

Yeast and Pueblo Chili Seeds

A PCC Demosat Experiment

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In a previous year, the Pueblo Community College Space Grant team did an exciting experiment dealing with the CO₂ production of yeast using a specific type: *Saccharomyces cerevisiae*. Once BioForce5 was formed, the interest of the group was biology related and then decided to replicate a previous team's data. In addition, the team wanted to send up chili seeds for something new to be added to the satellite payload. The main goals for this year were to (1.) replicate, and (2.) create a new avenue for the replication of test results in the future. Before satellite launch (Nov. 9, 2019), it was predicted that the experimental yeast would act similar to previous years experiment concerning CO₂ production (produce at a higher rate than the control), and that our chili seeds would be either slowed in growth compared to the control or sterile if fruition occurs.

The Launch

Our launch was successful; the microbes and seeds traveled above the expected 100,000 ft and reentered the atmosphere without any notable damage done to the satellite. Once back to the labs, the team was excited to get the project off the ground and going.

Two Experiments: Yeast and Chili Seeds

Yeast

The fermentation portion of the experiment was a replication of previous work done by a different team. The procedure was executed differently in a couple of ways, compared to the previous team's work. During testing, we used a 10% sucrose solution instead of using two different carbohydrate sources. Also, instead of fermentation tubes to capture CO₂, the team utilized SparkVue CO₂ capture probes for more accurate readings.

The Procedure

- Heat incubator to 40 C

- Prepare 10% sucrose solution
- Weigh 0.5g of yeast
- Add yeast to mini Erlenmeyer flasks
- Add 15mL of sucrose solution to the yeast
- Seal with parafilm and swirl to combine
- Let sit in the incubator for 30 minutes
- Pierce the film with the probe tip and hold for one minute to capture CO₂

Results

The results were not as easily compared to the previous year's findings due to using different capture techniques and equipment, but the results were similar. In figure 1.1, the control graph shows the control test results where there is an observable plateau whereas in figure 1.2, the experimental graph shows a steep increase in CO₂ and no consistent plateau.

