Preventing Spoiled Milk

UHT Shelf life – The application of lactose oxidase to control *Pseudomonas* and improve UHT milk.
Project Goals

• Evaluate MQIPs library of proteolytic *Pseudomonas* spp. to identify 2-3 strains that produce heat-stable proteolytic enzymes.

• Demonstrate the ability of lactose oxidase to control *Pseudomonas* spp in raw milk under typical storage conditions.

• Demonstrate the subsequent shelf-stability of UHT milk made from proteolytic *Pseudomonas* spp. contaminated raw milk treated with and without lactose oxidase.

• Demonstrate that there is minimal detrimentally sensorial impact on UHT milk made from lactose oxidase-treated raw milk.
Strain Selection

- Reactivation
- Protease screening
- Protease isolation
- Heat treatment
- Stability test

NEGATIVE CONTROL
POSITIVE CONTROL
SAMPLE 1
SAMPLE 2
### Strain Selection: Results

<table>
<thead>
<tr>
<th>Strain code</th>
<th>(I) Reactivation [Incub: 32 °C - t = 24 h]</th>
<th>(II) Protease synthesis [Incub: 21 °C - t = 48 h]</th>
<th>(III) Protease heat resistance [Heat: 95.0 °C - 8.5 min] [Incub: 37 °C - t = 14 days]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P. fluorescens</strong></td>
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<tr>
<td>FSL R5 - 0199</td>
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<tr>
<td>FSL R5 - 0202</td>
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<tr>
<td>FSL W5 - 0203</td>
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<tr>
<td>FSL W5 - 0208</td>
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<th>(II) Protease synthesis [Incub: 21 °C - t = 7 days]</th>
<th>(III) Protease heat resistance [Heat: 95.0 °C - 8.5 min] [Incub: 21 °C - t = 14 days]</th>
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<td><strong>P. fragi</strong></td>
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<th>(II) Protease synthesis [Incub: 21 °C - t = 21 days]</th>
<th>(III) Protease heat resistance [Heat: 95.0 °C - 8.5 min] [Incub: 21 °C - t = 14 days]</th>
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Papers

2. Lara-Aguilar S, Alcaine SD. Inhibition of Foodborne Pathogens and Spoilage Microorganisms Associated with Dairy Products by Lactose Oxidase. (Under Review) 2019

Conferences


Presentations

2. New York State Cheese Manufacturers’ Association Spring Meeting. New York State Cheese Manufacturers’ Association, Syracuse, NY. “What’s Fermenting in Extension Research” Participants = 135, length in hours = .75, Total contact hours = 101, March 6-7, 2018
5. IFT Live Webcast - Emerging Technologies in Dairy Foods to Reduce Food Waste. March 21, 2017
Novel Diagnostics for Dairy
Evaluating the ElastoSense as an indicator of incoming milk quality and product shelf life for cheese and fermented dairy producers.
Other Variables: Culture type, Temperature
Understanding Limitations

Gel Strength (G') vs. Time (s)
Refermented

Upcycling dairy by-products into a new category of value-added consumer beverages.
Current Progress

- Understand other isolates and dairy-product fermentation

- Understand value-add products Ethanol & Organic Acids relevant to NY State Producers

- Evaluating Alternate Production Methods to Improve Processing

J. Marcus, T. DeMarsh, S. Alcaine. 2018
Presentations

2. Lawton M, Alcaine SD. Mashing lactose into a fermentable adjunct. ASBC Annual Meeting. American Society of Brewing Chemists, Fort Myers, FL. June 4-7, 2017 (Poster)

Papers


Conferences

1. Northeast Dairy Foods Research Center Annual Meeting. "Developing Streams for Acid Whey Utilization" January 12-13, 2018
3. New York State Cheese Manufacturers’ Association Spring Meeting. New York State Cheese Manufacturers’ Association, Syracuse, NY. "What’s Fermenting in Extension Research” Participants = 135, length in hours = .75, Total contact hours = 101, March 6-7, 2018
5. Whey and Dairy Co-Products Symposium. Cornell University, Ithaca, NY. “Acid Whey Beer: acid whey as a fermentation base in a brewing process” August 13-14, 2018

Outcomes

Marie Lawton
Ph.D. Program

Justin Marcus
M.P.S. Program
2018

2017
Samuel D. Alcaine, Ph.D.
Assistant Professor - Dairy Fermentations
Department of Food Science
Cornell University

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