

final report

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Smart Snack – fibre added red meat snack

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Executive Summary

Functional foods include a wide variety of foods and food components that are believed to improve overall health and well-being or reduce the risk of disease. There are significant opportunities for the food producers to include functional ingredients into snacks and foods in order to make it healthy, attractive and enjoyable. The growing demand for novel and healthy food ingredients makes functional foods an important part of the food industry in Australia. The ultimate goal of the project was to produce a red meat product containing small amounts of natural ingredients or functional components, at levels approved by the Food Standard Australia New Zealand (FSANZ) and Food and Drug Administration (FDA), with specific health benefits. This product should also be convenient to prepare and ready for eating within 20 minutes, which is suitable for high school students, universities and aged care facilities as a quick snack.

In the formulation process, several steps were undertaken in order to develop a snack that is similar to the existing beef savoury roll product. At each step, products were subjected to taste evaluation by randomly selected consumers. The product was developed using 1 g of beta glucan (Oatwell) and 2 g of flaxmeal incorporated into beef mince mix during the final stages of the cooking process. The weight of the final product was approximately 70 g containing 40 g of pastry base and 30 g of mince mix. These products meeting the set criteria were then further evaluated for product stability, taste and market acceptance.

The product stability assessment indicated that the addition of Oatwell or flaxmeal to the beef mince mix approximately doubled the amount of fibre content compared with the standard beef mince. Both fibre-enriched products had greater levels of fibre remaining in the beef mince mix after 7 month of storage at -20°C. The results from sensory evaluation showed clear differences between tested products, the product with Oatwell fibre standing out for its curry flavour, spiciness and taste. As the products were formulated with the same amount of spices, this implies that the addition of OatWell fibre enhances natural taste of the product. However, there were recommendations given by the 'Sensory Solutions' that modifications which will result in enhanced aroma delivery are highly recommended as aroma is enticing and also acts to create an expectation of flavour in the product. It was also stated that the improvement in the oiliness of the pastry would be more attractive to consumers because an oily product will potentially cancel out any positive effect that the fibre added snack can bring.

Once the assessment of sensory properties and storage stability of snack products was completed, it was decided by the Meat & Livestock Australia and AIFoods that the snack products added with Oatwell ingredient will be launched into supermarkets and retail outlets for scale up and in store evaluation process. For distribution of snack with Oatwell fibre and standard beef snack, 15 stores of Coles and Woolworth were selected using Aztec data. Special care was taken to select stores in both blue collar and white collar suburbs. AIFoods requested permission from Coles and Woolworth to

distribute the samples along with questionnaire and a cover letter in their stores. The in-store evaluation results indicated that an equal number of customers found no difference in appearance and oily flavor of both the products. Minor differences were observed between results for overall flavor, filling flavor, taste, aroma and aftertaste.

The project work show that snack with Oatwell fibre was not significantly different from standard beef snack. The objective of this study was to develop a red meat snack rich in fibre, by incorporating fibre into standard beef snack product while maintaining all the sensory attributes close to the standard product. The outcomes of the project indicate that it is feasible to develop a fibre added snack, which is suitable for high school students, university students and aged care people. The objective of the project was achieved successfully. However, at commercial level beef snack with Oatwell fibre can be improved by increasing curry flavor and improving the texture of product as indicated by consumers from the scale-up and in-store evaluation.

Introduction

Rapid advances in science and technology, increase in healthcare costs and interest in maintaining health and wellbeing through food are some of the main factors driving consumers to consider the incorporation of functional foods into their diet. Thus, there is an increasing interest amongst the food companies to identify/develop normal food products having ingredients with scientifically proven health benefits. Red meat contains unique nutrients that are essential for optimum growth and development. There is interest in developing new fibre added red meat snacks that can be used by high school students, university students and aged care as a ready to eat (convenient to serve within 20 minutes) health-enhancing food. The aim of this project was to develop a fibre added balanced red meat snack that can be used by school children, adults and age care facilities as a quick snack.

Methodology and outcomes

The project was completed in five stages, which were reported as milestones. In brief these were:

1. Identification of fibre ingredients or functional components that can be incorporated into red meat mince for the preparation of convenient snacks through a literature search.

In this literature report, several functional ingredients that have health improving properties were discussed. The identified ingredients that were acceptable to the Food and Drug Administration (FDA) for inclusion into meat snacks as fibre supplement were flaxseed, oat fibre, psyllium fibre and guar gum. The literature demonstrated that consumption of 3 g of soluble fibre per day from guar gum, oat bran or psyllium fibre may provide a favourable effect in maintaining human health. It was also found that these ingredients would provide reasonable amounts of insoluble fibre as well.

