

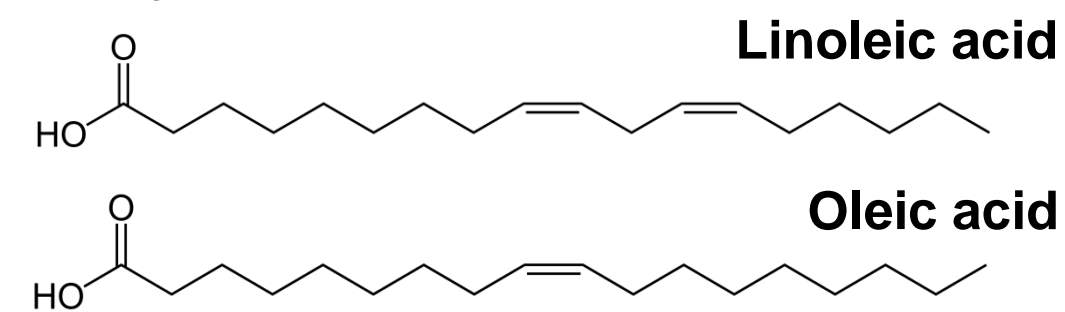
# Evaluating the impact of safflower oil concentration and fatty acid composition on consumer acceptance of soy pretzels

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## INTRODUCTION

Obesity rates are only growing, leading to higher rates of metabolic syndrome, congruent with an increase in sedentary lifestyles<sup>1,2</sup> and snacking.<sup>3,4</sup> Snacking is highly problematic since it typically consists of energy-dense and nutrient-poor foods, contributing to increases in blood glucose and triglyceride levels as well as decreasing satiety. Therefore a functional food which consists of nutritious ingredients such as soy and safflower may be one strategy in ameliorating obesity.

High linoleic acid safflower oil has been shown to reduce body fat accumulation<sup>5,6</sup> and significantly improve several factors of metabolic syndrome in diabetic women by increasing insulin sensitivity and reducing trunk adipose.<sup>7</sup> Soy contains many bioactive compounds, most importantly isoflavones, that have been associated with improving energy utilization.<sup>8</sup> When a functional food such as a pretzel is used as a delivery vehicle, substantial quantities of safflower oil and soy in pre-portioned amounts can be accommodated as it affords the consumer the convenience of a snack food. However, integration of large quantities of oil may in theory compromise the quality of a yeasted dough product such as the pretzel hence have a detrimental impact on consumer acceptance. Moreover, linoleic acid since it is a polyunsaturated fatty acid, it is more prone to oxidation compared to a monounsaturated fatty acid such as oleic. The composition of the two types of fatty acids can be enriched in safflower oil and the basis of this investigation.



## OBJECTIVES

- To characterize the organoleptic attributes in the high linoleic safflower oil pretzels and high oleic safflower oil pretzels
- To investigate consumer acceptability at the various percentages of oil content (5, 10, 20, 30%) in the two types of pretzels through sensory evaluations.

## METHODS

### Pretzel Preparation

A sponge-dough process was utilized for the production of the pretzels and according to the formulation detailed in Table 1. The respective safflower oil either high linoleic or high oleic was added. Dough was rolled in approximately 6 to 10 inch cylinders and cut into 12 equal pieces, Figure 1A. The pieces were placed on a prepared baking sheet and sprayed with 5% NaOH. The pretzels were placed in a proofing cabinet (40 °C for 15 minutes uncovered) and baked at 163°C for 10 minutes, Figure 1B.



Figure 1. Safflower oil soy pretzels before (A) and after baking (B)

Table 1. Safflower Oil Pretzel Formulation

Ingredients	5% Safflower Oil	10% Safflower Oil	20% Safflower Oil	30% Safflower Oil
Wheat flour (Bouncer, Bay State Milling Co, Quincy, MA)	55.0%	50.0%	40.0%	30.0%
Gluten (Bob's Red Mill, Portland, OR)	3.0%	3.0%	3.0%	3.0%
Soy flour and Soymilk Mix (ADM Nutrisoy flour and Devansoy, soymilk)	32.8%	32.8%	32.8%	32.8%
Yeast (SAF, Le Saffre, Milwaukee, WI)	0.7%	0.7%	0.7%	0.7%
Sugar (GFS, Wyoming, MI)	13.0%	13.0%	13.0%	13.0%
Safflower Oil (HighOleic: Hollywood, Dain Foods High Linoleic: Arista Oils)*	5.0%	10.0%	20.0%	30.0%
Salt (Diamond Crystal, Tampa, FL)	0.7%	0.7%	0.7%	0.7%
Dough conditioner (Caravan Foods, Totowa, NJ)	0.1%	0.1%	0.1%	0.1%

\*High-Linoleic Safflower oil (71% of total fatty acids) and High-Oleic Safflower oil (76% of total fatty acids)

### Sensory Design

**Acceptability Test:** 9 point Hedonic scale (1=dislike extremely and 9= like extremely). Samples presented in a randomized serial monadic presentation order.

