

Development of Value Added Products from Dried Sea Cucumber (*Holothuria scabra*)

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Abstract

The processed sea cucumber, which is commercially known as Beach-de-mer, has been an important source of income for most of the Pacific Island countries. However, no research has been carried out to add value to processed sea cucumbers in the Pacific Island countries. Therefore, the present investigation is the first research on sea cucumbers that were processed and converted to value added food products. In this study, Sandfish (*Holothuria scabra*) sea cucumbers were used to produce value added Sandfish biscuits and jams. The two different types of biscuits (sweetened and salted) and four different types of Sandfish jams were made with fruits like Guava, Banana, Lemon and Wi (wild apples or Polynesian plum). The proximate composition and sensory evaluation of Sandfish biscuits and jams were evaluated. High protein content in both biscuits (sweetened and salted Sand fish biscuits: 12.3% and 11.3%) was observed in comparison to normal biscuits (Oreo: 1%). The four sandfish jams (Lemon Sandfish jam: 11.27%, Banana Sandfish jam: 16.39%, Guava Sandfish jam: 15.37% and Wi Sandfish jam: 18.44%) had higher protein content compared to normal Fruto jam (0.26%). Wi Sandfish jam had the highest protein (18.5%) content amongst the four jams. However, there were no significant differences ($P \geq 0.05$) between the means of moisture, fat and protein content in sandfish biscuits and jams. Sensory evaluation indicated sweetened Sandfish biscuits to be more acceptable in comparison to salted biscuits. Jams made of banana and Wi fruit were more acceptable compared to jams made of Guava and Lemon. However, there were no significant differences ($P \geq 0.05$) between the means of sensory characteristics of Sandfish biscuits and jams. The research indicated a positive outcome in value addition to low cost sea cucumbers.

Keywords: Sandfish; Proximate Composition; Sensory evaluation; Sandfish value added food products

Introduction

Value addition is any step in the production process that improves the product for the consumers and results in a higher net worth. Commercially, sea cucumbers have been collected about 1000 years ago [1]. The processed sea cucumber is commercially known as Beach-de-mer in French, Hai-som in Chinese and Trepan in Indonesian. In some countries like Japan and Korea, sea cucumber body wall and viscera are consumed raw or pickled while they are also used in soaps and fried with meat and vegetables [1-3]. Some of the value added products of sea cucumbers are salted sea cucumber, frozen and smoked sea cucumber and salted sea cucumber soup [4]. Hornell [5] first proposed improvement in the quality of beach-de-mer. On the other hand different quality principles were developed by Durairaj [6,7]. Various suggestions on methods to produce quality sea cucumbers were proposed by James [8]. Sea cucumbers mainly contain higher moisture and lower protein content compared to marine fish and shellfish [9]. Processed sea cucumbers form an important source of income mainly for local communities near coastal areas in the Pacific [10]. In the South Pacific countries, very little research has been done on post-harvest sea cucumber management while no research has been observed with regard to value addition to sea cucumbers as food. The present research attempted to produce value added food products (Biscuits and Jams) from sea cucumbers.

Materials and Methods

The fresh and cleaned sea cucumber Sandfish (*Holothuria scabra*) were purchased from local market in Suva, Fiji. They were brought to post harvest fisheries laboratory of the School of Marine Studies at the University of the South Pacific. They were then gutted under running tap water by cutting the sandfish in the middle, salted (1:1) and were stored in chiller. After four days, sea cucumbers were dried (without any smoke) at 40°C for four hours and cooled. They were blended with

different ingredients to produce sweetened and salted biscuits and four different types of jams. The formulations and procedures are given below:

Sweetened Sandfish Biscuits

Ingredients

- 1 cup normal flour (121g)
- ½ cup sugar (95g)
- 1 tablespoon baking powder (7g)
- ¼ cup cooked sea cucumber, blended (34g)
- ¼ cup butter (36g)
- 1/3 cup milk (92g)
- ¼ cup cocoa powder, unsweetened (25g)

Salted Sandfish Biscuit

- 1 cup normal flour (121g)
- 2 tablespoon sugar (41g)
- 1 tablespoon baking powder (7g)

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¼ cup cooked sea cucumber, blended (34g)

¼ cup butter (36g)

1/3 cup milk (92g)

1/8 teaspoon iodized salt (7g)

Procedure

All the dry ingredients were mixed first and then blended with sandfish. Milk was added later. It was made into dough and placed in baking trays and baked in oven for 15 minutes at 200°C.