Among the ingredients reported in the literature, the Australian International Foods (AIFoods) company selected beta-glucan from oats (Oatwell) and flaxmeal from flaxseed as functional ingredients that could be used for the development of fibre enriched snack products. The challenge was to determine amounts that could be incorporated into snacks without changing the taste or texture of the snacks while keeping the product cost at an appropriate level.

2. Formulations and production methods for the preparation of a convenient healthy snack

There were two options to incorporate the functional ingredients into the product. One was to add ingredients to beef mince and the other was to add ingredients to the pastry base. It was decided that the functional ingredients would be incorporated into the mince in order to prepare the fibre enriched red meat snack. The weight of the product was ~ 70 g, representing 30 g of beef mix and 40 g of pastry base. The beef mix was made of beef, potato, onion and spices. The pastry base was made of wheat flour. Several steps were undertaken in the formulation process in order to develop the snack that is similar to their existing product (beef savoury rolls). Those steps were

1. Different amounts of functional ingredients tested in the formulation.
2. Different levels of water added to get the beef mix appropriate.
3. Length of cooking/heating with other food ingredients.
4. Stage of addition of functional ingredients to the formulation.
5. Substitution level of other ingredients from the existing formulation.
6. Addition of other ingredients in the formula such as tomato paste, hamburger mix, vegetable mix etc.
7. Variation in the amount of beef mix used in the pastry base.

During product development, products were given away for tasting by randomly selected consumers at each stage. For product tasting, the frozen products were re-heated in a stove/oven as per the instructions provided with the savoury snack box. Those who involved in tasting or giving remarks were:

- Y Australian International Foods staff members
- Y Department of Primary Industries staff members
- Y Melrose Health (Flaxmeal providers)
- Y CreaNutrition (beta-glucan providers)
- Y Individual household members

Their comments or remarks were considered to improve the product quality at each step. The major challenges that we faced was that the fibre component tended to absorb water from the mixed meat stuffing therefore making it dry. Thus, identifying the appropriate level of water for the formulation was one of the critical steps. Soluble fibre has a tendency to stick to the meat mince and therefore it can stop other ingredients and spices mixing with mince meat evenly. Incorporation of fibre ingredients at a particular stage of cooking was highly critical and important in order to spread the ingredients evenly.

Finally, the product was developed using 1 g of beta glucan and 2 g of flaxmeal incorporated into beef mince mix during the final quarter of the cooking process. These products were used for product stability, consumer acceptance and market evaluation.

3. Consumer product research and market evaluations

The consumer product research and market evaluation was undertaken by 'Sensory Solutions'. Sensory Solutions was commissioned by the Australian International Foods to conduct sensory research in the form of a product evaluation on the performance of two new, high fibre savoury beef roll products against their current market product. The objectives of this market evaluation process were: 1) to measure the sensory performance of the new savoury rolls (with added fibre) against the current product on shelf; 2) to gauge consumer response to any claims or benefits communicated by the new fibre added products.

Some of the important points summarised by the Sensory Solutions during the evaluation process of products were:

- The products were all perceived to be moderately, but not particularly unique, and of moderate quality.
- The product profiles (attribute intensities) show clearer differences between the tested products, with snack enriched with OatWell fibre standing out for its curry flavour, spiciness and taste. This product was also firmer, with a more chewy pastry shell.
- The current standard snack seems to be the one liked the least, in general, amongst those tested. This was primarily flavour and appearance driven.
- The snack enriched with flaxmeal fibre seems to fall short on flavour delivery and was perceived as the oiliest of the three samples tested. Flax fibre, in this instance appears to have a negative effect on the overall product performance.
- The snack with Oatwell fibre was the one that most closely matched consumer ideals. Improvements, however, could be implemented to increase appeal, focusing on increased aroma, beef and overall flavour, with a slight decrease in the chewiness of the pastry and overall oiliness of the product.
- More extensive product optimisation changes required to snack with flaxmeal (mostly flavour and oiliness related) and the current product on shelf (mostly flavour).

The sensory evaluation showed clear differences between the tested products, the product with Oatwell fibre standing out for its curry flavour, spiciness and taste. As the products were formulated with the same amount of spices, this implies that adding Oatwell fibre enhances the natural taste of the product. However, it was recommended by the Sensory Solutions that Aroma was a key attribute missing from the products tested. Modifications which will result in enhanced aroma delivery are highly recommended as aroma is enticing and also acts to create an expectation of flavour in the product (most of us "eat with our noses"). In addition, it was also stated that the oiliness of the pastry should be improved because oily product will potentially cancel out any positive effect that the fibre addition can bring.

