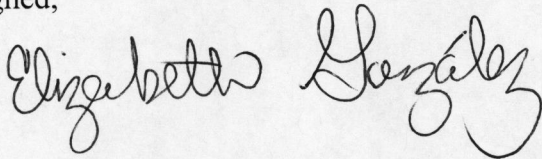
## Abstract

In recent decades people have begun to buy more organically grown or raised food because it is healthier and better for the environment. The purpose of our study was to examine the growth of mold on organic bread versus non-organic bread. We set out 40 samples of bread that included different brands of organic and non-organic bread in the UVB field at the University of Michigan's Biological Station. Using a qualitative scale we ranked the percent coverage of mold on each piece of bread. We hypothesized that mold would grow quicker on the organic bread than the non-organic bread, but found the opposite. Our results showed that mold grows quicker on non-organic bread. This could potentially be explained by the difference in ingredients in each brand, such as sugar content. If organic bread lasts longer than non-organic and is better for the environment, future research can potentially sway more people and large corporations to produce bread organically or only buy organically made bread.

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Signed,

A handwritten signature in cursive script, reading "Elizabeth Gonzalez". The signature is written in black ink on a white background.



Summer 2015

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EEB 381 – Dr. Shannon Pelini

**Elizabeth González**

OTHER GROUP MEMBERS: CHELSEA HOLBROOK  
AND COLIN O'NEAL



**Abstract**

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## **Introduction**

In recent decades there has been an increase in the number of people who choose to buy organic food rather than the more commonly found non-organic food. This can be seen across every food group and in various parts of the world, including the United Kingdom and the Netherlands (Makatouni 2002; Schifferstein 1998). Citizens tend to lean towards buying organic products because of health and environmental concerns (Magnusson 2002). Organically grown or raised food does not use antibiotics or growth hormones on animals, conventional pesticides, or fertilizers made with synthetic ingredients (Gold 2007).

Utilizing fertilizers on terrestrial crops can have a detrimental effect on aquatic ecosystems that can ultimately affect human economies. When pesticides are overused in the Midwestern United States they can run off through the river systems and end up in the Gulf of Mexico causing eutrophication and dead zones (Smith 1999). Eutrophication provides algae with nutrients that were once limiting causing massive algal blooms to occur. When the phytoplankton at the surface of the water dies, it sinks to the bottom where bacteria decompose it and use up a lot of oxygen in the process causing the water to turn hypoxic, not allowing many other organisms to survive. One of the main organisms affected are fish, which are a common source of income in the areas surrounding the Gulf of Mexico so when the fish begin to die many of the people depending on the industry do not have any other source of income. (Bruckner 2012).

Health concerns are another main reason people buy organic products. Many of the pesticides used in agriculture have been linked to increases in human and animal antibiotic resistance (Shafiani 2003; Witte 1998; Gilbert 2003). Animals are usually injected with antibiotics and growth hormones to force them to grow quicker or yield more product in order to

satisfy the high demand of food. Studies have also shown that farmers working with these food products show a higher percentage of antibiotic resistant bacteria in their systems (Bogaard 2001).

Bread is a food item that can be found in the homes of many people. The purpose of our experiment was to study the growth of mold on different kinds of bread since little research has been done on the subject. We hypothesized that the organic brands on average will take a shorter period of time to grow mold than the non-organic brands because they contain smaller amounts of preservatives and are made using products that have been grown in a more natural setting.

## **Methods**

We selected 6 non-organic brands of wheat bread and two organic brands. The non-organic brands were Aunt Millie's (Fort Wayne, IN), Lumber Jack, Sara Lee (Horsham, PA), Spartan (Grand Rapids, MI), Farmhouse, and Oleson's (Petoskey, MI). The organic brands were Rudi's (Boulder, CO) and Stone House Brand (Traverse City, MI). We cut the bread into 5x5 centimeter pieces and then dried them for 24 hours at 60 degrees Celsius. We then added 5ml of water to every piece of bread to ensure that they started with the same amount of water to account for the water that would have been lost.

We put out 5 replicates of each bread type in the UVB field at the University of Michigan's Biological station in Pellston, MI under crates wrapped in plastic clear trash bags to exclude macrofauna and rain, but allow sunlight to reach the bread. We observed the bread every day and used a qualitative scale to rate the mold coverage. The scale was 1 to 5; 1: no mold, 2: under 25% mold, 3: over 25% and under 50%, 4: over 50% and under 75%, and 5: over 75%. We also weighed the bread before and after setting it out on the field.

