

Developing a Novel Pectin Extraction Process To Increase the Efficiency of Natural Coagulants

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Current industry standards for responding to eutrophication utilize chemical coagulants. These coagulants, while effective, have harmful downstream impacts, leading the scientific community to explore natural alternatives that utilize crucial biopolymers such as pectin. However, pectin extraction is currently held back by ineffective extraction methods. These methods compromise pectin's chemical stability by promoting higher degrees of acetylation (DAc), a molecular property which can negatively impact gelling capacity. The aim of this study was to resolve that challenge by proposing an alternative extraction method that i) tested and quantified the impact sodium hydroxide (NaOH) had on the DAc of pectin compared to conventional which utilizes citric acid (C6H8O7) and ii) test the impacts that the use of NaOH can have on the coagulation activity of pectin. The use of NaOH in pectin extraction was validated with a mean DAc of 0.395% compared to C6H8O7 at 5.388%, indicating that pectin extracted using 0.5 M NaOH presented a lower DAc ($p < 0.01$) then the commercial gold-standard C6H8O7. The pectin was then tested for coagulation activity with aluminum sulfate. Using 0.5M NaOH in pectin extraction resulted in a 262% increase in the coagulation activity of pectin compared to 0.5 M of C6H8O7 ($p < 0.01$). This research successfully proposed a new and exciting alternative to current methods that significantly improves pectin extraction by lowering DAc (%), thus contributing to a substantial increase in coagulative abilities. Future research should investigate ways to optimize methods for extracting flocs using novel and established approaches, bolstering the process of implementing coagulants into real world samples.

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