Effects of pH and Temperature Variability on Fungal Pathogen Development and Population Survival in Daphnia

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Key Questions

- How does temperature variability influence a fungal pathogen of Daphnia?
- How does an increase in temperature variability influence infection prevalence and population size?
- What effect does pH have on spore development within host s over time?

Fig. 1 Daphnia are aquatic zooplankton commonly know as water fleas. They reproduce clonally and measure in small size(1 mm to 2 mm) This Daphnia is infected with its fungal pathogen *Metschnikowia bicuspidata.*

Introduction

- Host-pathogen relationships are affected by environmental conditions.
- For temperature variability, we examined host and pathogen population dynamics and the corresponding infection dynamics under the various temperature treatments.
- Along with extreme temperatures playing a role on the environment, we also developed the study of extreme pH conditions and the influence it has on the infection and spore development within Daphnia.

Spore Survival

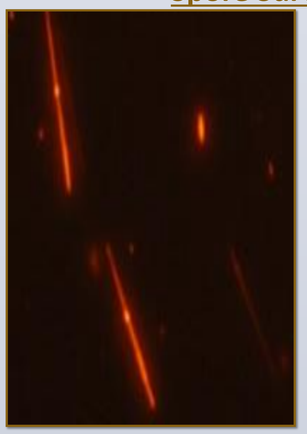

Fig. 2 Fluorescent stained spores that were separate from host to determine spore survival.

Purpose of pH Experiment

- Determine the effects of pH on spore development within an individual host over time.

Results

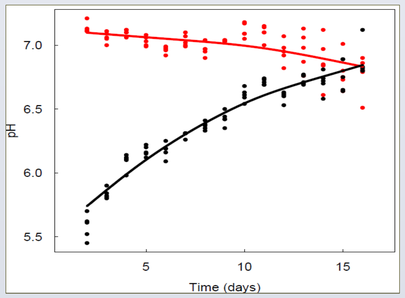

Fig.3 shows a pattern of the pH's neutralizing over time.

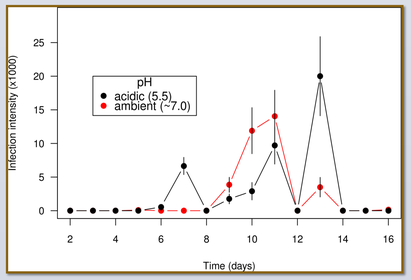

Fig. 4 shows that by calculating the mean for the control and acid population we found more spore development from the acid populations.

Purpose of Temperature Variability Experiment

- Determine the effects of temperature variability on spore survival and population and infection dynamics.

Results

Fig. 5 Incubators set to 12C, 20C, and 28C

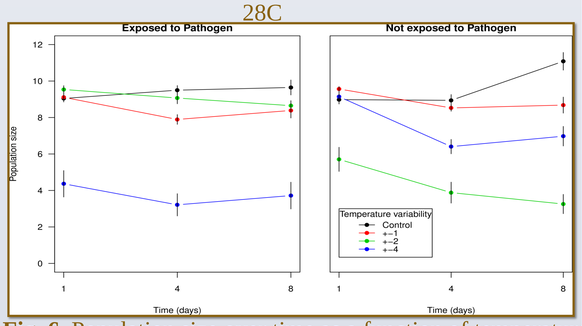

Fig. 6 Population size over time as a function of temperature variability treatment for populations exposed to the pathogen (left), and those unexposed to the pathogen (right).

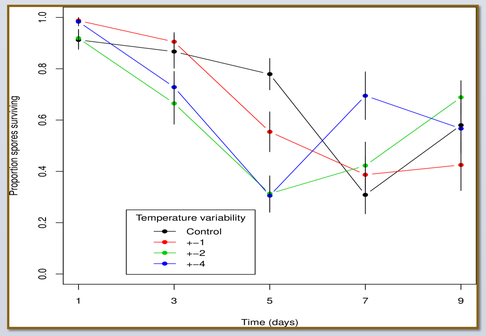

Fig. 7 Spore survival over time with variation of time of temperature treatment

Results

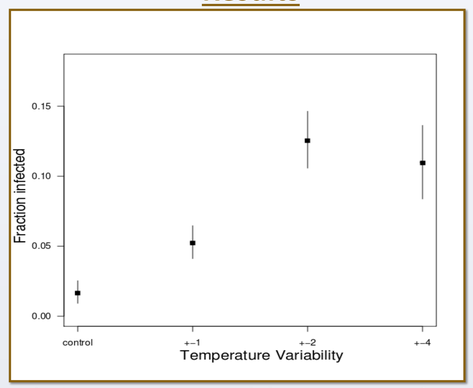

Fig.8 Temperature variability increases infection prevalence

Conclusion

- There isn't enough data to determine whether lowering the pH had an influence on the development of spores.
- For future studies, the pH value that produced the most spores could be tested alone against a neutral 7 pH to see if a lower pH produces more spores than a neutral environment.
- Data are still being collected for the temperature variability experiment, but thus far the results show us that temperature does play a role on population dynamics.
- The data from the spore survival experiment show how the different temperature treatments affected the amount of surviving spores, which suggests increased temperature variability decreases spore survival.
- Increased temperature variability will result in an increase in infection prevalence.

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