Initial Screening of Interactions Between Probiotics and Natural Products

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Introduction

Natural products are chemical compounds produced in nature by living organisms. Quercetin, berberine and resveratrol, seen in Figure 1, are natural products. These chemicals are antioxidants that may slow or prevent cell damage caused by free radicals. Antioxidants can prevent unwanted inflammation and may reduce the risk of many diseases [1]. People use these compounds as medicine for health conditions.

- **Quercetin** is taken to treat heart conditions, diabetes and prevent cancer.
- **Berberine** is commonly taken for diabetes, high cholesterol and high blood pressure.
- **Resveratrol** is commonly taken for high cholesterol, cancer prevention and heart disease.

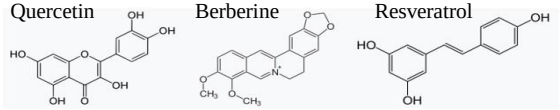

Figure 1. Antioxidant's chemical structure.

Method

Probiotics are microorganism introduced into the digestive system for health benefits. In this research experiment the above natural products were added to probiotic cultures to screen possible interactions. The fermentation broth was analyzed using high performance liquid chromatography and UV spectroscopy. The results will determine if the probiotics can metabolize the natural products or if they are stimulated to produce a new metabolite.

Results and Discussion

Bacillus infantis NRRL B-14911 and Bacillus subtilis subsp. subtilis ATCC 6051 were the two probiotic strains used. The experiment was replicated to determine if the results were consistent. After screening both strains, no new products were found in the presence of berberine or resveratrol. In Figure 2, a new product was seen in the presence of quercetin. This new peak at 12 min was seen in HPLC results for both strains.

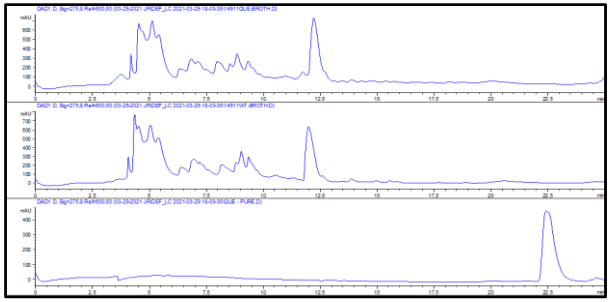

Figure 2. HPLC analysis of fermentation broth.

UV spectroscopy was used to compare the unknown product to quercetin, seen in Figure 3. The product is most likely a new metabolite produced in the presence of quercetin.

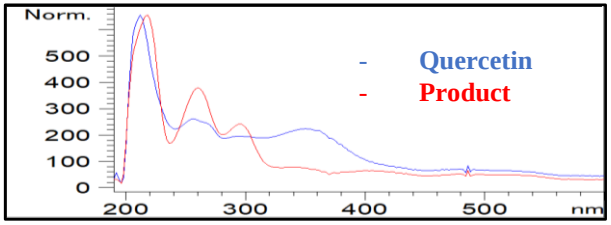

Figure 3. UV data of quercetin and the product.

Conclusion

No new metabolites were found in the presence of berberine or resveratrol. HPLC analysis showed a new product peak in the quercetin sample. Analysis of the UV data suggest the product is most likely a metabolite. The results were repeated to confirm that quercetin stimulated the probiotic to produce a new metabolite. More research can be done to better understand how these probiotics interact with the given natural products.

Future Work

- Separation and purification of the product.
- Mass spectroscopy to determine the molecular weight of the product.
- Structural determination of the product.
- Classify the product and find potential uses.
- Similar research to screen the interaction between natural products and probiotics in yogurt.

Acknowledgements

Thanks to Dr. Zhan for instruction during this project. Dr. Zhan also allowed me to work in his lab and use his materials. Thanks also to Jie Ren for helping me throughout the process.

References

[1] WebMD - Better information. Better health. (2021). WebMD. https://www.webmd.com