Deactivation of Lipase in Pearl Millet

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Background
- Pearl millet is a major crop in India, particularly for the lower classes.
- Pearl millet flour has a shelf life of about 8-10 days.
- Rancidity is caused by lipase turning the lipids into free fatty acids (FFAs).
- Heat is one way deactivate enzymes

Problem Statement
- Determine a cost-effective method to heat treat pearl millet in order to deactivate lipase to extend shelf life

Objectives
- Deactivate lipase in pearl millet
- Maintain a constant moisture content
- Maintain pasting properties
- Keep cost under $20,000

Global and Societal Impacts
- Effective deactivation of lipase will extend the shelf-life of pearl millet flour.
- With a longer shelf-life, less pearl millet will go to waste

Sustainability
- India’s sunny climate allows for solar power to be used
- Water is continuously recycled through the heat exchangers

Morphological Analysis

Experiments
- Grind pearl millet into a flour
- Let pearl millet return to room temperature
- Let incubate at room temperature for 3 hours on orbital shaker
- Use data to calculate activation energy and reaction rate constant

The Problem—Reaction Kinetics

Experiments

Optimization

Future Work
- Correlate percent deactivation with how many days the shelf-life is extended
- Measure pasting properties after deactivation
- Test process in a fluidized bed

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