College of Food, Agricultural, and Environmental Science/ Food Science Technology

Comparison in physicochemical attributes changes between soy pretzels made with various saturated lipids at 10% or 40% oil concentration

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INTRODUCTION

Pretzels, traditionally made with 3-6% shortening, is a popular snack in America resulting in over 500 million in sales in 2010. Incorporating ingredients shown to decrease biomarkers of obesity in this popular snack food may provide an excellent means of enhancing nutrition. In previous studies, diets rich in safflower oil induced fat-mass reduction by influencing lipogenesis and lipid metabolism; while thermogenesis was mediated by saturation of fatty-acids. Various studies indicated soy protein have anti-obesity implications. Changes in amount, composition (chain-length, degree of saturation) and crystalline polymorph of added lipid affect the pretzels physicochemically and may lead to undesirable food products.

AIM

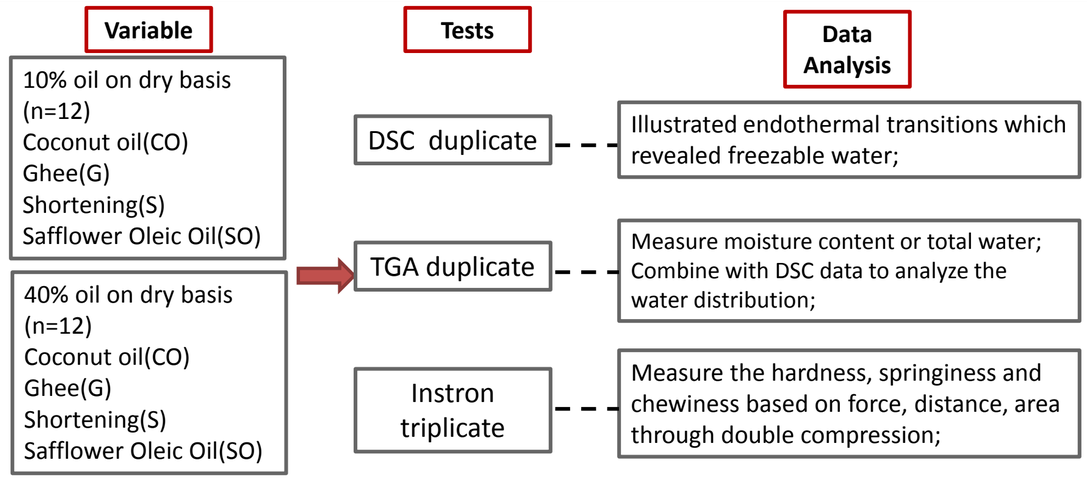
The objective was to select a type and amount of lipid that will least affect the texture and water distribution of an optimized soy pretzel.

Variables selection

The lipids investigated are coconut oil, ghee, shortening and high oleic safflower oil. Base on the structures of the hydrocarbon chain, there are divisions in fatty acids(see Table 1.). Lipids can also be classified by their crystalline behavior, including *alpha-, beta-,* and *beta-prime* forms. Ghee and shortening are classified to *beta-prime* type, while safflower and coconut are *beta* type. *Beta-prime* polymorph is usually the most stable and functional in fat products.

Table 1. Fatty acid composition of Coconut oil, Ghee, Shortening and Safflower

Oil	Saturated fat	Mono-unsaturated fat	Poly-unsaturated fat
Coconut Oil	91% (50% lauric acid C12)	6%	3%
Ghee	68%	28%	4%
Shortening	52% (35% palmitic acid C16)	22%	26%
Safflower Oleic Oil	7%	76%	12%



Method

Soy pretzels were made by mixing, proofing, alkaline spraying, baking, and then were frozen until instrumental analysis. Samples varied in types (coconut oil, ghee, shortening and safflower oil) and amount (10% and 40%) of lipids were analyzed to give total water content, amount of bounded water and textural attributes (hardness, springiness and chewiness) results.

