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GROWTH LOCATION ALTITUDE PREFERENCE OF THE TURKEY TAIL FUNGUS *TRAMETES VERSICOLOR*

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ABSTRACT

The ecological niche is a well-documented phenomenon that describes the distribution of species based on the preferences and necessities for their survival. Species will be found most often where all of their requirements for survival are met. This study looked to explore the idea that fungi, specifically *Trametes Versicolor,* show a preference toward the height at which they grow. There were 97 samples that were measured in the experiment to see if the fungi would show a statistically significant preference for their growth height. The results of the study were statistically significant. They suggested that the fungi preferred to grow lower to the ground, and near the tops of the pieces of wood, they were attached to. Further research with more samples can be done to further investigate this relationship and help determine what other factors determine where the fungi grow and why. This is important because knowing more about certain species can help determine how different ecosystems will function when the species is involved.

*Key words: Chi-square test, fungi, Turkey Tail (*Trametes Versicolor*).*

INTRODUCTION

The ecological niche is a well-documented phenomenon that describes the distribution of species based on the preferences and necessities for their survival. Species are able to survive and reproduce where their basic needs are met, and they can reproduce more efficiently if the species is in an optimal habitat for their growth. Among these preferences living organisms exhibit are factors such as diet, temperature, and location preferences. Location preference in organisms can appear in multiple ways and can tell us what types of resources the organism values the most. Location preference can be shown in terms of altitude at which the organism is residing (Midolo and Wellstein, 2020). This can be measured much more accurately at small scales when dealing with non-motile organisms such as plants and fungi. This study investigates these altitude preferences in fungi and whether they prefer to grow near the tops of the wood they inhabit, near the base, or show no preference whatsoever. The species of fungus being measured for this study is the turkey tail fungus (*Trametes Versicolor)*. This species of fungus is being focused on primarily because of its abundance. There is plenty of it available to measure allowing for results to be more reliable with a larger "n" value.

Trametes Versicolor is a fungus in the Polyporaceae family. Polypores, as the fungi in this family are commonly called, are a type of fungi that reproduces by creating a large fruiting body that releases spores from the underside. These pores are dispersed via abiotic factors like the wind and rain. The spores will begin to try and grow once they've landed. The hypothesis being tested is that the fungi will prefer to grow at lower heights because the wind and the water that disperses the spores will be at the mercy of gravity and deposit the spores closer to the ground more often than higher up. Determining if there is a preference in the fungi's growth location is important information because it provides insight to the mechanism of dispersal of the spores as well as showing what conditions are necessary for the fungus to reproduce.

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FIELD SITE

The site where the data was collected was in a small wooded area in Brunswick Maine. The data were collected in early spring at a temperature around 55°F. The area contained an equal mix of coniferous evergreens and deciduous trees. The data was mostly collected from a pile of chopped firewood and stumps around the area. The pile of wood was around 4 feet tall and the stumps were under 2 feet tall. The ground of the field site was covered with decaying leaf litter and downed sticks and branches. The area received a fair amount of sunlight throughout the day. The only animals that were regularly observed at the site were grey and red squirrels as well as various birds. The area typically receives around 5.5 feet of snow annually, and around 4 feet of rainfall. Although the soils were not tested at the field site it should be noted that most soils in Maine are acidic due to the pine needles among other factors.

METHODS AND MATERIALS

The data was able to be collected with relatively cheap and abundant materials. A 25-foot tape measure was used to measure the height of the fungus and to measure the height of the wood it was growing on. A notebook and pencil were used to record the data as it was collected. When collecting the data, the tape measure was used to first measure the height of the log housing the fungi. This was done by placing the tip of the tape measure on the ground and holding it perpendicular to the ground to ensure an accurate reading. The greatest height of the log was recorded as the maximum possible height for all of the fungi on the log. If there was any leaf litter on the ground it would be swept away so that the tape measure could be placed on the ground of either dirt or rocks. Once the maximum growth height was recorded the fungi needed to be measured. This was done the same way as the measurement of the log height. The height of the fungi was recorded at the base of the anchor point of the fungi. This meant the lowest point directly attached to the wood was used as the point of measurement. Around 60 individual fungi were measured and recorded. The fungi were determined to be individuals based on how many separate anchor points there were. If a fungus had 2 ledges, but only 1 connection to the wood it was considered 1 fungus and was recorded as such. This wasn't common, but still an important distinction. After all of the fungi in the area were measured and recorded the data needed to be analyzed. The first step for data analysis was to input the data into excel so that it could quickly be manipulated to make the process easier. The first process was to calculate the percent height of each of the fungi. This was done by dividing the height of the fungi by the maximum height it could've grown at and multiplying it by. The maximum height the fungi could've grown at was the height of the tallest log pile. These percentages were then divided into five categories (0-20%, 20.1%-40%, 40.1%-60%, 60.1%-80%, 80.1%-100%).

