Analysis:

The purpose of conducting preliminary testing was to get a first-hand experience at the effects of changing the culture medium to a food source alternative, store bought pineapple juice in this case. By growing the bacteria in both a typical HS media and a 100% pineapple juice media simultaneously, the resulting wet masses of the samples displayed an increase in cellulose yield when shifting to the pineapple juice medium. Not only this, but even the backup medium with 50% HS medium and 50% pineapple juice medium offered a similar result, indicating a positive correlation between concentration of sterilized pineapple juice and cellulose yield. After preliminary testing, the focus shifted to utilizing food waste instead to simulate their effectiveness. Using leftover mango peels, the cellulose producing bacteria was once again grown and the wet masses of the samples were compared with those of the HS media, only to show an increase once again in cellulose yield. To further justify its effectiveness, an XRD analysis was run on the mango peel media cellulose to compare its crystallinity with the crystallinity of the HS media cellulose sample. The resulting graphs indicated that they had similar crystallinity patterns, as peaks in the graph were positioned at similar angles, therefore helping show the effectiveness of growing bacterial cellulose with this food waste source.

Average Weight of Cellulose Production

This graph described the results from the preliminary testing. The three different culture mediums included the 100% pineapple juice medium, 50% HS medium and 50% pineapple juice medium, and the 100% HS medium (going left to right on the bars in the graph). The average cellulose weight produced with the 100% pineapple juice was around 2.39

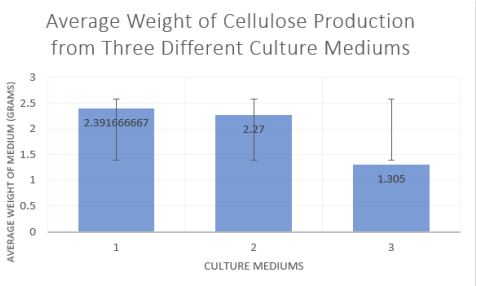

Figure 1: Bar graph displaying the average weights of cellulose produced through different culture mediums. Bar one signifies the 100% pineapple juice medium, bar two represents the 50% juice and 50% HS medium mix, and bar three represents the 100% HS medium. From the bar graph, there is a clear decline in cellulose production as the concentration of pineapple juice

grams while the average cellulose weight produced with the 100% HS medium was around 1.31 grams. There is a clear decline in amount of yield produced as the concentration of pineapple juice decerases from the culture medium.

Specific Yield Comparison

This line graph represents the results from the preliminary testing in a different format. This type of graph showcases each sample and what the wet mass was, to help see the common trends instead of just the overall average of each culture medium. While there are a couple spikes here and there, a similar message is portrayed in this line graph: the higher the concentration of pineapple juice, the higher the yield of bacterial cellulose.

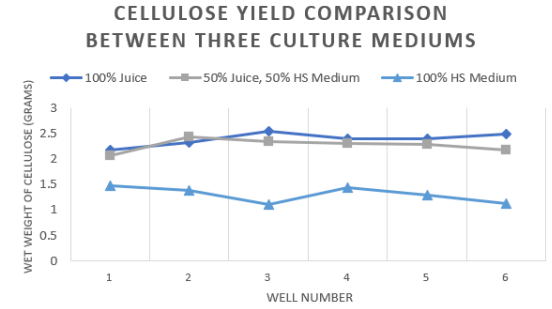

Figure 2: Line graph representing the specific wet weights of cellulose produced through different culture mediums. As a whole, the line displaying the cellulose grown in a 100% pineapple juice medium has the highest numbers, indicating that it had the greatest cellulose yield, particularly in comparison with the 100% HS medium line.

XRD Analysis

This line graph analyzes the data obtained through the X-Ray Diffraction done on both the HS media produced cellulose and the mango peels media produced cellulose. After the X-Ray generator ran for 8 minutes, the graph of sample holder #5- where the cellulose sample was located- was formed to identify crystallinity patterns. These patterns in the graph were then directly compared to patterns in the HS media graph to observe for similarities in where peaks occurred. These peaks indicate crystallinity in the structure, so if peaks in the two graphs are located at the same angle, this can be used as justification towards how the cellulose produced by the mango peel medium might be the same as the cellulose produced through the HS medium. This is important to know when attempting to conclude whether the mechanical properties of

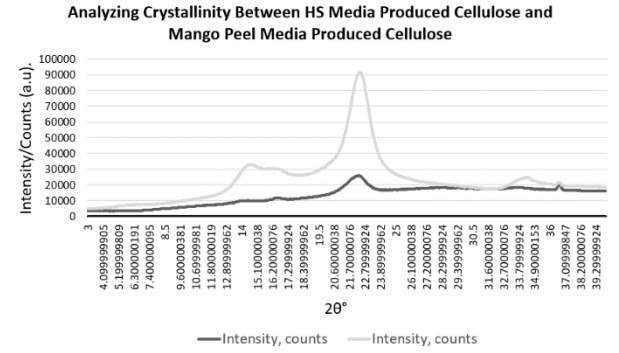

Figure 3: Line graphs representing the XRD analysis of both the HS media produced cellulose (lighter line) and the mango waste media produced cellulose (darker line). The key takeaway from this graph is identifying where the peaks in each graph are located and seeing if they remain similar between the two lines.

bacterial cellulose (e.g. tensile strength) are conserved even when the medium is altered. From this graph, it is evident that peaks occur at approximately 16 and 23 degrees for both mediums. This shows that the two samples of cellulose are crystalline in the same areas, which serves as an indication that they could be the same cellulose.

Comparison Between Mango Peel and HS Mediums

To perform a statistical test to determine whether mango had a statistically significant impact on the yield of cellulose produced, more samples needed to be cultured and weighed. 8 samples per medium were grown and the averages of their masses were taken and represented in the bar graph to the right. Like the preliminary testing, this bar graph provides insight into how the addition of mango peel extract did increase the cellulose yield drastically and therefore, the mango peel extract does affect the weight of cellulose. The average weight of the 50% mango and 50% HS media was 0.98 grams while the average weight of the 100% HS media was 0.45 grams, so there is a clear increase in cellulose yield. A T-test was run to see if there was a statistical difference between the two mediums to provide evidence that adding mango peels to the media affects the cellulose yield. The null hypothesis stated that the mango peels had no effect to the weight of cellulose produced and with a p-value of 0.000264 and a significance level of 0.05, the p-value was less than 0.05, which supported the idea that the mango did have an impact on how much cellulose was produced.

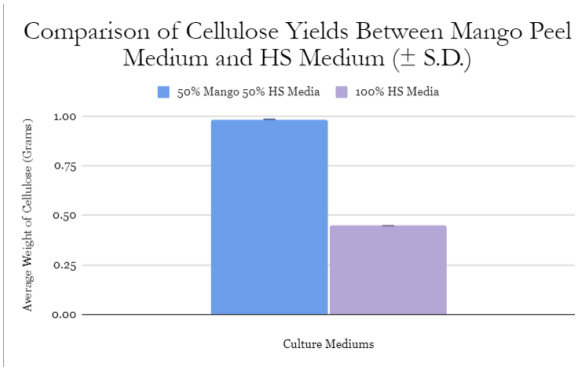

Figure 4: Bar graphs representing the average cellulose yields from the mango peel medium (represented by the blue graph; average of 8 samples grown in 50% mango peels and 50% HS media) and the HS Media (represented by the purple graph; average of 8 samples grown in 100% HS Media)