Fall 2020

Plant-Soil Feedback Systems in Invasive Grass: Microstegium vimineum

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Introduction

Japanese Stiltgrass (*Microstegium vimenium)* is an invasive grass that dominates many southeast woodland areas which grows best under sunny conditions but can also thrive in shady areas.

We hypothesized that *M. vimenium* in invaded soils would have higher germination rates as compared to *M. vimenium* in native soils.

Methods

By using the method of Dabney et al. (1996), we tested germination rates between soil types. The units, which we referred to as seed burritos, were comprised of a layer of saran wrap, a moistened paper towel layer, 10 seeds placed an inch apart, 100mg of soil spread over the seeds, and another moistened paper towel, which was then rolled up and secured on both ends by rubber bands. Ten replicates were completed for each of seven soil conditions with each seed type, resulting in 140 trials. There were a total of 7 soils to be tested with two sets of seeds, from one concurrent population, one type from plants that were predominantly in the sun and the other type from plants that were predominantly in the shade.

Field Site

There were 3 field sites surrounding Louisville, KY where soil was taken from and a control soil that was used for comparison. Each field site had soil collected from areas that were already dominated by *M. vimenium* (invaded), as well as soil collected from areas that had no *M. vimenium* presence at all (native) with no homogenizing done to the soils. The three sites used were UofL Horner Bird & Wildlife Sanctuary, TNC Rabbit Hash Nature Reserve, and a private property in Harrison County, IN.

Results

***Microstegium vimenium* in invaded soils had higher germination rates as compared to than *Microstegium vimenium* in native soils.**

Germination between groups was analyzed using a one-way ANOVA, which was significant ($F(2,137)=3.774$, $p=0.0254$), but failed normality so a Kruskal-Wallis test was used as well. There is a significant difference between groups ($H=9.4152$, 2 d.f., $p=0.009$). According to Wilcoxon Rank Sum tests, germination rates in invaded soils were significantly different from both native soil ($p=0.02$) and control soil (0.03). There was no difference in germination between native and control soils.