RESULTS

After measuring the fungi there were 97 usable data points. There was no need to exclude data points because if a fungus was not the right species or unfit for the experiment for some other reason it wasn't measured at the field site. These points were analyzed in two different ways using two chi-square tests of independence. Below are the two graphs measuring the preference for the growth height of the fungi.

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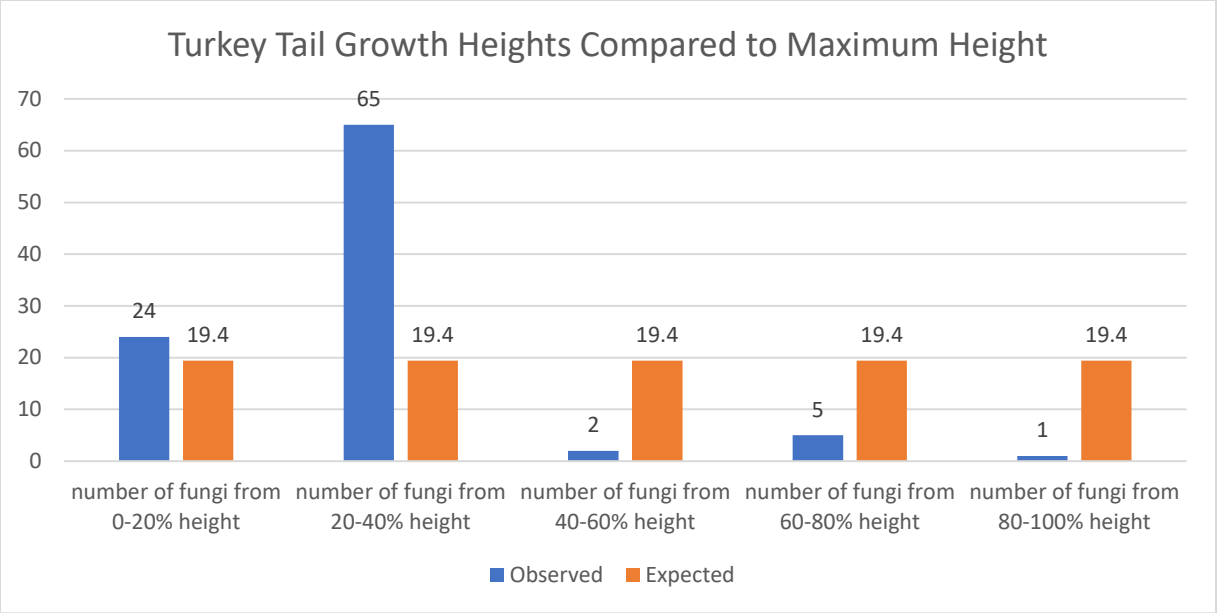

Figure 1. This graph shows the expected results of fungi that show no preference for growth height in orange compared to the observed results of the fungi in blue. The percentage categories are generated by comparing the height of the fungus to the height of the tallest possible growth point in the field site.

