

## DEVELOPMENT OF A SOY SASKATOON BERRY SMOOTHIE

### INTERIM REPORT

PROJECT #3568

Prepared for:

Manitoba Pulse Growers Association Inc  
38 4<sup>th</sup> Ave N.E.  
Carman, Manitoba  
R0G 0J0

Submitted by:

Meeling Nivet, B.Sc. Group Leader, Product Development  
Mia Wang, B.Sc. Product Development Consultant  
Food Development Centre

Contact: [Meeling.Nivet@gov.mb.ca](mailto:Meeling.Nivet@gov.mb.ca)  
(204) 239-3755

## Prototype Development of Soy Yogurt-Saskatoon Berry Smoothie

The growing awareness of health benefits of the soybean and its unique functional properties has made soy-based products increasingly popular in the mainstream market. Manufacturers are demanding high solubility and better flavoured soy products. These include the highly demanded soybean oil, soy flour, soy protein concentrates and isolates, textured soy protein, soy lecithin, soy isoflavones and new soy foods. Traditional soy foods including tofu, soymilk, miso, and tempeh, have been consumed for centuries by Asian populations and more recently by Western populations, especially vegetarians, lactose intolerant and consumers needing cholesterol reduction diets. Hence, consumer demand for non-dairy beverages with high acceptance and functionality has been increasing in North America. From a nutritional perspective, soybeans and soyfoods have been primarily identified for their protein content, but during the past several years there has been much interest among clinicians and researchers in the potential role of soyfoods in preventing and treating chronic diseases. However, the undesirable flavours (beanie, bitter, astringent) associated with soy products, generated primarily during processing, have had an effect on the market growth and consumption of soy food and beverage products.

Smoothies, are considered one of the most popular high end beverages in the USA and UK markets and projected to reach \$9 billion by 2015 (Global Industry Analysts (GIA) 2011). Smoothies have a broad definition and are mostly defined as a thick, creamy beverage composed of both fruit and dairy ingredients. A non-dairy smoothie can be made by replacing the dairy ingredient of traditional smoothies with soymilk derived from soy meal thus the idea of affiliating soymilk and bacteria culture to formulate an innovative, unique, multifunctional soy beverage has been explored. Several studies from Wang et al. (2002, 2003, 2006) have shown that fermenting soymilk with lactic acid bacteria considerably increases its health value, by increasing the antioxidant activity. Another fermentation studies performed by Scalabrini et al (1998) have shown that fermentation can remove the undesirable beanie taste, mostly due to the presence of *n*-hexanal and pentanal. The study conducted by Hughes&Dallas (1991) have shown that fermentation with *Bifidobacteria*, can make the soy more digestible by reducing the soy oligosaccharides, stachyose and raffinose (Cruz et al 1981) thus less flatulence and discomfort is experienced.

This project explored the product development challenges to produce a prototype soy-Saskatoon berry smoothie. The smoothie had to incorporate Manitoba Saskatoon berries as an ingredient, consist of a creamy texture, be natural, tasty, contain functional nutritional value and be marketable to the general public. The decision to apply a fermentation step to the soymilk was based on the literature review that indicated fermentation increases nutritional value and reduces the undesirable beanie flavour of soy. The literature review also recognized

that the main value of soybean is to produce soy oil (15% of the bean) the soymeal (85% of the bean) is used primarily for animal feed. The defatted soy cake/meal, the by-product from soybean oil extraction, is considered underutilized and further processing of this nutritionally dense by-product containing high protein and high fibre could be made into defatted soymilk for further processing into a smoothie beverage. A source of defatted soy cake/meal was available from the Richardson Centre for Functional Food and Nutraceuticals (RCFFN) in Winnipeg. The Manitoban Saskatoon berries were chosen as the fruit base, but other Manitoban berries were added to the fruit blend subsequently increasing the antioxidant level of the beverage and improving the flavour profile of the smoothie.

The product and process development of the soy-yogurt (sogurt) Saskatoon smoothie beverage involved the development of the following processes:

1. Process development of soymilk from defatted soy cake/meal
2. Process development of sogurt from soymilk
3. Process development of Saskatoon puree and juice from Manitoba berries
4. Process development for sour cherries and black currant juice from Manitoba berries
5. Product formulation of soy smoothie
6. Process development of soy smoothie

Several challenges were encountered during the smoothie development.

- i. The gritty mouth feel and beanie flavour from the defatted cake were undesirable consequently suitable clarification and homogenization equipment had to be identified.
- ii. When blending the soymilk directly with the fruit based juice, immediate enzymatic browning occurred and an unappealing color was generated.
- iii. The fermentation process development identified that suppliers of the lactic acid bacteria generated different viscosity and yogurt flavour. Several trials had to be conducted to incorporate the culture, Saskatoon berry purees and juices.
- iv. Manitoba berries were sourced as the whole fruit intact from farmers therefore a puree and juice processing method was a necessary step.
- v. The product development investigated sweetener systems including, organic cane sugar, grape juice concentrate and honey to determine appropriate flavour balance.
- vi. The most challenging development was to determine the best flavour blend to incorporate into the smoothie. After two weeks shelf life, panellists noted that the fruity flavours of the smoothie deteriorated and the beanie flavours dominated the smoothie. FDC worked closely with flavour houses to determine a natural flavour to mask beanie, bitter flavours and at the same time incorporate a creamy mouth feel and improve overall balance.

- vii. The preliminary study showed that separation of phases in the beverage occurred during storage, so the product development investigated stabilization methods and ingredients (colloid homogenization, gums); heating systems (70<sup>0</sup>C to 90<sup>0</sup>C); two storage temperatures (refrigerated and room temperature).

As the smoothie, is a plant-derived protein based beverage, regulations on fortification were investigated and considered in formulation development. A final prototype smoothie beverage was successfully developed containing, defatted soy, bacterial culture, Saskatoon berry puree, saskatoon berry juice, sour cherry juice, black currant juice, grape juice concentrate and water, multivitamins and mineral fortification and natural flavour. The prototype was considered by panellists to have a pleasant balance of fruity flavours and soy with appealing colour. Panellist's comments included that the smoothie tasted less beanie in flavour than traditional soy beverages.

The nutrition claims that can be made from this smoothie beverage include:

- Rich in or very high in calcium
- High in iron or Good source of iron
- A source of fibre
- Low in fat
- Low in saturated fat

### *Opportunities*

Soy meal is mainly used in animal feed, but food developers could add value to this by-product of soy oil production, as a food ingredient in meat analogues, energy bars, beverages, bread, baked goods and pastas. Particularly the beverage and liquid food industry can develop soy-yogurt based soy deserts, dips, soy cream cheese and soy beverages with functional value. Alternatively these products can be made from the whole soy bean and the undesirable flavours of soy can be successfully masked. Farmers can benefit as more value added soy foods are developed and integrated into the market from the whole soy bean or soy cake.

### *References:*

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