4. Identification of the stability of added fibre component in healthy red meat snack during frozen storage.

The stability of the product derived from Oatwell or flaxmeal incorporated into beef snack was investigated following storage at -20°C for 3 and 7 months. Four hundred products of either a standard beef snack or the standard beef snack with Oatwell added or the standard beef snack with flaxmeal added, were produced. These were used for the shelf-life stability test and consumer market evaluation.

Snack products were sent to 'Agrifood Technology' for determination of the shelf-life stability of Oatwell and flaxmeal added to the snacks, after 3 and 7 months of storage at -20°C. Beef mince analysed after 3 months of storage from Oatwell- or flaxmeal-added products had approximately twice the amount of fibre content in the snack. In other words, there was more than 80% increase in total fibre content with Oatwell or flaxmeal added products compared with the standard beef snack (Table 1).

Table 1: Total fibre content of beef mince mix formulated for standard or Oatwell- or flaxmeal-added snacks after 3 and 7 months of storage at -20°C.

Type	Standard	Flaxmeal	OatWell
3 months			
Total fibre (mg /30 g mince)	754	1589	1454
Total fibre (%)	2.5	5.3	4.6
7 months			
Total fibre (mg /30 g mince)	Not tested	1417	1538
Total fibre (%)	Not tested	4.7	5.1

When compared after 3 or 7 months storage at -20°C, there was a small variation in total fibre content between the products. This might have been due to variation in the water content of the products. Overall, both the Oatwell-enriched product and the Flaxmeal-enriched product had greater levels of fibre remaining in the beef mince mix after 7 month of storage at -20°C. Based on the outcomes of stages 3 and 4, it was decided to carry out the scale-up and in-store evaluation with Oatwell fibre added snacks.

5. Scale up and in store evaluation of fibre added red meat snack

Australian International Foods prepared commercial batch of standard beef snack and beef snack with Oatwell fibre. Two hundred retail packs (each containing 4 Rolls of 75 g) of both the products were distributed in carefully selected 15 Woolworth and Coles Stores. All the customers were distributed with a cover letter explaining the details of the study, a questionnaire to respond and the snack products to taste. All the respondents were to receive \$20 Coles/Woolworth gift voucher upon the tasting and completion of this task with handing over of the questionnaire. Participants were expected to taste standard beef snack and beef snack with Oatwell fibre and answer a set of questions which included organoleptic and subjective type. Customer responses from ninety-one participants were received out of 200 participants.

The results showed that there was no significant difference between standard beef snack and beef snack with Oatwell fibre from the consumer point of view. Equal number of customer found no difference in appearance and oily flavor of both the products. Minor differences were observed between results for overall flavor, filling flavor, taste, aroma and after-taste. According to 24% customers, curry flavor of snack with Oatwell fibre needs to be stronger. Standard beef snack was slightly more preferred compared to beef snack with Oatwell fibre for the attributes of overall flavor, filling flavor, taste, aroma, aftertaste, curry flavor and texture. The in-store evaluation concluded that snack with Oatwell fibre is not significantly different from the standard beef snack. However, results demonstrated that at commercial level, beef snack with Oatwell fibre can be improved by increasing curry flavor and improving texture of the product.

Conclusions

A review of the literature revealed that the use of flaxmeal, guar gum, beta-glucan from oats (Oatwell) or psyllium has potential in improving the functional properties of the red meat snack. Consuming two or three snacks with added fibre would be ideal for daily use by school students, university students or aged care. Keeping in view the scientific evidence concerning health benefits and functionality of various dietary ingredients, AIFoods and MLA decided to use flaxmeal and beta-glucan from oat for the development of fibre added red meat snacks. The weight of the snack product was ~ 70 g, representing 30 g of beef mix and 40 g of pastry base. The product was developed using 1 g of beta glucan (Oatwell) and 2 g of flaxmeal incorporated into beef mince mix. The addition of Oatwell or flaxmeal to the beef mince mix approximately doubled the amount of fibre content compared with the standard beef mince. Both fibre-enriched products had higher levels of fibre remaining in the beef mince mix after 7 month of storage at -20°C. The sensory evaluation showed clear differences between the tested products, snacks with Oatwell fibre standing out for its curry flavour, spiciness and taste. From the outcomes of the sensory evaluation, it was decided that snack products with Oatwell should be progressed to scale-up and in-store evaluation stage. Fifteen Coles and Woolworths stores were selected for the in-store evaluation. The evaluation showed that an equal number of customers found no difference in the appearance and oily flavour of both normal and Oatwell added snack products. Minor differences were observed between the products for overall flavour, filling flavour, taste, aroma and aftertaste. The snack with Oatwell fibre was not significantly different from the standard beef snack. The outcomes of the project indicate that it is feasible to develop a fiber-enriched meat snack that is suitable for high school students, university students and aged care people.