

Annual Report of Progress
to the
MISSISSIPPI SOYBEAN PROMOTION BOARD
for 1999

PROJECT TITLE: Fortification of Low Fat Yogurts with Soy Protein

PROJECT LEADER: Dr. MaryAnne Drake
Dept. Food Science and Technology
Mississippi State University

OBJECTIVES & SIGNIFICANT ACCOMPLISHMENTS:

Objective 1: Determine the physical and sensory properties of soy protein fortified yogurt

Objective 2: Determine the effect of soy protein on yogurt microflora

Objective 3: Optimize soy protein yogurt formulations and compare different consumer group perceptions of a soy protein fortified yogurt

Objective 4: Determine effect of soy protein fortification to milk-based yogurt on consumer market acceptance and perception

Work has been completed on objectives 1 and 2. Work on objective 3 is currently underway (halfway through). Fermentation and microbiological properties of yogurt are not affected by the addition of soy protein. Yogurts fortified with 1 or 2.5 % soy protein are most similar to traditional yogurts in sensory and physical properties. Higher concentrations of soy protein result in yogurts that are chalkier, more viscous in texture and less sweet. Soy flavor is not affected by sweetener type or concentration, but fruit flavorings (lemon or strawberry) significantly decreased soy aroma, soy flavor, and astringency. Work in the coming year will focus exclusively on consumer knowledge, perception, and acceptance of soy fortified yogurts.

A peer-reviewed abstract and presentation on objectives 1 and 2 (see attached) was presented at the 1999 IFT annual meeting in Chicago, IL. The results of part of objective 3 were written into an abstract (see attached) which has been peer-reviewed and accepted for presentation at the 2000 IFT annual meeting in Dallas, TX. The manuscript for objectives 1 and 2 of this study was completed and submitted to the Journal of Food Science in November 1999. Two to three subsequent manuscripts from objectives 3 and 4 are also expected. Current results continue to

provide evidence that a highly acceptable soy protein fortified yogurt product will result from this research, and that this product, with technology transfer, will be highly marketable and appealing to food processing companies, thus increasing marketing venues for soy protein. The principal investigator has continued to work closely with Brotech, Inc. and Central Soya, Inc. In July, 1999, the principal investigator was presented the Central Soya Researcher of the Year award by Central Soya for this work with yogurt fortification. In conjunction with Brotech, Inc., and Central Soya, Inc., 2500 4-oz cups of lemon flavored soy fortified yogurt were made at a commercial processing facility in Kansas City, MO and exhibited at the World Wide Food Exposition in Chicago, IL on Oct 28-31. The exposition was attended by 20,000 representatives from the food industry. The production of the yogurts in a commercial facility confirms applicability of the developed procedure to the food industry. A preliminary patent application was also filed in July 1999. Many options are currently being explored for technology transfer. A letter of support from Brotech, Inc. is attached.

PUBLICATIONS:

Development of a soy protein fortified yogurt. 1999. M.A. Drake, X. Q. Chen, S. Tamarapu, and B. Leenanon. Abstract 37C-20, Book of Abstracts, IFT Annual Meeting, Chicago, IL July 24-28.

PROVISIONAL PATENT

Yogurt comprising surfactant-free soy protein. Filed July 13, 1999, Ref # 99041907.

Peer-reviewed abstract presented at the 1999 International Food Technologist meeting in Chicago, IL

Development of a soy protein fortified dairy yogurt

M.A. Drake, X. Q. Chen, S. Tamarapu, and B. Leenannon

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Interest in the health and functional benefits of soy protein continues to grow. Results from different studies confirm the numerous health benefits of soy protein. Development of an acceptable and healthy soy product continues to be a challenge. The objectives of this study were to determine the microbiological, chemical, and sensory effects of soy protein fortification on dairy-based yogurts.

