Aug 6th, 9:00 AM - 12:00 PM

Gender variation in the Prezygotic reproductive effort of the Common Silver Moss

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Investigation into the prefertilization reproductive efforts of the moss bryum argenteum with respect to gender differences.

The bryophyte Bryum argenteum is a vigorous moss with a cosmopolitan distribution and high tolerance to desiccation and temperature stress. Due to its widespread nature, B. argenteum has been highly investigated (e.g., Chopra and Bhatla 1981). However, very little research has been done on the reproductive aspects of this moss with respect to gender differences. This project will address the prefertilization reproductive efforts of the moss, and look for any differences in the rate of growth and sexual expression between the sexes. The hypothesis to be tested is that males actually have a higher prefertilization reproductive effort than females and seeks to explain male rarity in desert habitats.

Gender Variation in the Prezygotic Reproductive Effort of the Common Silver Moss *Bryum argenteum*

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Abstract/Introduction

The bryophyte *Bryum argenteum* is a vigorous moss with a cosmopolitan distribution and high tolerance to desiccation and temperature stress. It occurs in drastically varying environments, and is found in the dry, hot deserts of the western United States, the frozen, cold plains of the Antarctic, and throughout temperate regions (Spence 1988). The cosmopolitan distribution of this species means it plays a role in arguably every terrestrial ecosystem, and due to its potentially widespread environmental relations, *B. argenteum* has been highly investigated (e.g., Chopra and Bhatla 1981). However, very little research has been done on the reproductive aspects of this moss with respect to gender differences. This project addresses the prefertilization reproductive efforts of the moss, and looks for any differences in the rate of growth and sexual expression between the sexes. It tests the hypothesis that males actually have a higher prefertilization reproductive effort than females, and hopes to explain male rarity in desert habitats.

Objectives/Hypothesis

The objective of this experiment was to grow a variety of genotypes of the two sexes of the species *Bryum argenteum*, and look for variation in the growth rate and time to sexual expression between the sexes. Prior pilot work in the Stark lab has already seen a difference in growth rates and sexual expression when both sexes are grown together. This experiment further investigated these differences by exploring whether or not a statistical difference is also observed when the sexes are grown separately under identical conditions.

The hypothesis is that across different genotypes, the female plants of *Bryum argenteum* will exhibit a similar growth rate, slower sexual expression, and lower prezygotic investment in reproductive tissues than male plants. This would suggest a greater contribution to reproduction, prior to fertilization, in the male sex.

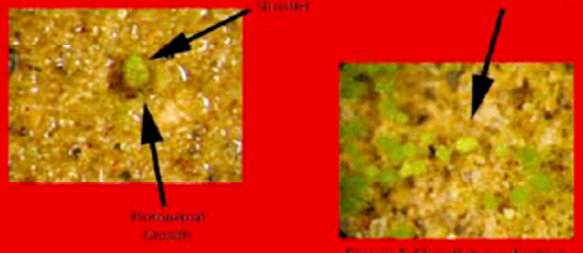


Figure 1: Protonemal growth off shootlet

Figure 2: Shootlet production

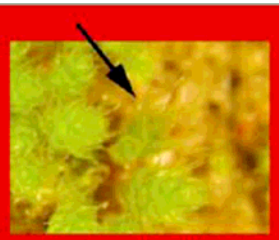


Figure 3: Female sexual shoot

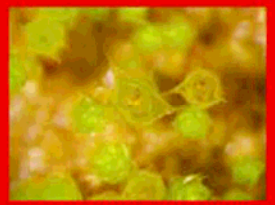


Figure 4: Male sexual shoot

Procedure

Six genotypes were chosen, and a male and a female were grown from each. 16 shootlets (small asexual propagules that are deciduous shoot apices) were collected from each growth culture.

- Santa Margarita Mts, Arizona (2)
- University of Kentucky (UK) campus (2)
- Cultured cross between a UK campus male and a SE Arizona female (2)

The shootlets were removed from the culture dishes, allowed to air-dry for 2 weeks, and then each placed in a separate sterile 35 mm (inner diameter) Petri dish filled half-way with moist sand. The dishes were placed in rows on two shelves of a climate controlled chamber set for a 12 hour photoperiod (20C lighted, 8C darkened). The shelves were rotated and the dish positions on each shelf were randomized twice the first week, and once every week thereafter. This ensured comparable light for each dish. Substrate moisture and humidity were also kept constant and comparable for each dish. Starting on week 4, each dish received 3 drops of Hoaglands nutrient solution, diluted to 30%.

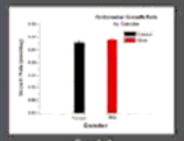
The following growth events and measurements were recorded (response varaibles):

- Day of germination (protonemal emergence, figure 1)
- Day of first shoot appearance
- Day of first protonemal shoot
- Day of 10 protonemal shoots produced
- Day when protonemal growth reached 8mm (half way to dish edge)
- Day when protonemal growth reached edge of dish
- Day of first shootlet produced (figure 2)
- Day of 10 shootlets produced
- Day of sexual expression (figure 3 and 4)
- Day of 5 sexual shoots
- Day of gamete release

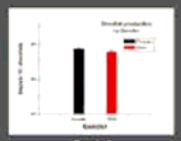
The experiment has been running for 70 days. We anticipate ending the experiment after approximately 70% of the shoots have reached sexual maturity, which should occur near day 84. At this time all the dishes will be allowed to air-dry and the growth from each dish will be separated and weighed for further data collection and analysis.

Results

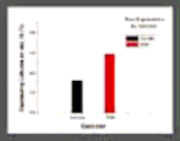
The initial measurements taken as the moss grew were compared between male and female, across all the genotypes observed. No statistical difference was seen in the rate of protonemal growth, shoot production, or production of shootlets between the sexes. A difference was seen between male and female in the production of sexual shoots (graph 3).



Graph 1



Graph 2



Graph 3

However, since the experiment is ongoing, the data as to the production of sexual shoots is not yet complete. At the end of the experiment, the data from the last two weeks of observations will be included. The weights of each growth type: protonemal, shoots, shootlets and inflorescences, will be compared between male and female groups, for futher analysis of their growth rates and final growth output.

Conclusion

We had hypothesized that male plants would grow faster and express sex more quickly than their female counterparts. However, thus far we have observed little or no differences between the sexes in the vegetative growth rate, shoot production, and production of shootlets. Any difference in sexual shoot production is yet to be determined.

References

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Chopra, R. N. and S. C. Bhatla. 1981. Effects of physical factors on gametangial induction, fertilization, and sporophyte development in the moss Bryum argenteum grown in vitro. New Phytologyst 89: 439-447.

Acknowledgements

Thank you to EPSCoR for the funding of this research. Thanks to the researchers of the Stark lab for their accommodations and help. And special thanks to fellow researcher Crystal Erickson for all her help, and the plethora of experience and knowledge she shared.