Use of Soybeans to Produce Dairy-Like Products

Susan Arntfield, Karen Pitura and Mingjue (Shirley) Wu, and Gary Fulcher, Food Science, University of Manitoba

While the presence of soy milk in the market as an alternate to cow's milk is well established, the production of other dairy like products is not as well advanced. In this study we looked at using high protein soybeans to produce a frozen dessert and cheese –like products. While the combination of dairy and soy material was initially considered for the work, the fact that both dairy and soy proteins are considered major food allergens led to the realization that a 100% soy product would have stronger commercial appeal.

Three different starting materials were used, all from a high protein soy bean (PR702A07RR). The whole seed as well as high-oil and low-oil press cakes prepared from this soybean variety were used. Protein and fat contents are given in Table 1.There was batch to batch variation in fat content of the press cakes from the Richardson Centre. Protein contents were determined on one batch only. The higher protein content in the press cakes compared to the whole seed was considered beneficial in terms of production of soy based products and both the cheese-like products and frozen desserts made from the press cakes had a better texture. As the protein level in the press cakes was similar, the high oil press was the preferred starting material, in that it was easier to produce and required lower levels of fat addition when making cheese-like products.

Table 1. Protein and fat contents of soy materials used for production of cheese-like products.

Sample	% protein (N*5.71)	% fat
High- protein soybeans	6.84	19.0±0.9
Low-oil press cake	8.41	7.5±0.5
High-oil press cake	8.37	10.8±0.7

Frozen Dessert

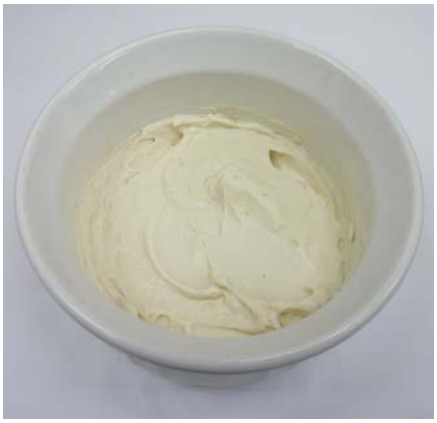
The preparation of a frozen soybean dessert began with preparing soy milk by extracting protein from the press cake using approximately 1 part press cake to 7 parts water. To this sugar, vanilla and a pinch of salt were added and the ice cream-like product was prepared using a small scale automatic ice cream maker. Initially all formulations produced icy products with signs of layering when frozen. To over come this problem several stabilizers were investigated; the inclusion of 1% sodium alginate (food grade) resulted in a creamier texture that resembled ice

Frozen soybean dessert

cream. The addition of flavours (vanilla, chocolate and strawberry) seemed to mask any beany soybean flavour. There is still room for improvement on the texture as the product does not have the richness of an ice cream.

Cheeses

As was the case with the frozen dessert, initial experiments confirmed that there were advantages in working with the high oil press as the starting material. The initial step in the production of cheese was to make tofu from the extracted soymilk. To produce a cream cheese-like product, it was then necessary to add oil, pectin, gums and salt. The pectin and commercial gums were required for texture. In the end, approximately 5% added oil, with pectin, gum and salt added at approximately 1% each produced the most acceptable product in terms of texture. A noticeable beany flavour was obtained with the early editions of this product. Addition of flavours, in particular, herbs (local grocery store), lemon and cucumber (from Virginia Dare) flavours seemed to give a more desirable taste.



Cheese-like soybean spread

Attempts were made to produce a hard cheese-like soy product. Reducing pH and adding rennet as is done for normal cheese production did not produce the coagulation necessary for cheese. Using the formulation for the cream cheese-like product with increased pectin and gums (up to 5% of each) produced a firmer product, but the product was sticky and did not resemble a hard cheese. To get the required texture, we used agar flakes and compared two levels of press cake concentrations (3:1 water to press cake and 5:1 water to press cake), three levels of agar flakes (0.1, 0.3 and 0.5 g) and three levels of a corn starch product (0, .3 and .5g). To prepare the cheese-like product, agar flakes had to be mixed with cold tap water, and boiled. The starch was added to the hot agar and mixed with the press cake extract, oil and salt. From this experiment, it was concluded that the 5:1 soy concentration provided a milkier appearance than the 3:1 mixture. As the 0.5 g agar flakes didn't dissolve well in water the best formulation contained 0.3 g agar flakes and 0.5 g starch dissolved in 10mL water and mixed with 10 mL of the 5:1 soy mixture. Images of these cheeses can be seen in Figure 1. Alternates to the starch are being considered and flavours will be required to overcome the beany taste, but the texture is close to that of a hard cheese. Inclusion of carrot powder adds some nutritional benefits and produces an orange colour that is typical of many cheeses.

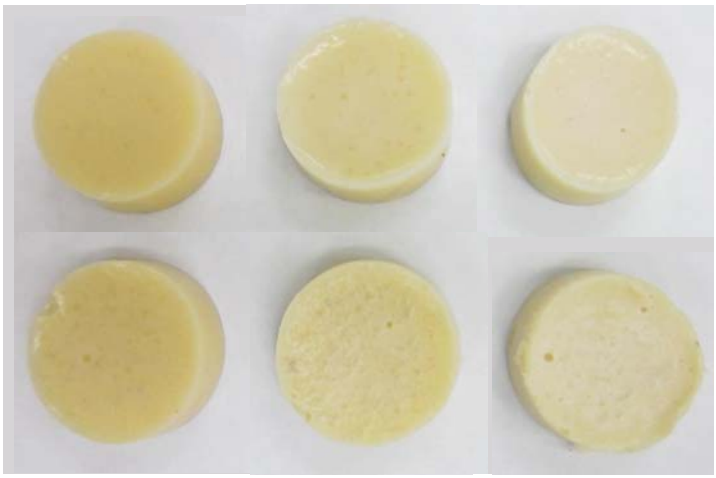


Figure 1. Hard cheeses from soybean with various levels of agar and starch.

Acknowledgement: This project was supported by the Manitoba Pulse Growers Association and the Manitoba soybean industry and made possible due to funding from the Governments of Manitoba and Canada through the Growing Forward, Strategic Innovation Fund-Advancing Agri-Innovation Program.