HR-321 Production of Acetic Acid by Fermentation with Propionibacteria

Key Words: Propionibacteria, Acetic Acid

ABSTRACT

This project was undertaken jointly with a project supported by the Iowa Corn Promotion Board. Together the projects aimed at producing the organic acids, propionic acid and acetic acid, by fermentation. The impacts were to provide agriculturally based alternatives to production of these acids, currently produced mainly as petrochemicals. The potentially high demand use for acetic acid is as the "acetate" in Calcium Magnesium Acetate (CMA), the non-corrosive road deicer.

Fermentation was, however, far from being an economically acceptable alternative. Gains were made in this work toward making this a feasible route. These advances included

1. development of a variant strain of propionibacteria capable of producing higher concentrations of acids;
2. comparison of conditions for several ways of cultivating free cells and establishment of the relative benefits of each;
3. achievement of the highest productivity in fermentations using immobilized cells;
4. identification of corn steep liquor as a lower cost substrate for the fermentation;
5. application of a membrane extraction system for acid recovery and reduction of product inhibition; and
6. initial use of more detailed economic analysis of process alternatives to guide in the identification of where the greatest payback potentials for future research.

At this point, the fermentation route to these acids using the propionibacteria is technically feasible, but economically unfeasible. Future work with integration of the above process improvements can be expected to lead to further gains in economics. However, such work cannot be expected to make CMA a less expensive deicer than common road salt.