Sandfish and Guava/Lemon/ Banana/ Wi Jam

Ingredients

60g of blended sandfish guava/lemon/banana/ wi

4 cup sugar

6 cups of water

Procedure

The guava/lemon/banana and Wi were washed and cut in to four pieces and then boiled with water for 30 minutes. Then guava/lemon/banana and wi syrup were collected and boiled for three hours with addition of sugar and blended with sandfish. Jams were packed in bottles which were given a hot treatment in water bath to avoid any bacterial infection.

Proximate composition of biscuits and jams

Moisture, protein and fat contents were measured according to the procedure of AOAC [11] in triplicates.

Sensory evaluation of sandfish biscuits and jam (hedonic scale and triangle test)

The biscuits and jams were evaluated by five member panelist (hedonic scale and triangle test) in triplicates. The parameters studied were color, texture, taste, aroma and overall acceptability. The score card for evaluation of biscuits and jams were provided along with instructions to each of the panelist.

Statistical analysis

Analysis of variance (Two ways) was performed to examine whether any significant differences existed between sandfish biscuits and normal biscuits and sandfish jams and normal jams using the 5% significance level. Protein, fat and moisture content were also tested for significant variations.

Results and Discussion

Table 1 showed no significant differences ($P \geq 0.05$) between the means of moisture, fat and protein content of Sandfish biscuits. Fat and protein content was higher (3.45% and 12.29%) in sweetened sand fish biscuits while moisture content was lower (0.48%) compared to salted Sandfish biscuits. In comparison to normal Oreo biscuits, the protein content was more in Sandfish biscuits than Oreo biscuits while Oreo biscuits had higher fat content (Figure 1).

Wi fruit sand fish jam had the highest protein content (18.44%). Fat content of Lemon and Sandfish jam (2.92%), Guava and Sandfish jam (2.97%) and Wi fruit and Sandfish jam (2.78%) had almost same amount of fat content (Table 2). There were no significant differences ($P \geq 0.05$) between the means of moisture, fat and protein content of

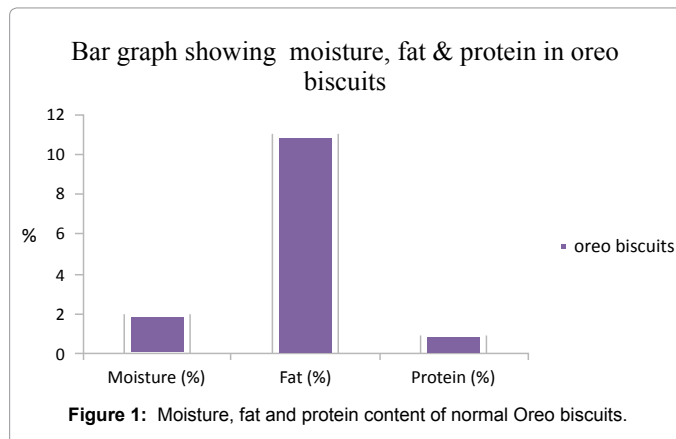
Sandfish jams. Fat and protein content in Fruto jams were much lower compared to all of the sand fish jams (Figure 2).

Sensory evaluation indicated that Sweetened Sandfish biscuits were more acceptable while Banana and Wi fruit Sandfish jam ranked higher (Table 3). No significant differences ($P \geq 0.05$) between the means of sensory characteristics of Sandfish biscuits and jams were observed.