We ran two separate Student's t-test comparing the means of the mold rank of the organic bread and non-organic bread as well as the mass lost by each bread type. To standardize the mass lost we added 1g to every sample to avoid having negative numbers in our data set. We also ran an ANOVA comparing the different brands of bread to each other.

## **Results**

We found that there is a statistically significant difference in mold growth between organic bread and non-organic bread, the p value was 0.27 (figure 1). Less mold grew on the organic bread than the non-organic bread. We found no statistically significant differences between the brands (figure 3) or the mass lost by each bread type (figure 2).

## **Discussion**

Our hypothesis was disproven, less mold grew on the organic bread than the non-organic bread. This can be due to different ingredients in each type of bread, variation across the different brands, or differences in the expiration dates and dates the breads were made. Further studies need to be performed in order to verify that organic bread lasts longer since we were only able to get ahold of two different brands of organic bread.

A study has shown that growing food organically can yield the same amount of product as growing it non-organically (Badgley 2007). If organic bread last longer than non-organic bread and yields the same amount of food it can potentially be useful knowledge in the future when it will be necessary to move towards more environmentally friendly processes. Eventually humans will reach a point where it is no longer an option to be careless with our environment.

## Figures

Figure 1

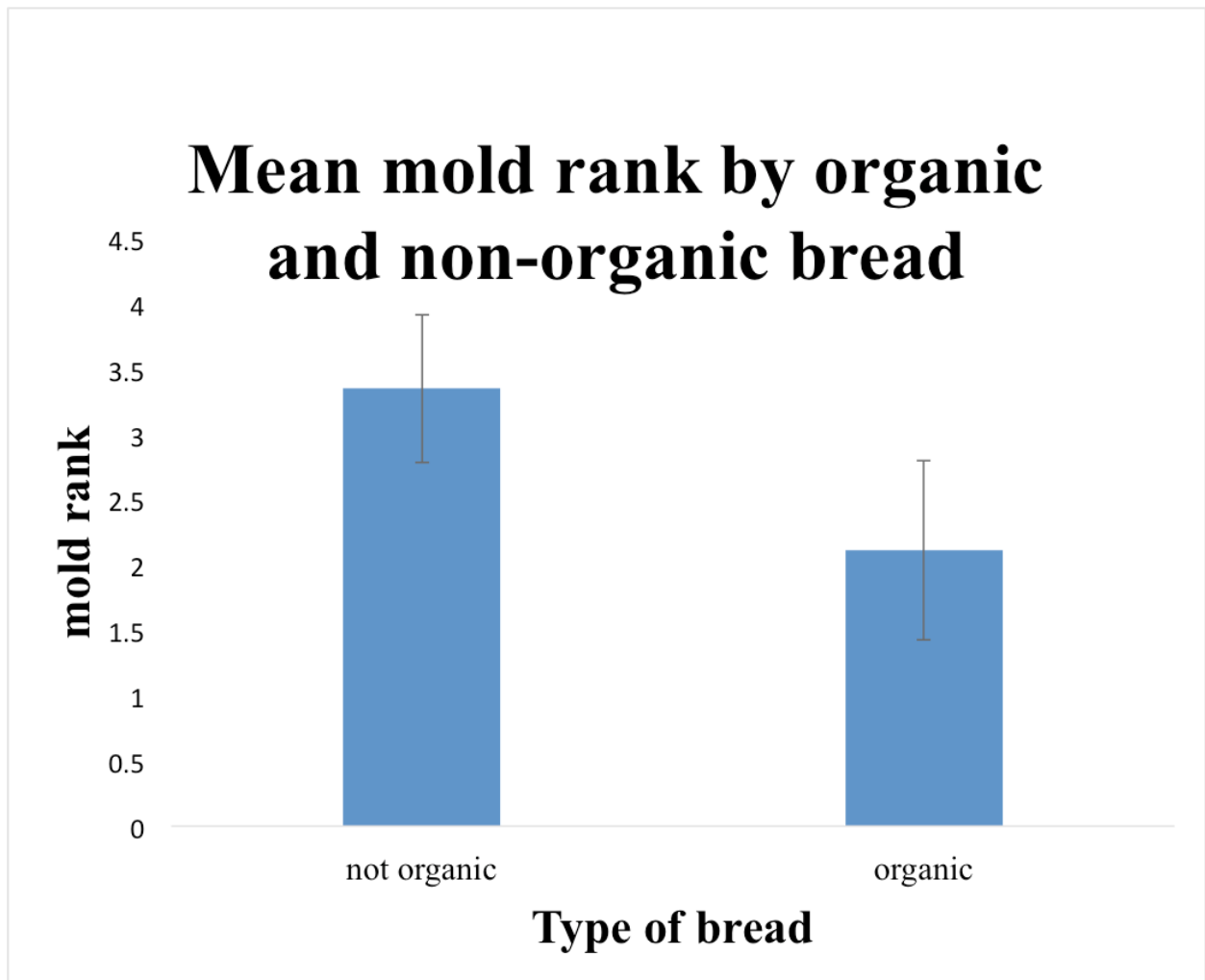




Figure 2

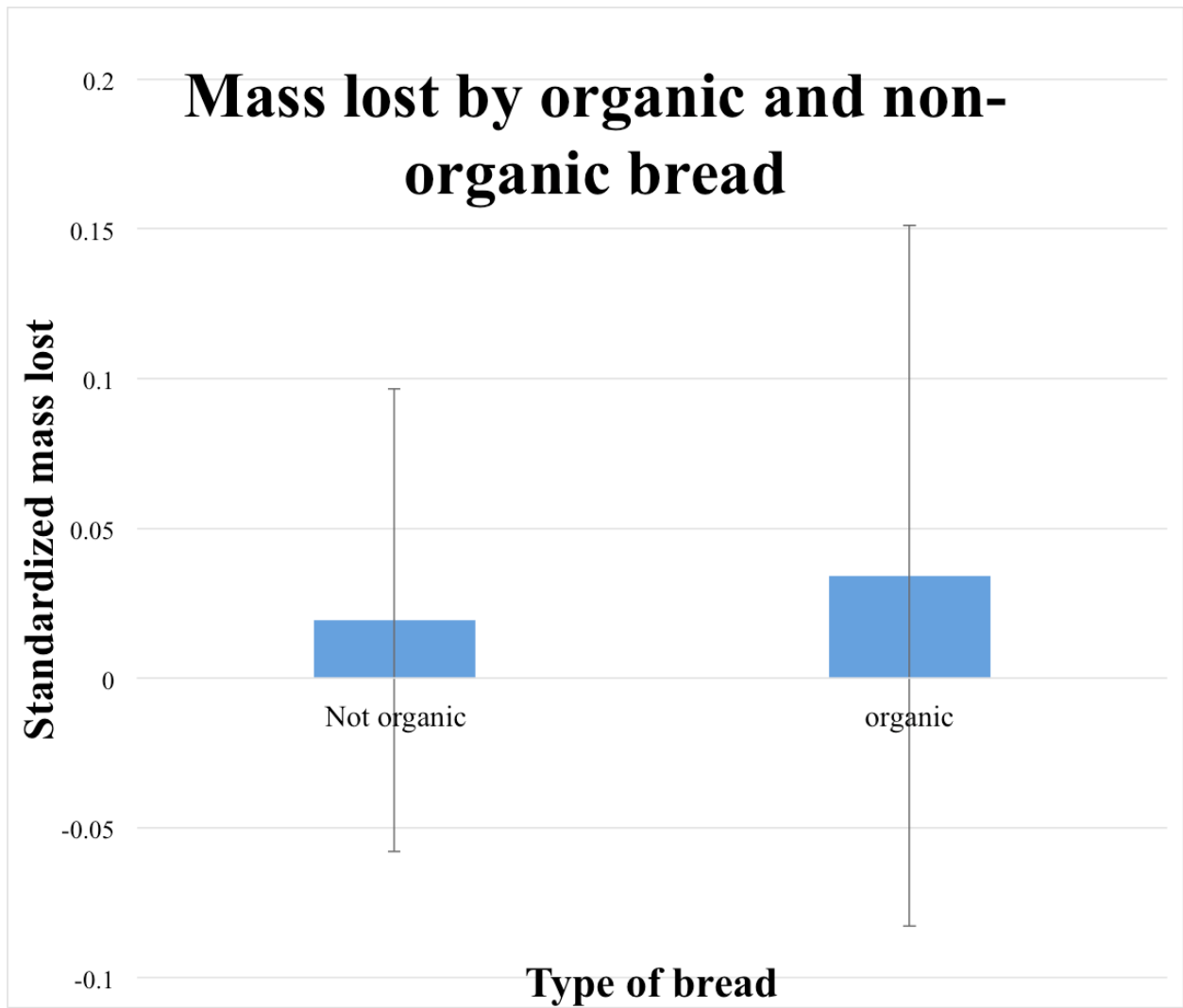
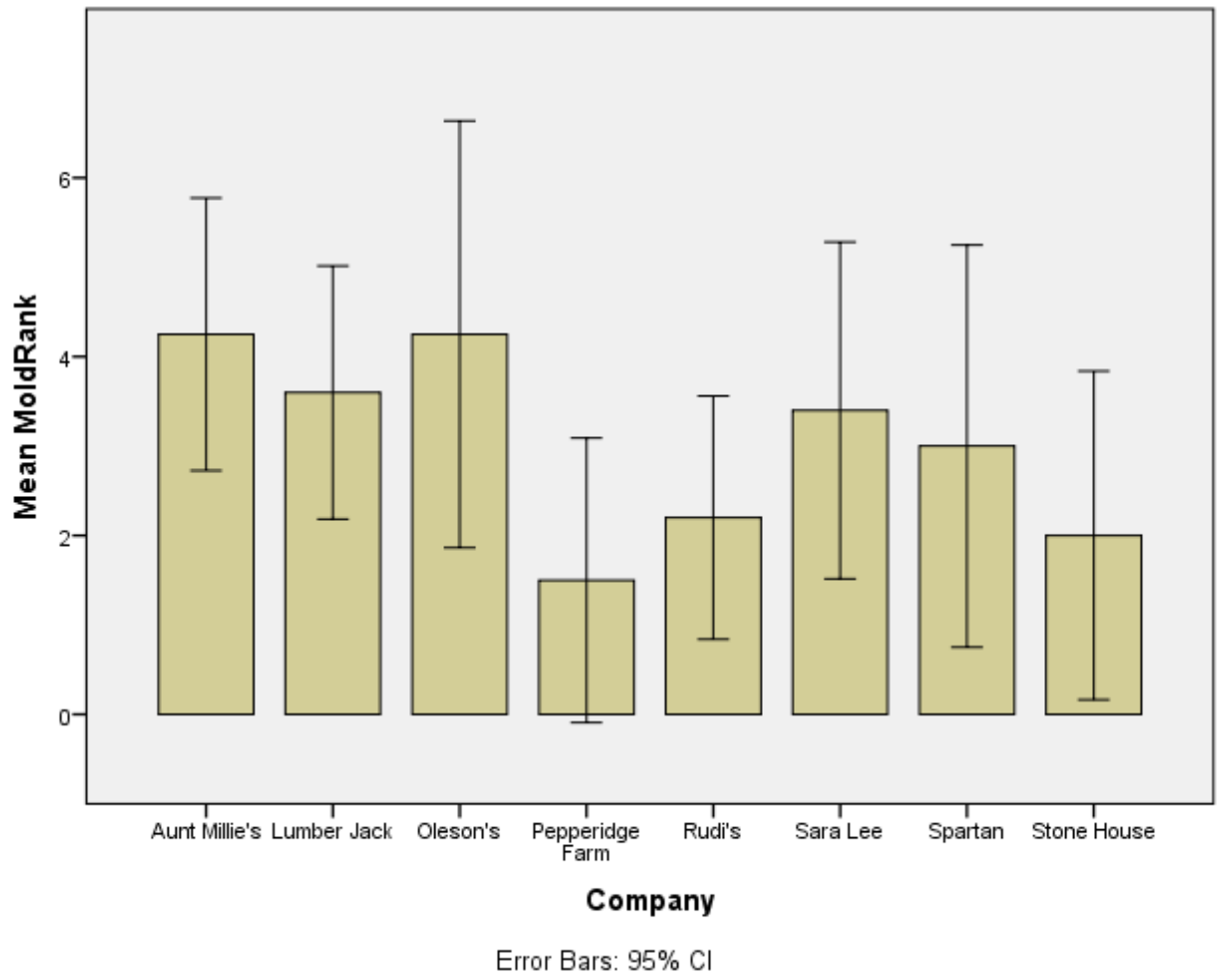


Figure 3

### Mean mold based on the bread's company



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