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BLOODROOT (*SANGUINARIA CANADENSIS)* ABUNDANCE AT VARYING ELEVATIONS THROUGHOUT PENNSYLVANIA

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ABSTRACT

Bloodroot (*Sanguinaria canadensis)*, a member of the Papaveraceae family, spreads quickly as ground cover due to their easily dispersed seeds. Bloodroot can be found in the Eastern half of North America, in both high and low elevations of upland woods and floodplain woods. Knowing that Bloodroot can be found in a range of elevation, we wanted to see which elevation Bloodroot was more prevalent in. We hypothesized that Bloodroot will have the same preference of elevation, whether that be high or low, throughout the tested sites in Pennsylvania. To test this, we examined 9 randomly selected plots for Bloodroot. We looked at 3 plots of high elevations and 3 plots of low elevations. Due to a low number of Bloodroot citings, we can neither reject nor accept our hypothesis. For a more conclusive measure additional plots and locations should be sampled.

Keywords: Sanguinaria canadensis, Bloodroot, elevation, distribution

INTRODUCTION

Bloodroot (*Sanguinaria canadensis),* is an herbal medicinal plant, found in hardwood forests in North America (USDA). As a member of the Papaveraceae family, this flower only lasts for a short period of time, growing between March and April. When blooming, the flower rises from its curled leaf, open in full, then closes entirely at night. Each flower and leaf grows from a separate stem, where the leaf fully engulfs the bud before it blooms. Bloodroot grows to have 8-10 white petals, with a yellow pistil, see figure 1. The plant has a unique leaf pattern, they grow large, rounded leaves with 5-9 lobes, see figure 2.

Figure 1: Bloodroot in bloom

Figure 2: Leaf of Bloodroot

The roots and stem of Bloodroot produce an acrid red-orange sap, which is the cause for the latin name, *sanguinarius*, meaning bleeding. The names puccoon, paucon, pauson, red puccoon, coonroot, and Indian paint are all terms that reference the Native American uses of this dye (USDA). This was used by Indians as a dye for clothing, paints, and baskets (Wildflower). Native in over half of the 5 U.S. states and 5 Canadian provinces (NRCS), Bloodroot spreads rapidly as ground cover as seeds are easily dispersed by ants. As Bloodroot is said to be found in both upland woods (higher elevation) and floodplain woods (lower elevation), we decided to test which elevation, in Pennsylvania specifically, Bloodroot is more abundant. We

hypothesized that Bloodroot will have the same preference of elevation, whether that be high or low, throughout the tested sites in Pennsylvania.

METHODS

We tested for bloodroot in three areas of Pennsylvania. These areas included Whitehall, Millmont, and Lancaster PA. At each location, we tested at high elevation (dry habitat) and low elevation (wet habitat) areas. At high elevation, three 3x3 meter plots were randomly selected to be examined for bloodroot. Inorder to pick the areas where we would set up the plots, we used a random number generator. Standing towards the middle of the total area, the random number was generated. The random number determined how far (in feet) from where we were standing that we would set up the plot. To measure the plots, we used measuring tape and stakes to mark the four corners of the plots. For about 3-5 minutes, we searched for bloodroot within the plots. We used the Lady Bird Johnson Wildflower Center plant database website to help us identify the plant. The number of bloodroot found was recorded at each plot. This was repeated at low elevation as well. In total we had 9 high elevation locations and 9 low elevation locations.

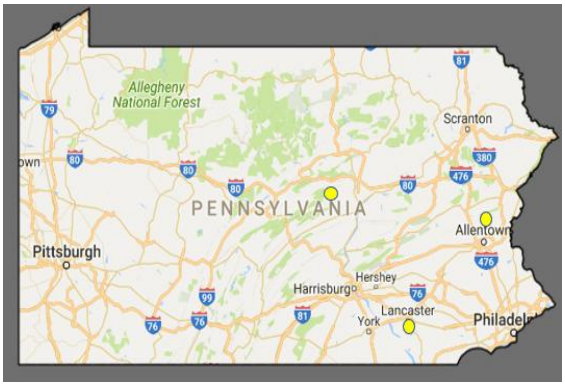

Figure 3: The yellow dots are the three locations where we tested for blood root. Whitehall, Millmont, and Lancaster.

