Difference in mold growth between organic and non-organic breads

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EEB 381 – General Ecology
8/17/2015
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Abstract

Organic products have been increasing in popularity recently due to health and environmental benefits. To determine differences between organic and non-organic products, we measured mold growth on organic and non-organic breads for one week. Our results indicated that non-organic breads grew significantly more mold than organic breads. This means that non-organic bread is a better environment for mold to grow. Additionally, it means that non-organic bread has a longer shelf life than organic bread. Currently, food shortages and sustainable farming are two prevalent global issues. Since organic products are better for the environment and have a longer shelf life, it may be beneficial to use organic farming as a solution to environmental and food availability issues.

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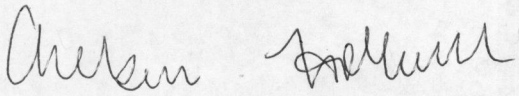

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ABSTRACT

Organic products have been increasing in popularity recently due to health and environmental benefits. To determine differences between organic and non-organic products, we measured mold growth on organic and non-organic breads for one week. Our results indicated that non-organic breads grew significantly more mold than organic breads. This means that non-organic bread is a better environment for mold to grow. Additionally, it means that non-organic bread has a longer shelf life than organic bread. Currently, food shortages and sustainable farming are two prevalent global issues. Since organic products are better for the environment and have a longer shelf life, it may be beneficial to use organic farming as a solution to environmental and food availability issues.

INTRODUCTION

Difference in mold growth between organic and non-organic breads

In recent years, there has been an increase in production of organic products. Organic crops are produced without GMOs (genetically modified organism) or the use of synthetic chemical pesticides and fertilizers (Pimentel et al. 2005). The synthetic chemicals used to produce non-organic crops are harmful to public health and the environment (Pimentel et al. 2005). Some GMO crops used in conventional farming decompose more slowly than non-GMO crops (Powell et al. 2009). Since GMO crops decompose differently than non-GMO crops this may negatively influence nutrient cycling. Some important nutrient cycles that depend upon decomposition are the carbon and nitrogen cycles (Cain et al. 2011). These cycles are important parts of our environment. Additionally, organic agriculture is beneficial to the environment because it reduces water usage, soil erosion, and chemical inputs (Pimentel et al 2005).

Consequently, it may be advantageous to support organic farming practices, not only because they do not use potentially harmful GMOs but also because they are more sustainable and reject the use of dangerous synthetic chemicals.

Many people buy organic foods because they perceive them to be healthier (Magnusson et al. 2015). However, there is no explicit evidence that organic foods actually are healthier (Magnusson et al. 2015). Some studies have shown that conventionally produced crops have higher nitrogen and phosphorous content than organically produced crops (Dangour et al.2009). However, this is likely due to differences in farming techniques (Dangour et al. 2009).

To test for differences in organic and non-organic foods, we compared mold growth on organic and non-organic breads. We placed bread samples outside and let them decompose for one week. At the end of the week we measured the amount of mold that was growing on each sample. To determine how much of the bread was consumed by the mold, we measured how much mass each sample lost at the end of the week. These measurements allow us to answer the question: Does mold growth on organic and non-organic bread differ? We hypothesized that the organic bread would grow more mold than the non-organic bread. We also hypothesized that the organic bread would lose more mass than non-organic bread.

METHODS

To determine if mold growth differs between organic and non-organic foods, we chose to analyze mold growth on 2 brands of organic bread and 6 brands of non-organic bread. The organic breads we chose to study were Stone House Bread Cracked Wheat (Traverse City, MI) and Rudi's Organic Bakery Wheat Bread (Boulder, CO). The non-organic breads we studied were Oleson's Wheat bread (Traverse City, MI), Pepperidge Farm Farmhouse 100 %Whole Wheat (Norwalk, CT), Spartan country style wheat (Grand Rapids, MI), Sarah Lee 100% Whole

Wheat (Horsham, PA), Aunt Millie's Homestyle 100% Whole Wheat Bread (Coldwater, MI) and Lumber Jack Giant Wheat Bread (Horsham, PA). We cut the bread slices into 5cm by 5cm pieces. We dried them for 24 hours in a drying oven at 60 degrees Celsius and then added 5 mL of water to each piece to control for variation of water content between brands.