Differential Scanning Calorimeter (DSC)

Thermogravimetric Analyzer (TGA)

Instron Universal Testing Machine

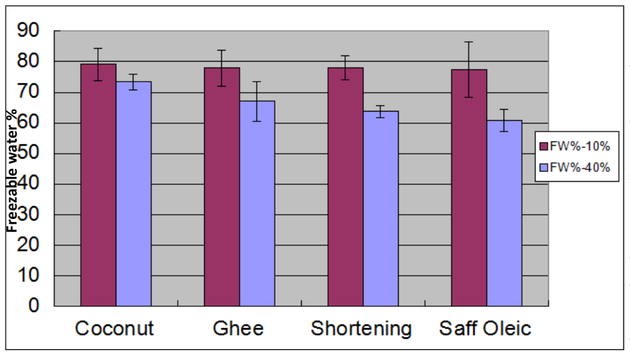


Figure 1. Percentage of Free Water to all water in the soy pretzels made with coconut, shortening, ghee and safflower oleic oils at 10% and 40% in the dry basis

Results

- No significant difference in freezable water content, springiness, hardness and chewiness at 10% among four lipids.
- Freezable water content decreased with the increase in oil content(40%) by S and SO, not C or G.
- Significant decrease in springiness and chewiness were observed between 10% and 40% with saturated fats; C, G and SO had similar springiness, but C is chewier than G and S.
- Hardness decreased with S and G, but increased with C at 40%
- No significant changes in springiness, hardness and chewiness with SO between 10% and 40%.
- Different modulating observation segregated lipids into 3 groups (CO, SO, and G and S), but not at 10% concentration.

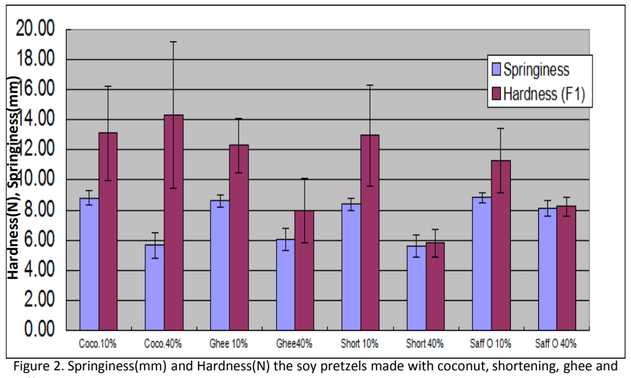


Figure 2. Springiness(mm) and Hardness(N) the soy pretzels made with coconut, shortening, ghee and safflower oleic oils at 10% and 40% in the dry basis

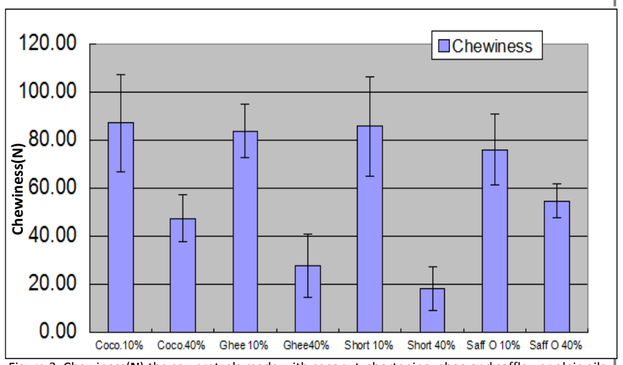


Figure 3. Chewiness(**N**) the soy pretzels made with coconut, shortening, ghee and safflower oleic oils at 10% and 40% in the dry basis

Conclusions

Safflower oil, rich in mono-unsaturated triglycerides, changed the least in texture properties compared to saturated fats, and showed a reduction of percent "freezable" water in soy pretzel. Thus a safflower oil/soy pretzel will be utilized in future human clinical trials.

Future direction

- Sensory testing to affirm the acceptability for soy pretzels with safflower oleic oil at high percentage
- Colorimeter, loaf volume, rheological studies and X-ray diffraction on starch gelation
- Monitor lipid oxidation during storage
- Incorporation of other liquid oils

Reference

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