**Attributes evaluated:** overall liking, aroma, flavor, sweetness, bitterness, and texture.

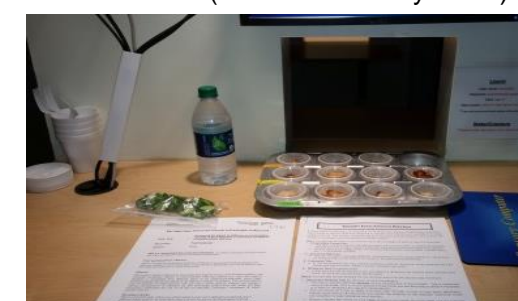
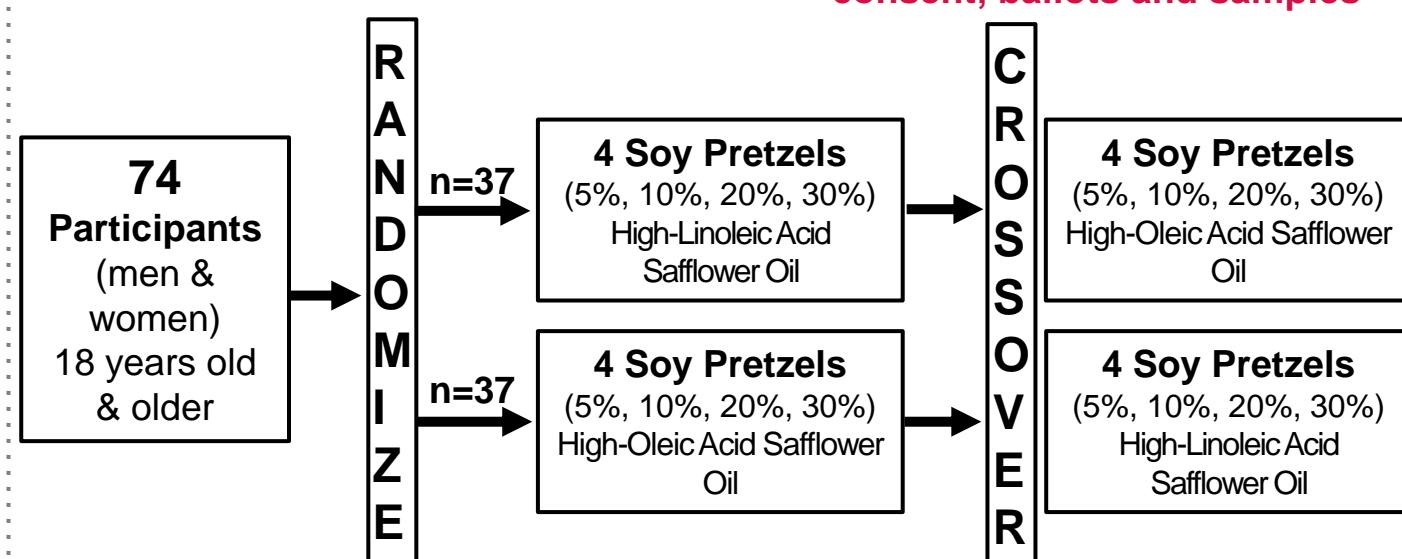


Figure 2. Sensory Evaluation, including palette cleanser, water, consent, ballots and samples