We let the bread decompose outside, in the UVB field at the U of M Biological Station for one week. We placed each sample in a petri dish. We randomly placed the petri dishes under crates, wrapped in clear trash bags. This prevented the rain and macrofauna from disturbing the samples. We had 5 replicates for each brand of bread, and a total of 40 pieces of bread.

To analyze mold growth, we used a qualitative scale from 1 to 5. Level 1 indicated no mold growth, level 2 indicated less than 25% of the bread was covered in mold, level 3 indicated 25% to 50% of the bread was covered in mold, level 4 indicated 75 to 100% of the bread was covered in mold, and level 5 indicated that all of the bread was covered in mold. We also weighed each sample before and after the experiment to determine mass lost.

We used a student's t-test to determine if there was a significant difference in the amount of mold growth between organic and non-organic bread. To determine the standardized mass lost we subtracted the final weight from the initial weight and then added one. We used a student's t-test to determine if there was a significant difference in the standardized mass lost between organic and non-organic bread.

RESULTS

We found that the non-organic bread grew significantly more mold than organic bread (figure 1). The p-value was .027, indicating there was a significant difference in mold rank between organic and non-organic bread. The F statistic was 3.886.

Additionally, we found that there was no significant difference in standardized mass lost between organic and non-organic bread (figure 2). The p-value was greater than .05, indicating that our results were not significant.

DISCUSSION

We hypothesized that organic bread would grow more mold than the non-organic bread. We made this hypothesis because organic breads are typically preservative free whereas non-organic breads usually have preservatives. Another basis for this hypothesis was that GMOs present in non-organic products decompose more slowly than organic products (Powell et al. 2009). We rejected this hypothesis based on our results in Figure 1. In fact, the non-organic bread grew significantly more mold than the organic bread. This means that the non-organic bread was a better environment for mold to grow on than the organic bread. It also indicates that organic bread has a longer shelf life than non-organic breads.

We hypothesized that the organic bread would lose more mass than the non-organic bread. We made this hypothesis because we predicted that the organic bread would grow more mold, and therefore lose more mass to the mold. Based on our data from figure 2, we rejected this hypothesis. There may not have been a significant difference in mass lost between the two bread types because the weight of the mold added to the overall weight of the bread.

There are many variables we could further study to help explain our surprising results. One variable that would be interesting to analyze would be the ingredients in the brands of bread. For example, mold may grow better on breads with higher sugar contents. Additionally, it would be ideal to test more than 2 brands of organic bread. This small sample size is a major discrepancy in this study. In addition to this small sample size, 5 of our samples were disturbed