Salarzadeh [9] found that the proximate composition of fresh sea cucumber (*H. parva* and *H. arenicola*) varied largely (moisture 82-92.6%, protein 2.5-13.8%, fat 0.1-0.9%, ash 1.5- 4.35 and carbohydrate 0-2.2%). Maria, et al. [12] studied on fresh, dried and canned sea cucumbers and observed that fresh sea cucumber contained 89-91% moisture, 5-6% protein, 0.3% fat, 3% ash and 0.3% carbohydrate

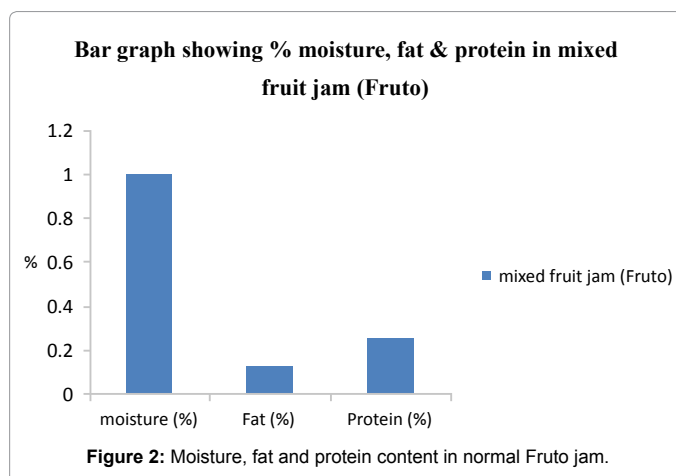
Samples	Moisture Content (%)	Fat Content (%)	Protein Content (%)
Sweetened sand fish biscuits	0.48	3.46	12.29
Salted sandfish biscuits	0.60	2.07	11.27

Table 1: Proximate composition of sandfish biscuits.



Samples	Moisture Content (%)	Fat Content (%)	Protein Content (%)
Lemon and Sandfish jam	1.08	2.92	11.27
Banana and Sandfish jam	1.05	2.06	16.39
Guava and Sandfish jam	1.23	2.97	15.37
Wi fruit and Sandfish jam	0.91	2.78	18.44

Table 2: Proximate composition of sandfish jams.



Samples	Color and Appearance	Texture/ consistency	Taste	Aroma	Overall Acceptability
Sweetened Sandfish biscuits	4.6	3.6	4.8	3.8	4.6
Salted sandfish biscuits	3.2	2.6	3.6	3.4	3.6
Lemon and Sandfish jam	4.2	3.8	4.8	4.6	4.6
Banana and sandfish jam	3.8	3.8	4.4	4.0	4.8
Guava and sandfish jam	4.2	3.8	4.6	4.0	4.0
Wi fruit sandfish jam	4.8	4.4	4.8	4.0	4.8

Table 3: Sensory evaluation of Sand fish biscuits and jams (Sensory points 1-5).

whereas dried sea cucumber contained 2-6% moisture, 61-70% protein, 2-3% fat, 16-24% ash and 2.3% carbohydrate. The canned sea cucumbers comprised of similar levels of moisture and protein in marine finfish. Maria, et al. [12] also found no significant differences in the texture of canned products made from fresh cooked, salted cooked and cooked dried raw material. The present investigation showed marked differences in protein content of sandfish biscuits and jams in comparison to normal biscuits and jams.

Conclusion

Sea cucumber is nutritious seafood with high protein and low lipid content and is rich in gluten, nitrogen, iodine [13]. Considered as one of the most popular Chinese seafood dishes, sea cucumbers are also used as medicine. Sea cucumbers were also found to have beneficial impact for impotent individuals [14]. The study concluded that low cost sea cucumbers could be converted to value added food products. These could address the issue of food security. The poor farmers could make marginal income from underutilized sea cucumbers found abundantly in the Pacific region.

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