Figure 1.1 Control Graph

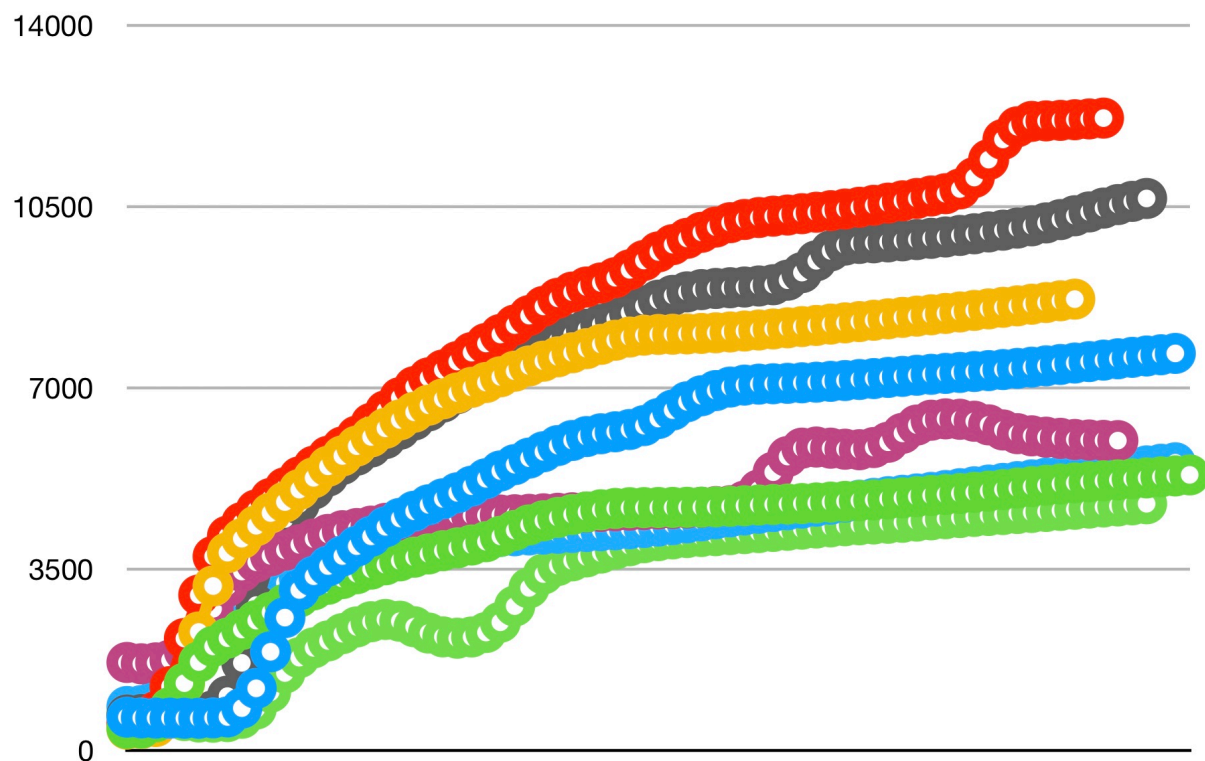
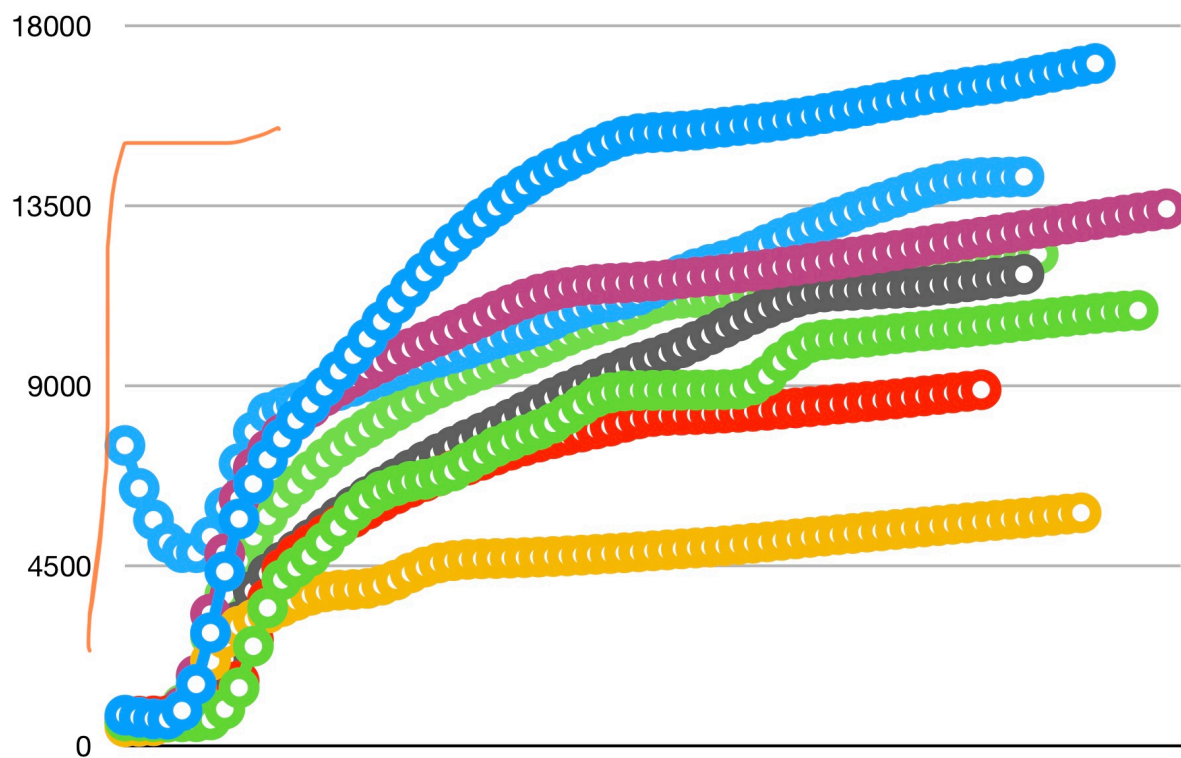