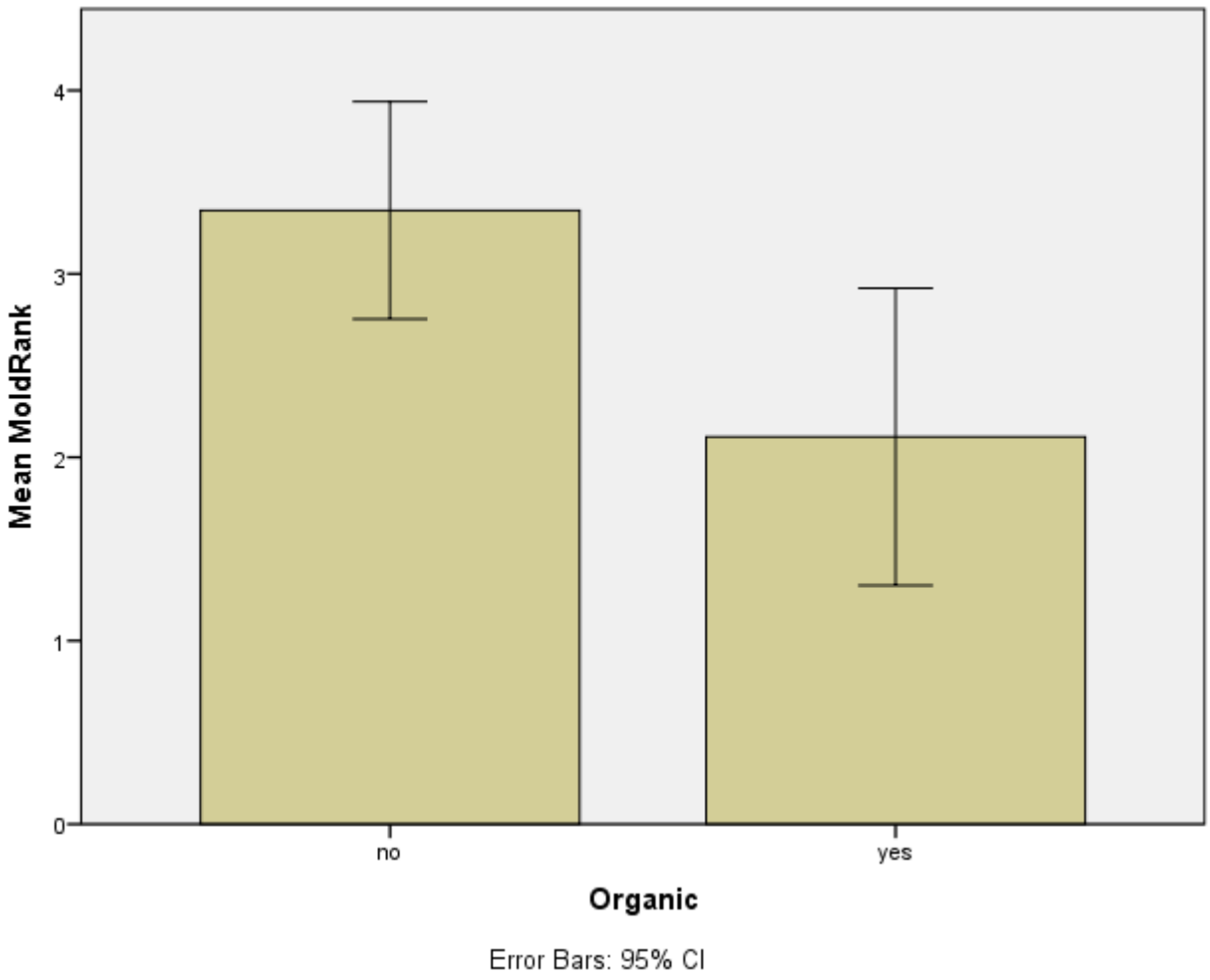
by macrofauna, further contributing to variation in our data. Another possible source of error was that some of the breads were bought on different days and they all had different expiration dates.

Organic farming is beneficial for both the environment and public health (Pimentel et al. 2005). One reason people say non-organic farming is better than organic is because it can increase crop yields. However, studies have shown that organic agriculture is just as productive as non-organic agriculture (Bagdley et al. 2006). In addition to these many benefits of organic farming, our study has proven that organic products also have a longer shelf life. This longer shelf life of organic products is important because then foods can be shipped for longer amounts of time or be stored for longer. Additionally, this longer shelf life of organic foods is important because it would also help reduce food waste. Organic farming may be the answer to global food shortages and agricultural sustainability issues.