Lowfat yogurt mix (2 % milkfat) was fortified with water-washed soy protein concentrate (0, 1, 2.5, or 5 %). Mixes were adjusted with nonfat dry milk to an equivalent total solids concentration. Yogurts were homogenized and fermented to pH 4.2. Microbiological counts for streptococci, lactobacilli, or bifidobacteria were determined weekly. Viscosity of yogurts was determined with a viscometer. Sensory attributes (visual, aroma, and flavor) were determined using a trained descriptive panel (n=11) at day one and after two weeks storage.

Microbiological counts in dairy yogurts were not affected by soy protein ($P \leq 0.05$). Instrumental and sensory viscosities of yogurts increased with soy protein concentration ($P \leq 0.05$). Yogurts with 5 % soy protein were darker, more chalky, and less sweet compared to control yogurts or yogurts with lower concentrations of soy protein ($P \leq 0.05$). Yogurts containing 2.5 or 5 % soy protein increased in soy flavor and aroma after two weeks storage ($P \leq 0.05$). Yogurts with 1 or 2.5 % soy protein were most similar to control yogurts.

Fortification of dairy yogurts with 1 or 2.5 % soy protein may result in yogurts with additional health benefits but similar in properties to regular yogurts.

Peer-reviewed abstract accepted for presentation at the 2000 International Food Technologist meeting in Dallas, TX.

Effects of sweetener, sweetener concentration, and fruit flavor on sensory properties of soy fortified yogurt

M.A. DRAKE, P.D. Gerard, and X.Q. Chen, Dept. Food Science, Mississippi State university, MS 39762-9805

The American diet does not traditionally include soy protein. With the recent FDA approved health claim, much research has focused on finding new acceptable food vehicles to include soy protein. Dairy yogurt is a potential way to introduce modest amounts of soy protein. To maximize flavor quality, research is needed to identify the effects of sweetener and flavoring on sensory attributes of soy fortified yogurt.

The objectives of this research were to identify the effects of sweetener type, sweetener concentration, and fruit flavor on the sensory attributes of soy fortified yogurt.

Soy fortified dairy yogurts were made by the addition of soy protein concentrate (0, 2.5, 5 %) to standard yogurt mixes prior to fermentation. Sweetener type (sucrose, fructose, sucrose/fructose) and sweetener concentration (6, 8, 10 %) were incorporated into yogurts in a split plot design with nested soy concentration. Flavor effects (plain, lemon, strawberry) were studied in a 3 x 3 factorial design (soy concentration x flavor). A trained descriptive panel (n=13) evaluated yogurts for eight flavor terms.

Sweetness decreased and astringency increased with increasing soy concentration ($P \leq 0.05$). Astringency decreased with increased sweetener concentration ($P \leq 0.05$). Soy flavor was not affected by sweetener type or sweetener concentration. Lemon and strawberry flavors decreased soy aroma, soy flavor, and astringency in soy fortified yogurts ($P \leq 0.05$).

These results indicate that sweetener concentration and fruit flavors play a crucial role in formulating yogurts fortified with soy protein.

BROTECH

TECHNICAL SALES AGENTS & CONSULTANTS

January 25, 2000

Mary Ann Drake, Ph.D.
Mississippi State University
Food Science Department
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Mississippi State, MS 39762

Dear Dr. Drake:

You are to be commended for the achievements realized through the research involving soy protein. To move from a concept to a commercialized product in such a short period of time is remarkable. This project positively reflects a very significant step in technology transfer from the university level to industry. The product's overwhelming acceptance verifies the success of this transfer by attendees at the "99 Dairy Food Expo." Introducing the soy protein into yogurt further enhances one of the industry's most healthy products by allowing one to take advantage of the Healthy Heart-Soy claim, recently approved by the FDA.

As in the past two years, we will continue our support of your work in this area both financially and with impute based upon our experiences with consumer products relative to the scope of this project. You are pioneering an effort to effectively join agricultural segments together for the benefit of all!

Sincerely,

E.J. Connolly

EJC:pac

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