

Enantioselective Biotransformation of Prochiral Ketone via *Daucus carota*

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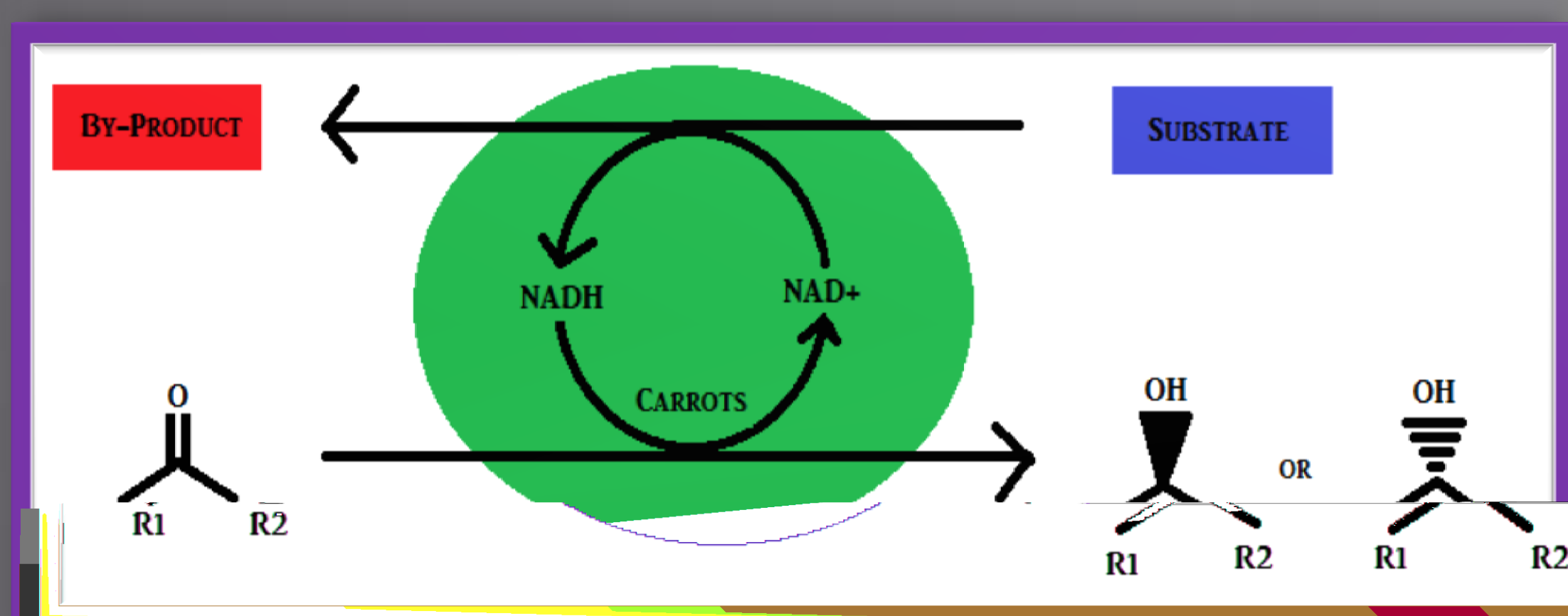
Abstract

Biotransformations of prochiral ketones can be performed using plant cells. The benefits of using plant cells include low cost, environmentally sound procedures compared to conventional chemical processes, and the stereospecific nature of the reaction.^{1,2} Benzofuran-2-yl methyl ketone was reduced to (-)-benzofuran-2-yl-ethanol after incubation with carrots in water. The reaction was enantioselective in that it produced the S-isomer as indicated by optical activity. Currently, attempts to isolate the carrot enzyme and antimicrobial studies of the (-)-benzofuran-2-yl-ethanol product are underway.