APPENDIX

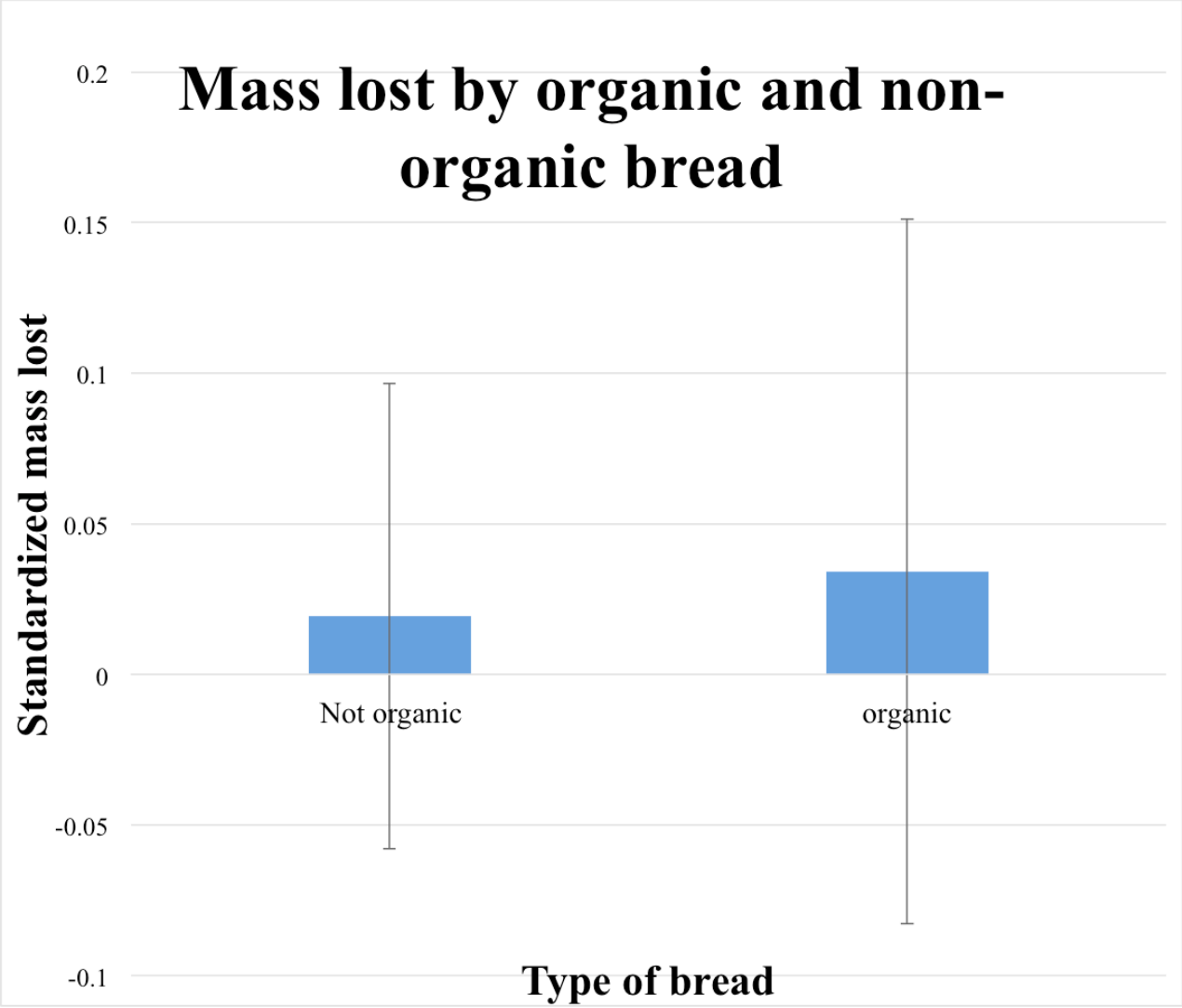
Figure 1

Mean Mold rank of organic and non-organic bread



Caption: Mean mold rank of organic and non-organic breads after 1 week of decomposition.

Figure 2



Caption: Standardized mass lost (Initial weight-Final weight+1) by organic and non-organic breads.

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