## RESULTS

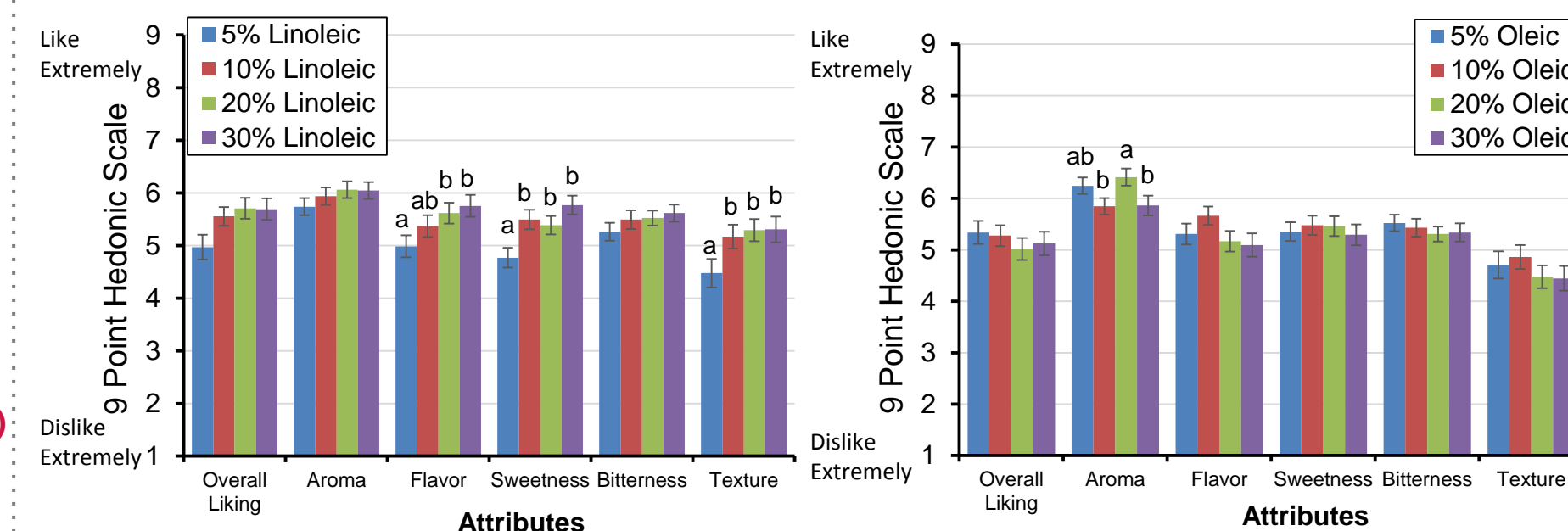


Figure 3. Consumer acceptability using a 9 point Hedonic scale of Soy Pretzels with High Linoleic Acid Safflower Oil (left) and of Soy pretzels with High Oleic Safflower Oil (right). Letters denote mean separation where significant differences ( $p \leq 0.05$ ) among the various oil concentrations were found using ANOVA with Tukey's posthoc test

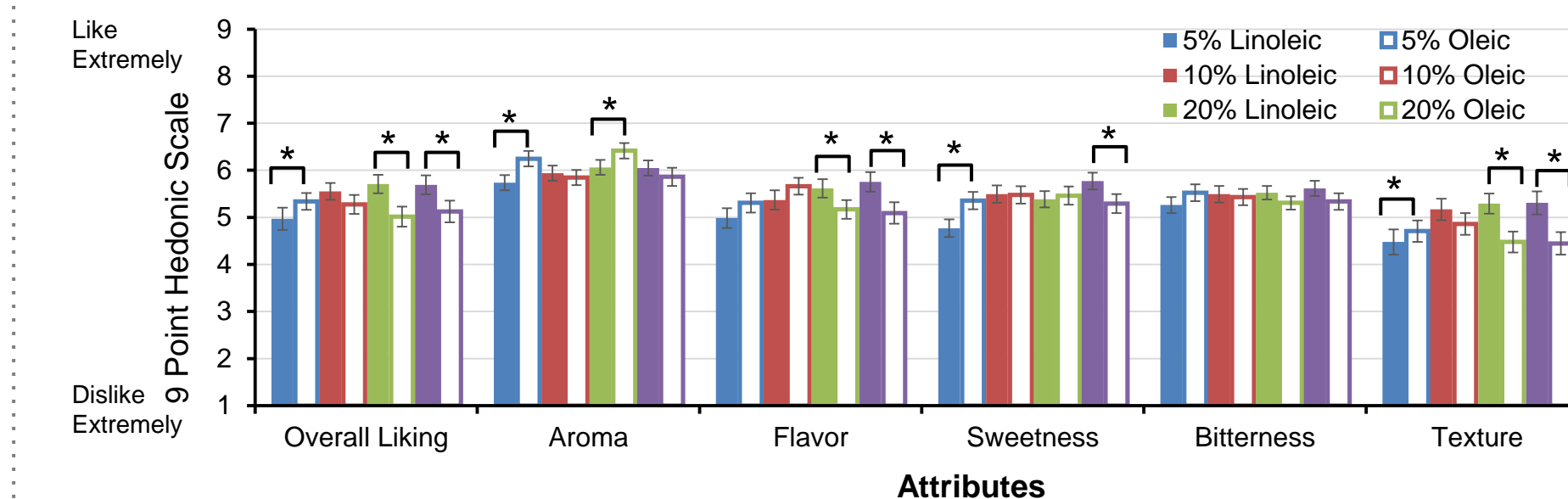


Figure 4. Comparison of consumer acceptability among the various attributes. Paired t-test was used to discriminate differences between high linoleic and high oleic soy pretzels ( $p \leq 0.05$ ) and indicated by asterisks

## CONCLUSIONS

In the high linoleic soy pretzels, concentration had a significant difference on consumer acceptance. Overall there was no significant difference on consumer acceptance in high oleic soy pretzels at the different concentrations. The fatty acid composition did impact consumer acceptance resulting in higher acceptance scores for the high linoleic soy pretzels.

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