RESULTS

The individual bloodroot plants were defined as an individual stem with leaf and flowering head (see figure 4). Bloodroot was only identified in Millmont, Pennsylvania at low elevation when sampling was conducted on April 3rd, 2020 at an elevation of 580 feet above sea level. At each of the three low elevation plots, eight, twenty-eight and one individual plant were identified respectively (figure 6). The data was inputted into Minitab to perform a chi squared goodness of fit test to determine if any significant difference existed between the observed data and the expected data. Upon analysis with five degrees of freedom, Pearson's chi-squared value was calculated to be 52.345 and the p-value was calculated to be 0.000 (table 3). Because our p-value was found to be 0.000 we can assume that the approximation may be invalid and that a larger sample size would be needed for more conclusive results. Our original hypothesis is that Bloodroot will have the same preference of elevation, whether that be high or low, throughout the tested sites in Pennsylvania. We cannot accept or reject this hypothesis at this time based on our results. For a more conclusive measure additional plots and locations should be sampled.

Figure 4: Individual bloodroot plant.

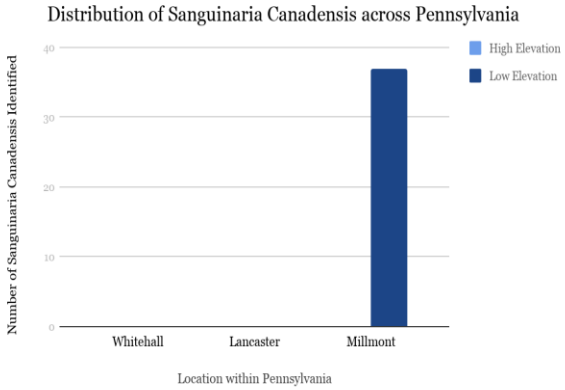

Figure 5: Number of Bloodroot plants sampled at each location across Pennsylvania at the given elevation.

Table 1: Observed number of Bloodroot plants at low elevation in Millmont, PA

Millmont Low Elevation 1	8
Millmont Low Elevation 2	28
Millmont Low Elevation 3	1

Table 2: Chi-squared table of the observed number of Bloodroot plants and the expected number of Bloodroot plants

	Observed	Expected
Lancaster High Elevation	0	6.167
Lancaster Low Elevation	0	6.167
Whitehall High Elevation	0	6.167
Whitehall Low Elevation	0	6.167
Millmont High Elevation	0	6.167
Millmont Low Elevation	37	6.167

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Table 3: Minitab chi-squared goodness of fit test of data set from figure 5

Chi-Square		**Degrees of Freedom**	**p-value**
Pearson	**52.345**	**5**	**0.000**
Likelihood Ratio	**66.432**	**5**	**0.000**

10 cell(s) with expected counts less than 5.
****Chi-Squared approximation may be invalid***

DISCUSSION

From the data observed, our hypothesis can not be accepted nor rejected. Since we have such little data from sampling, the p-value came out to be 0. In order to get a p-value with significance, we must collect more data. With a chi-square value of 52.345, we again can conclude that we will need more data to get a definitive result. The lower the chi-square value the better the data is, but since our number is in the middle it proves we need more sampling plots. Even though our data can not be conclusive, all of the bloodroot found was in the low elevation areas of Millmont PA. This could possibly mean that bloodroot prefers habitats at low elevation closer to the center of PA. Our hypothesis stating that bloodroot will have the same preference at each elevation, can not be deemed correct or incorrect due to the insufficient amount of data collected.

The limitations found in this study include how many areas we could test for bloodroot. With more sites, we could gather more data. Also, adding more areas could increase the range of where we could find bloodroot in PA. For example, extending our range more west of PA would add more elevations to the data and more interpretations to the results. Another way to expand this study is to include how high or low the elevations are relative to sea level. With a more specific idea of elevation, we can be even more conclusive with results. Knowing what habitat the bloodroot prefers can enhance the data base for common Pennsylvania plants. Also, having this data can help if the plant ever becomes endangered.

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