Reaction



Possible Reaction Pathway



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References

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2. Yadav, J.S.; et.al. *J. Org. Chem.*, 2002, 67, 3900-3903
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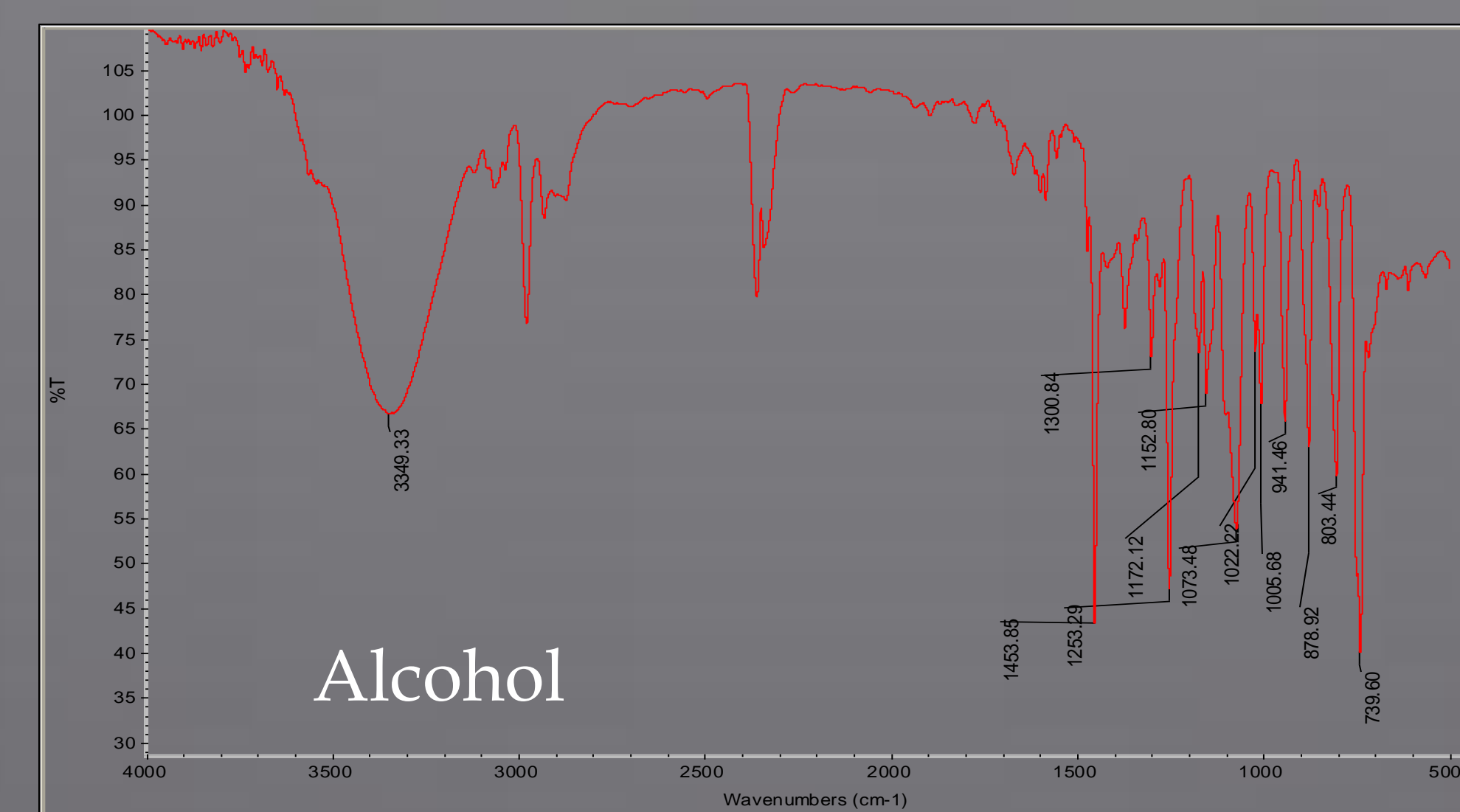
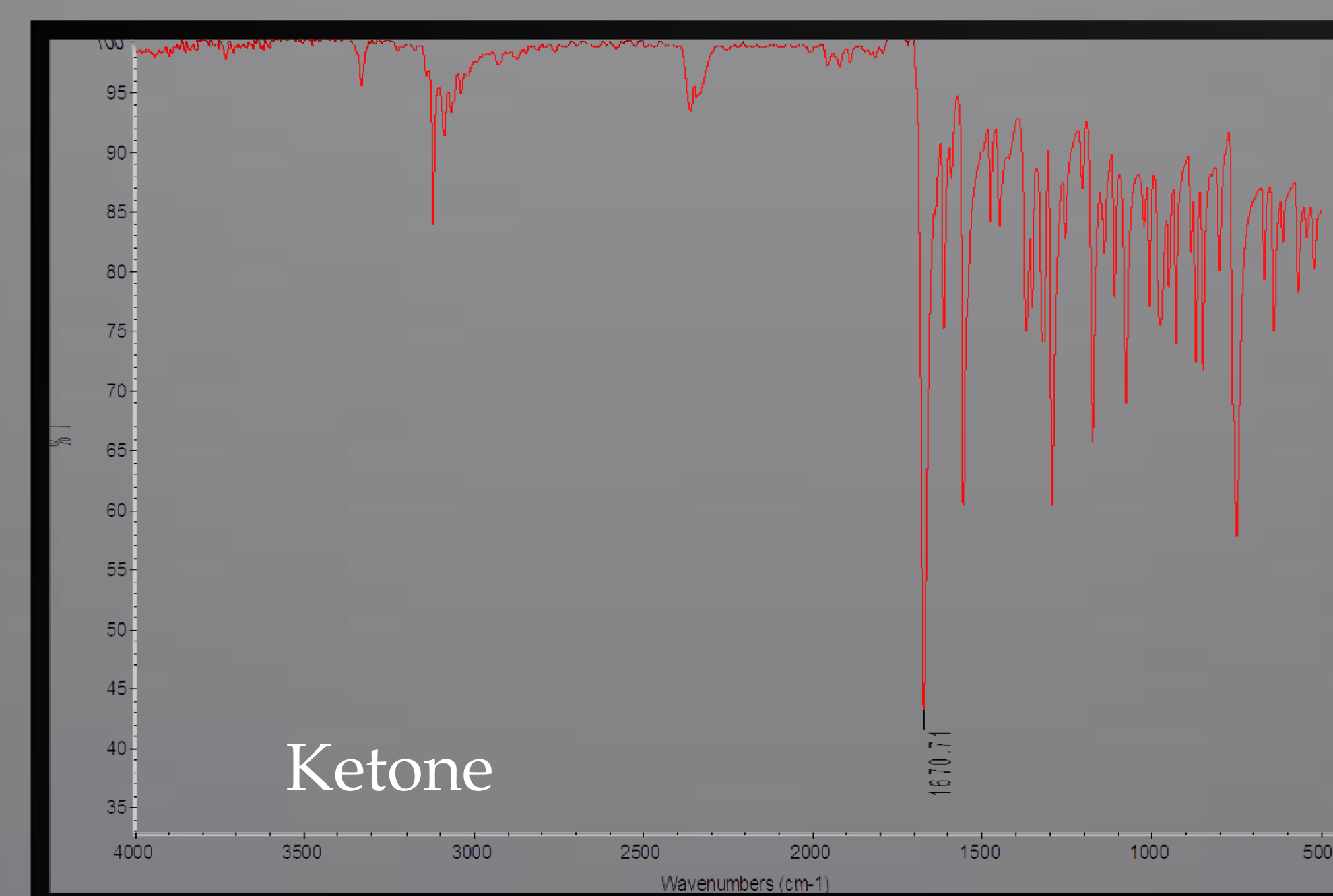
Methods