Figure 1.2 Experimental Graph



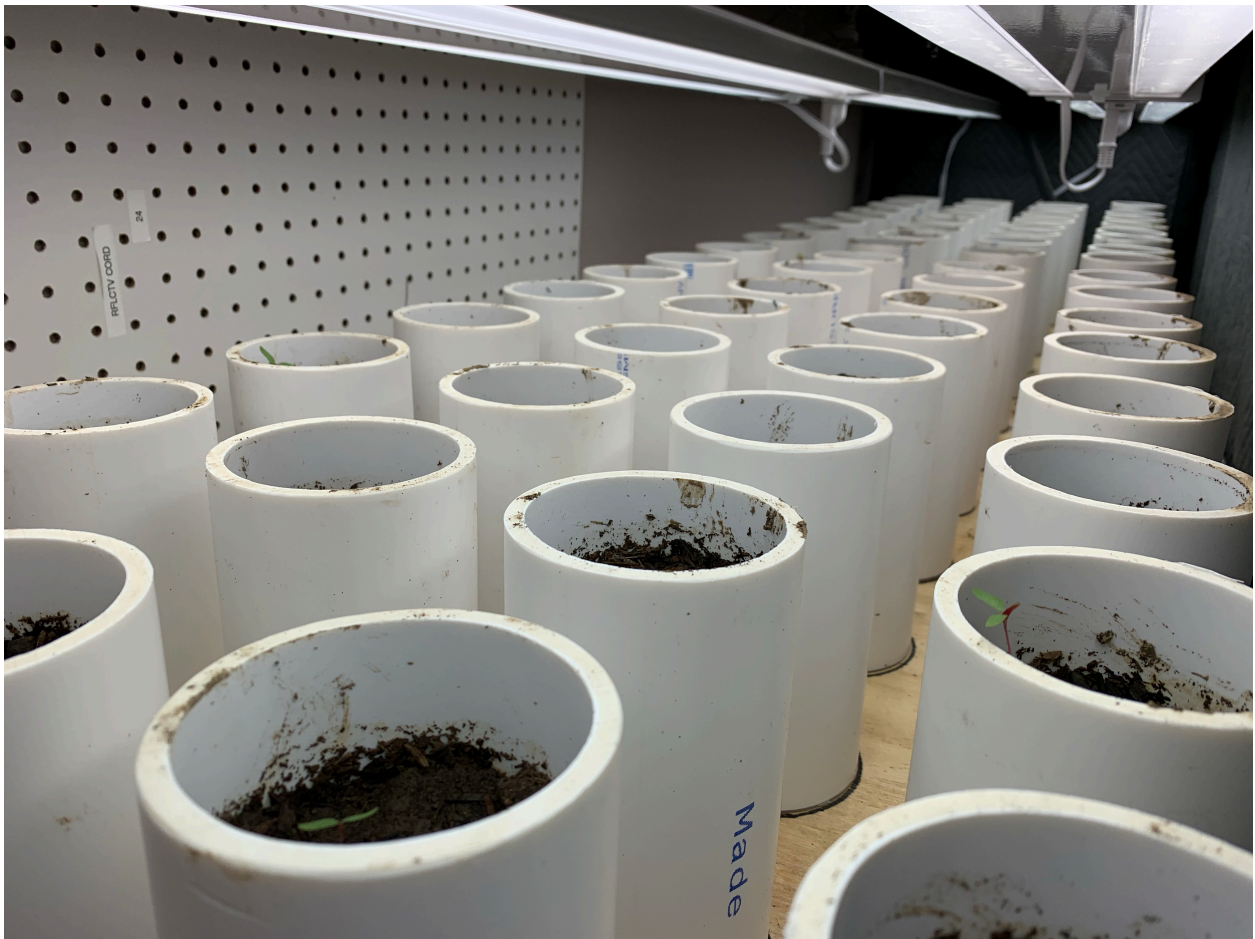
Yeast Results

Next year (2021) we hope to send up yeast again and replicate this year's experiment with no predicted major changes to the procedure. The biggest change would be to capture the CO₂ for longer than a one minute timeframe. We think the experimental yeast is doing something different than expected so we would like to replicate exactly. Thus, allowing the experimental yeast to show a better picture to just how high of a ppm CO₂ capture can be reached.

The previous results showed a higher percent of CO₂ production for the experimental yeast and we could agree that our experiment concluded similarly, but to a different degree. This could be caused by the utilization of older yeast or simply due to the more accurate readings for our experiment with upgraded equipment.

Chili Seeds

We were given seeds from a local Pueblo chili farm (DiTomaso Farms). They gave us both Pueblo and Big Jim Chili seeds. We had approximately 500 seeds of each to be distributed by controls and experimental. We've set up a testing environment Pueblo Community Colleges S.T.E.M. Center. Seeds will be planted on January 6th, 2020.



(Picture of the planted seeds in our STEM lab)

Although, it is too early to know what results will be shown, we will present updated data at the Research Symposium in April . We will observe the room/base board temperatures, relative humidity, and plant height in cm. Variables including distance of lights from planters, time of light exposure, and water added. We'll keep updating as our experiment continues.