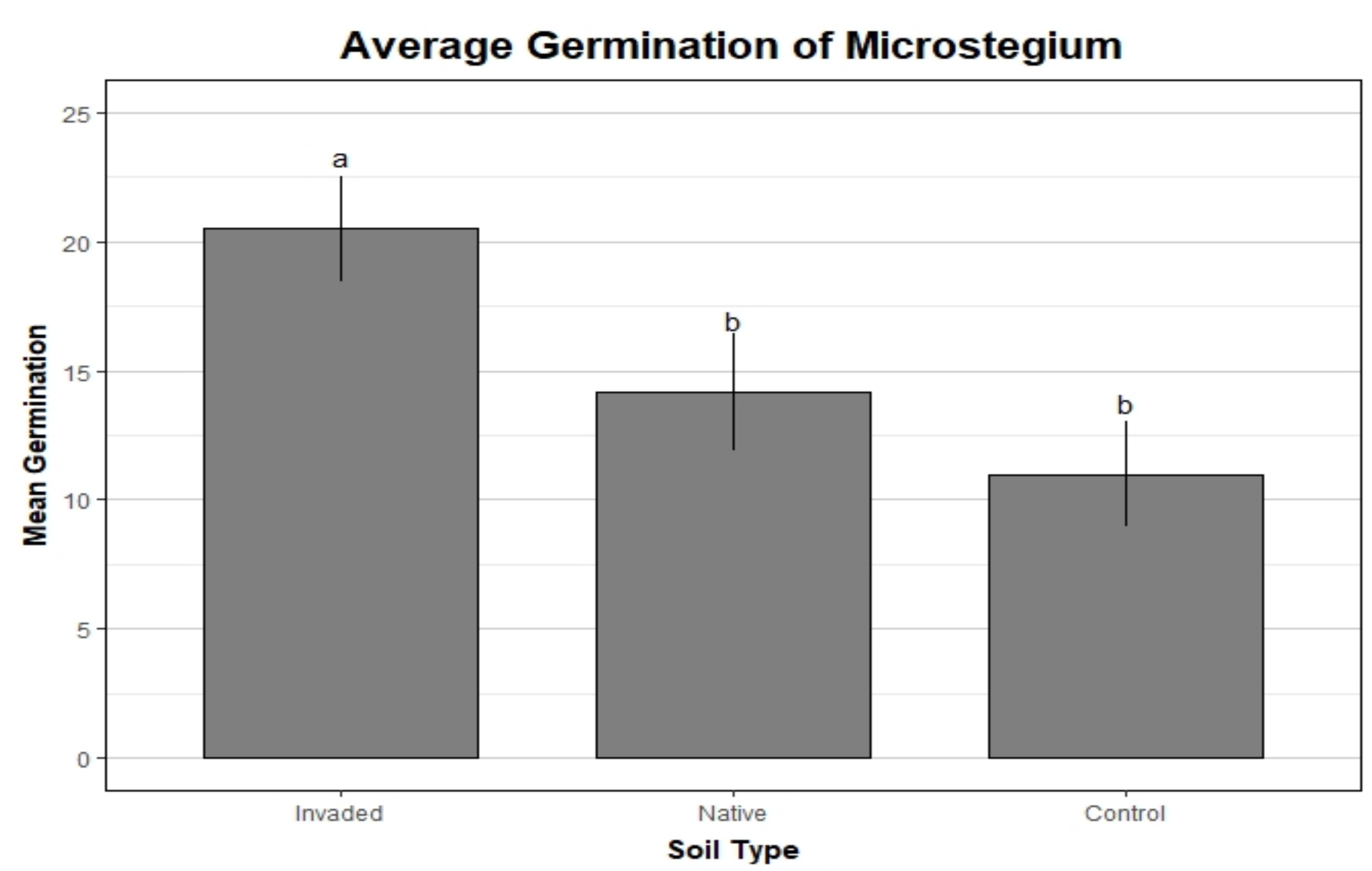
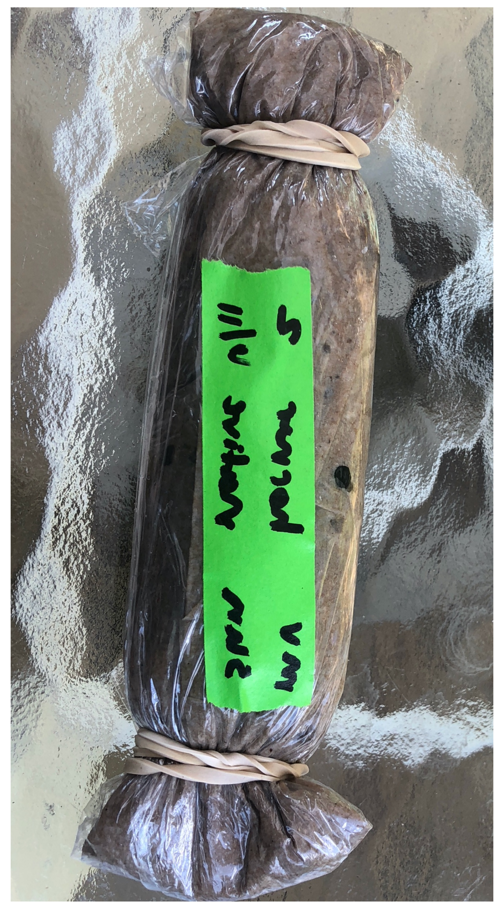
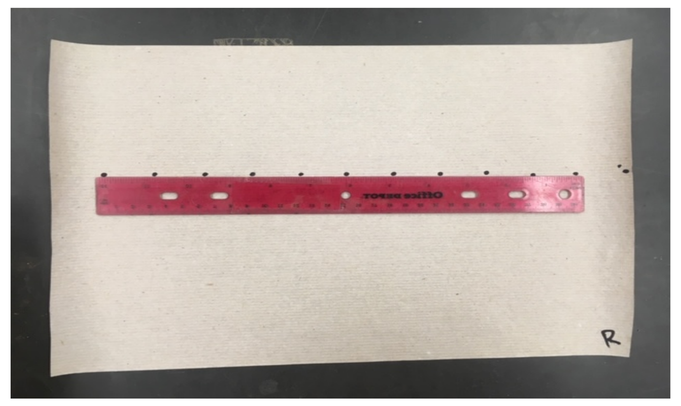


Fig. 1 Graph of mean germination rate for each soil type, with a and b representing significant differences between groups.



A Seed Burrito

M. vimenium Invasion in Horner Sanctuary



Top: Inside of a Seed Burrito prior to planting

Bottom: The inside 1 week after planting

Conclusions

Data supported that our hypothesis was correct. Invaded soils that previously had *M. vimenium* in its soil, and in turn microbiota associated with *M. vimenium* growth, showed higher germination rates as compared to than native soils that had not experienced invasion. There was no difference exhibited between the sun and shade *M. vimenium* seeds.

Determining the main driving forces that allow an invasive species to fully disperse and dominate areas is important in learning how to slow and stop the spread. Plant-soil feedback systems between invasive plants and the soil using microbial interactions are one aspect being tested as a driver.

Future Directions

The future direction of this work involves testing native grasses with the same method to determine their germination rates between native and invaded soils, with the hypothesis that native seeds would have lower germination rates in invaded soils than in native soils.

Then the next step would involve testing the germination of native woody species in invaded vs. noninvaded soils, using different methods due to the size of the seeds.

Acknowledgements

This research was funded by the Summer Research Opportunity Program, directed by the Office of the Executive Vice President for Research and Innovation and the Office of the Provost.

Also thanks to the Nature Conservancy in Indiana for allowing soil collection on the Rabbit Hash Nature Conserve.