

Intraspecific variation within *Viola pubescens* regionally and locally

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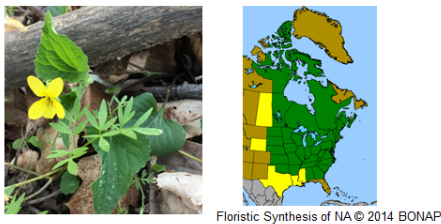
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Introduction

My research this week focused on the downy yellow violet (*Viola pubescens*), which is a common plant found throughout eastern North America. There are two varieties within the species: *Viola pubescens* var. *pubescens* and var. *scabriuscula*, which grow in slightly different soils and vary in their leaf hairiness.

I looked at intraspecific variation within the species both regionally and locally, asking at the regional scale, is there evidence from climate and trait data that the two varieties are different? At the local scale, I asked: are there differences in trait variation between sites that are a few miles apart?

This comparison will not only give us a further understanding on the structure of the variation within *Viola pubescens*, but also insight into the scale at which plants are adapting and responding to their environment. My hypothesis is that there will be climate and trait differences between the two varieties, but not between the local sites.



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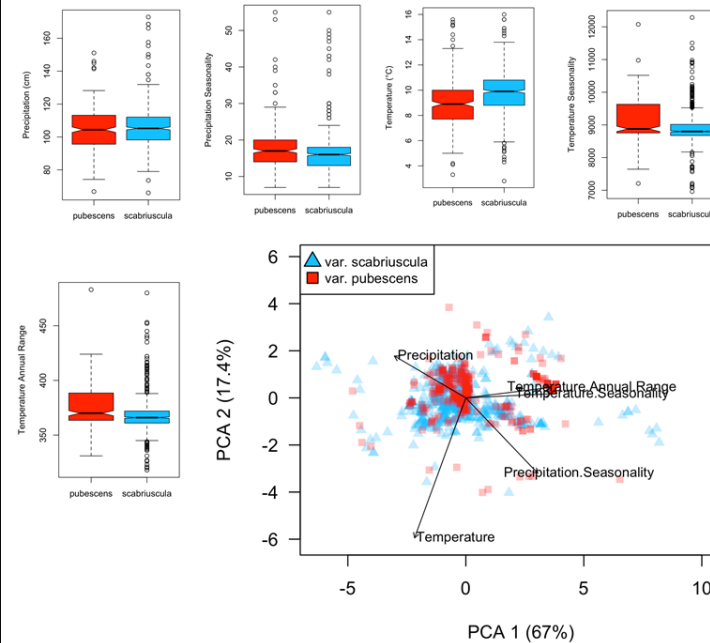
Materials and methods

To look at variation at the regional scale, I used digitized herbarium specimens to collect trait data for the two varieties of *Viola pubescens*. I measured the number of leaves, presence/absence of open flower and fruit, and fruit color as well as plant height, rhizome and root length using ImageJ. I used bioclimatic variables from WorldClim (temperature, precipitation, and seasonality) to compare the environmental characteristics of each variety to see if the climate is a contributing factor to the difference between these two varieties.

To compare variation among populations of *V. pubescens* that are geographically close together, I measured fruit color and hairiness from photos of individuals at four local Indiana sites (Kent Farms, Griffy Lake, Hoosier National Forest, and Lower Cascades). I also measured seed weight in ten individuals at each site.

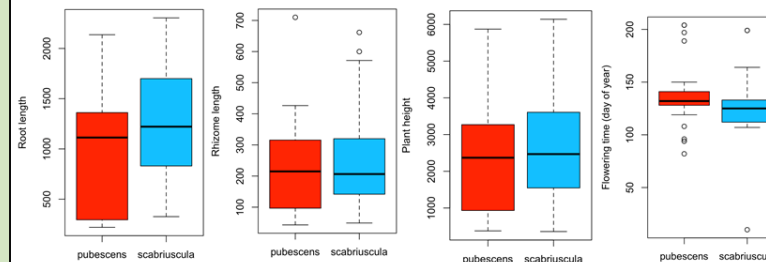
Results

Variation in climate variables in two varieties of *V. pubescens*



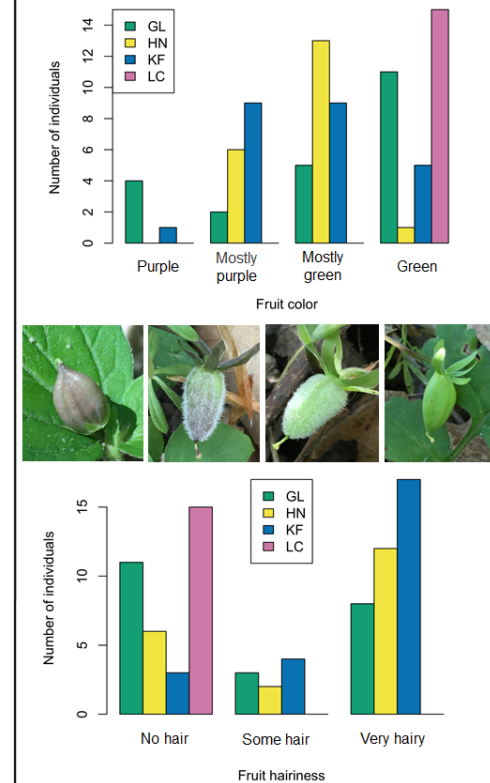
There was no difference in the distributions of the two varieties for the five bioclimatic variables measured. However, there were slight differences in range between the two varieties for temperature annual range and temperature seasonality.

Trait variation in two varieties of *V. pubescens*

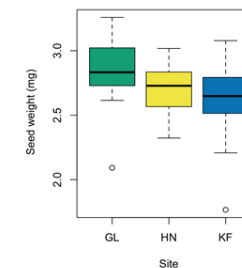


There were no significant differences between the two varieties for any of the traits measured from herbarium specimens.

Trait variation between three local sites



All sites had variation in color and hairiness except for the Lower Cascades site, which only had green smooth fruits.



Seed weight did not vary significantly between the sites, but there was a slight trend towards heavier seeds at Griffy Lake.

Conclusions

The results showed that regionally there was not a significant difference between the two varieties of *Viola pubescens*. This could mean that the varieties are not different in their climate or traits. However, it could also mean that we didn't include the traits and environmental variables that are important for differentiating the two types in this study.

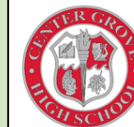
Between the local Indiana sites, we found some differences between sites for fruit color and hairiness, but no differences in seed weight. We found that fruits from Lower Cascades were always green with no hair, showing no variation in its fruit phenotype compared to the other sites which had variation in their fruit color and hairiness.

Future Directions

After comparing the traits and climates for *Viola pubescens*, the next possible step is to look into the genetic variation across the species and within the varieties of *Viola pubescens* to see whether or not there is a genetic difference between the two varieties.

Acknowledgments.

I would like to thank my mentor, Caroline Edwards, and Professor Leonie Moyle for the help and opportunity to work in this lab. I would also like to thank councilors Merrin Joseph, Imani Kigamwa, and Will Ramos. I thank my teachers John Moore and Jennifer Pickell for recommendations. A special thanks to Mary Ann Tellas for accepting me into this amazing camp.



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