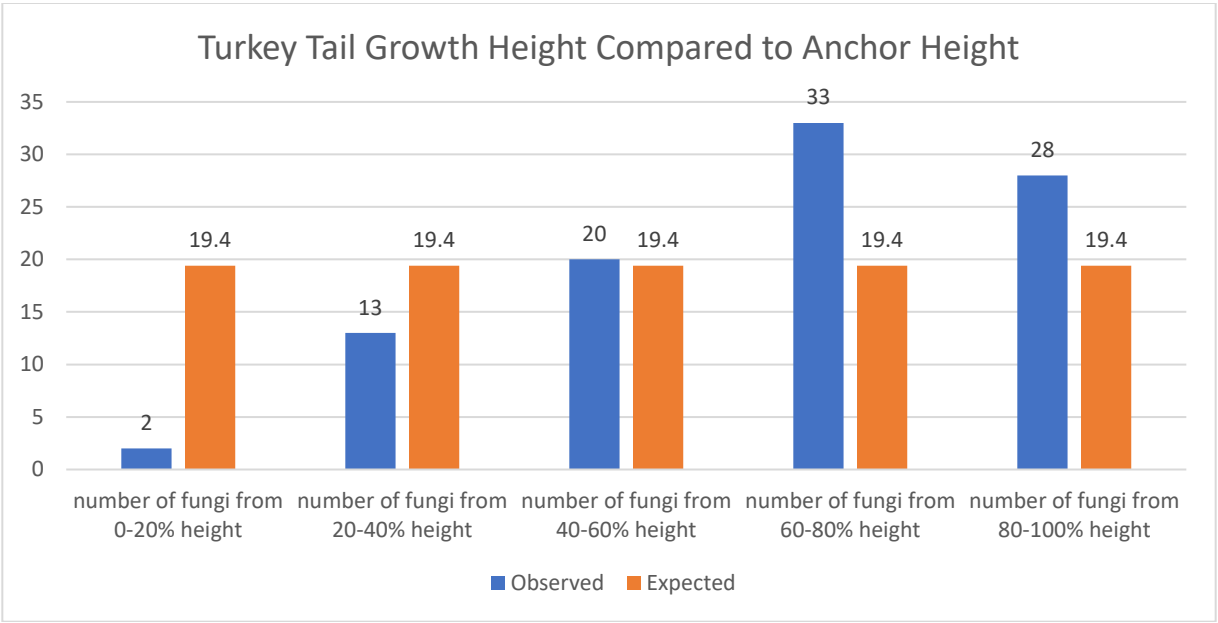

Figure 2. This graph shows the expected results of fungi that show no preference for growth height in orange compared to the observed results of the fungi in blue. The difference between the two graphs is that the first graph generates the height percentages by comparing the fungus height to the highest point in the field site. This graph generates the percentage points by comparing the fungus heights to the height of the wood they are attached to.

The graphs above both produced significant results. The graph from Figure 1 had a p-value of 7.51088E-32 and the graph from Figure 2 had a p-value of 2.94506E-06. Both of these values are drastically lower than the required $p<0.05$ and are significant as a result.

DISCUSSION

The results yielded statistically significant values in both chi-squared tests. From these results, we can see that there are some preferences shown in the fungi's growth height. The first test in figure 1.

That compares the fungi's height to the tallest height available suggests that the fungi prefer to grow at lower heights. The majority of the fungi grew in the category of 20-40% of the maximum height. This category included 65 of the 97 samples. This was over triple the expected value. The only other category with more samples than the expected value was the 0-20% of the maximum height category. The results of the second chi-squared test from figure 2 that compared the fungus height to the anchor height also showed a preference in the growth height of the fungi. This test was not as drastic, but it was still statistically significant. This second test showed that the fungus preferred to grow higher on the individual piece of wood they were attached to. The 60-80% category had the most samples and the 80-100% category had the next most samples. These are the only two categories that have significantly more samples than the expected results. When these two individual results are put together then they illustrate that the turkey tail fungus shows the greatest preference growing near the top of small logs, stumps, or dead trees. This is from the first test suggesting that the fungi don't grow at higher altitudes combined with the second test suggesting the fungi grew near the top of the wood it was attached to.

Although the experiment produced statistically significant results there is still a high probability that there is some error involved. This error can be attributed almost entirely to human error. The only tool that was used to measure data was a tape measure and the data that was analyzed was in the form of percentages. This means as long as the tape measure was the same one for all of the samples, which it was, it wouldn't provide error. The human error that could have occurred would have first been present with the selection of the samples. Some samples could have been included even if they weren't the correct species through misidentification. The error could have also occurred when measuring heights if the numbers were misread or the tape measure wasn't lined up properly.

Future research that could further explore the idea of location preference in fungal growth could include a wide range of alternate studies. Similar studies could be conducted in different areas to see how the biome affects the location of the fungi. Other factors that could be tested are preferences for moisture levels or light levels. Studies examining these factors could give better insight as to the best growing conditions for the fungi. There isn't any current research on location preference of the turkey tail fungi specifically, which is why studies like these could shed light on not only the turkey tail's preferred growth area but what factors are most important for fungi to thrive.

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