- Incubated carrots with ketone, extracted alcohol product, measured optical activity, and verified product using IR spectroscopy.
- Incubated carrot strips in buffer with low percent detergent. Used ammonium sulfate precipitation. Analyzed both supernatant and pellet using SDS-PAGE.
- Placed known quantity of purified alcohol on disk and placed on a Petri dish growing bacteria.

Optical Activity Results

- The optical activity of the alcohol product agreed with literature values of -16.4 and the percent yield was 37%.

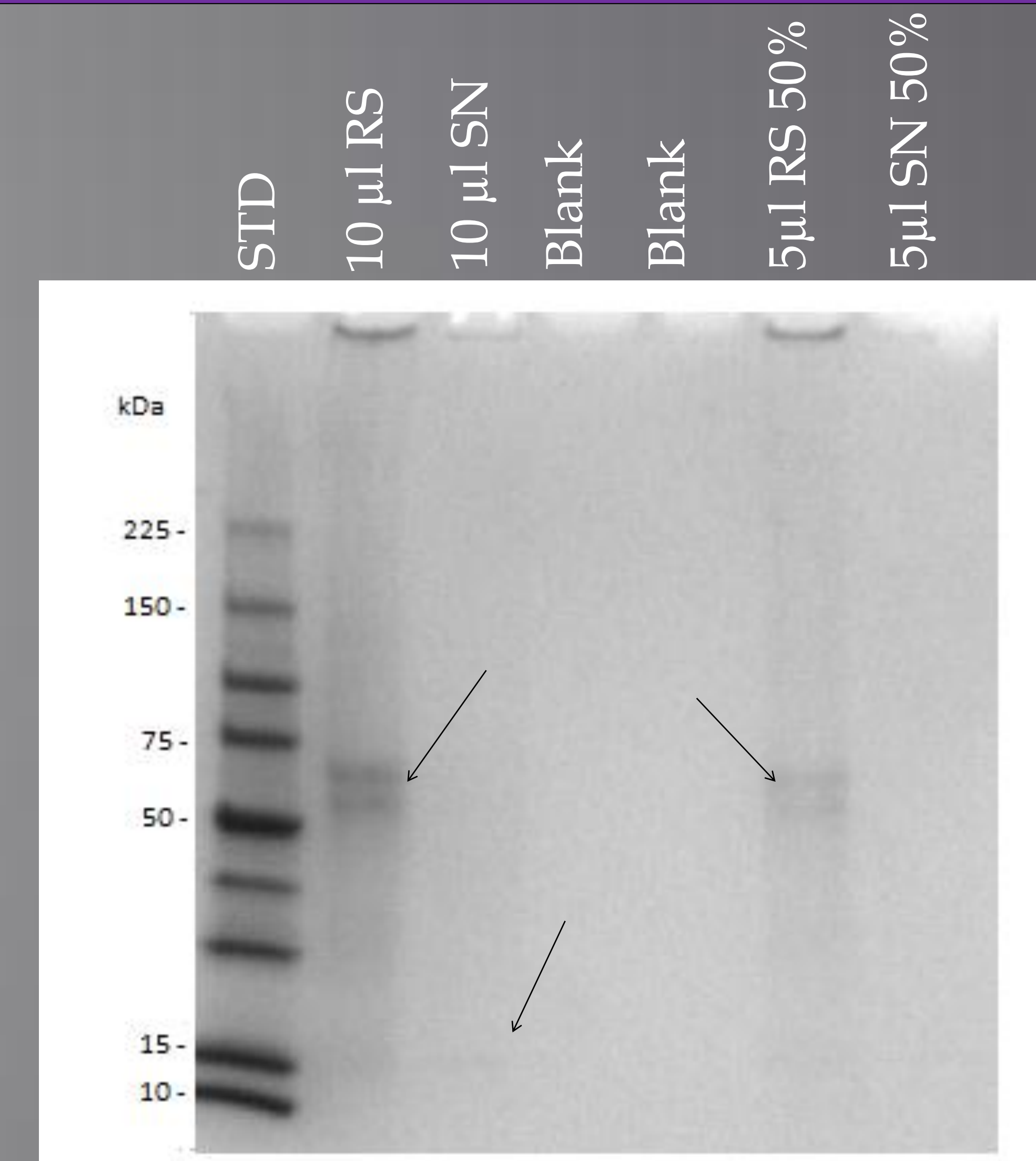
IR Spectroscopy Results



Acknowledgements

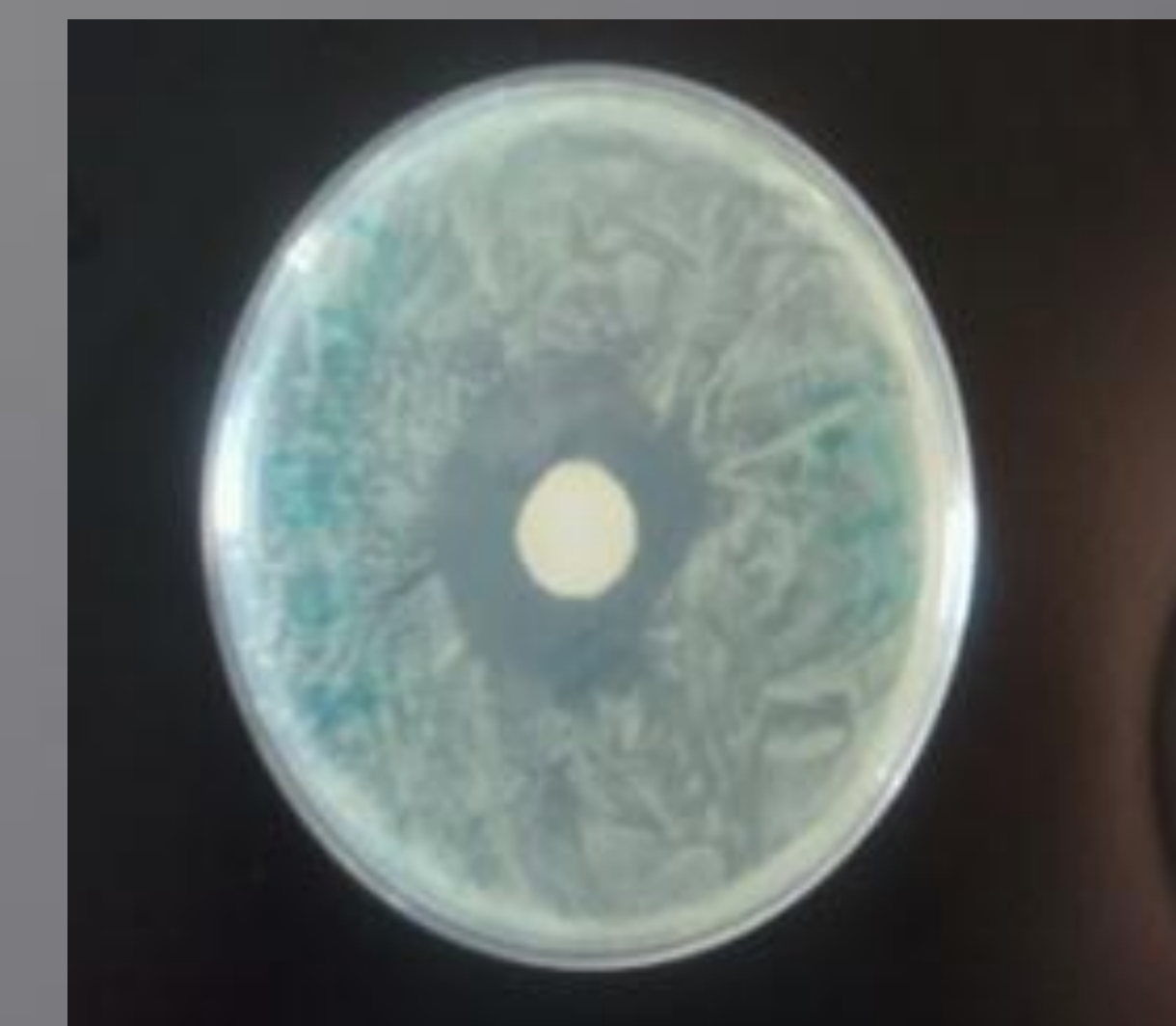
The following students collaborated on this project: Betty Abraha, Adrienne Crandall, Natasha Impink Hernandez, Olivia Korpe, John Sharp, and Kenneth Smith.

SDS-PAGE Results



Arrows indicate protein bands isolated from carrot surface.

Antibacterial Results



Ring of inhibition of bacterial growth. The concentration of the alcohol was 1.5 mg/ml.

Conclusions

This undergraduate group effort has worked out the preliminaries for:

- isolating pure, optically active alcohol
- demonstrated carrot protein can be removed from surface of carrot, and
- the alcohol may have some antibacterial properties at fairly high concentrations.