How Does Food Type Influence Larval Development in Green Sea Urchin Aquaculture?

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ABSTRACT

Live microalgae production for sea urchin aquaculture is costly. A formulated microalgae paste could alleviate the cost of growing live microalgae for sea urchin larvae. This experiment compares how larvae develop using a formulated microalgae paste. Six experimental tanks were used to test the two treatments; the two treatments were fed a REED (formulated microalgae paste) or CCAR (live microalgae) diet. Samples were taken from each of the experimental tanks to assess expected shape, feeding, deformed larvae, and stomach content. The larvae being fed REED did not consume as much as the larvae being fed CCAR live microalgae. The larvae for both treatments developed at a similar rate.

INTRODUCTION

Green Sea Urchins, *Strongylocentrotus droebachiensis*, are echinoderms that live in the Gulf of Maine. The population of *S. droebachiensis* was high in the 1980's, but due to overfishing and ecosystem changes, the population decreased during the 1990's. Green sea urchins have been grown in Maine using aquaculture for stock enhancement, but the cost of growing the larvae is high because of the production of live microalgae. Using a formulated microalgae paste could reduce the cost. For this project, larval development of *S. droebachiensis* larvae was compared using a formulated algae paste and live algae as feed. Using a formulated algae paste could save time and money for aquaculture industries.

METHODS

My project consisted of spawning and hatching *S. droebachiensis* using CCAR's established protocols. After hatching, we transferred the larvae to six randomized experimental tanks with two treatments, CCAR (live microalgae) and REED (formulated microalgae paste), which were kept at constant temperature throughout the project. Samples of larvae were observed daily using a compound microscope (Nikon Eclipse E200). The following characteristics were recorded: stage, total number of larvae, total with an expected shape, total number of larvae feeding on microalgae, stomach content (empty, half full, or full), and total with a deformed shape.

Data was analyzed by calculating the sums and percentages of expected shape, feeding, stomach content, and deformed larvae for each day of the experiment. The average of the characteristics were calculated for the entire duration of the experiment, 6 days.

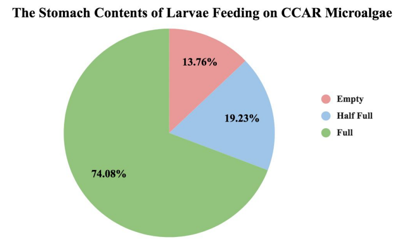

Figure 1. The stomach content of urchin larvae feeding on live microalgae. A majority of stomachs were full.

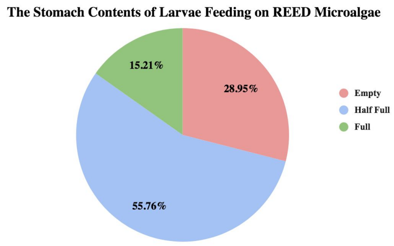

Figure 2. The stomach content of urchin larvae feeding on formulated microalgae paste. A majority of stomachs were half-full.

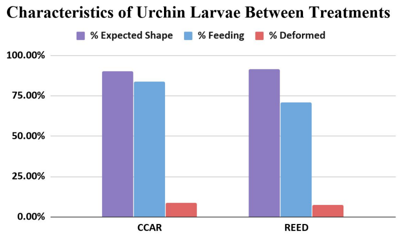

Figure 3. The characteristics of urchin larvae between treatments.This represents how the larvae in both treatments developed similarly.

Figure 4. Injecting the sea urchin broodstock with potassium chloride so that they will release their eggs and milt.

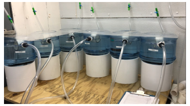

Figure 5. The six randomized experimental tanks are what the larvae stayed suspended in to feed on REED (formulated microalgae paste) and CCAR (live microalgae).

Figure 6. Samples of the larvae were taken from the experimental tanks and observed under a compound microscope to check their development.

Figure 7. This is an image of a normally developed sea urchin larvae at its four-arm stage.

CONCLUSIONS

- Sea urchins feeding on live microalgae had more full stomachs than those feeding on formulated microalgae (Figures 1 & 2).
  - REED (formulated microalgae paste) had a greater variety of microalgae species than the live feed, and could have been more nutritious so the larvae did not need to consume as much.
  - Visual observation shows that the REED (formulated microalgae paste) did not stay suspended in the water column as long as CCAR's live microalgae because the experimental tanks with REED (formulated microalgae) did not have green colored looking water. The color of the water indicates whether there is microalgae in the tanks. Larvae are suspended in the water column while feeding on microalgae. The formulated microalgae paste may have not had the right system to keep the paste suspended in the water column.
- *S. droebachiensis* larvae developed at a similar rate in each treatment, regardless of what type of feed they ate. (Figure 3).

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