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Development of Healthy Products Using Spider Conch (*Gastropoda stromboidea)*

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ABSTRACT

For years now, most doctors have insisted that an average diet that consists of healthy seafood at least twice a week can improve the quality of life (No, Meyers, Prinyawiwatkul, & Xu, 2007). The study utilized an experimental method in developing healthy products out of spider conch (*Gastropoda stromboidea)* shellfish. Spider conch extract was used in the formulation of sauce as an alternative product while the spider conch meat after the extraction was used for the development of the spread and patty. Panel responses were analyzed using 7 and 9-point hedonic scales. One Way Analysis of Variance was also used to determine whether a significant difference existed between and among the experimental lots. Findings showed that spider conch extract is good for sauce formulation, and the spider conch meat are good in preparing spread. Also, the study reveals that there is no significant difference between the variants of spider conch sauce and spread for taste; patty for aroma attributes, therefore, the null hypothesis was accepted. It was concluded that the developed spider conch sauce is a better alternative product that the commercial sauces available in the market regarding vitamins, protein, and iodine content. The researchers recommend the use of Cooking Manual and Procedures for HRM students.

Keywords — Food Technology, healthy products, experimental method, Philippines

INTRODUCTION

Seafood is a regular part of a balanced diet. It contains high levels of some important nutrients. Thus, helps maintain a healthy nutritional status, essential for our health. Seafood offers a diversity of natural flavors, colors, and textures, making it an ideal addition to any luncheon or dinner menu. Seafood is highly nutritious and easy to digest. It contains less than 2% fat, high in many vitamins like A, B, D and the excellent source of omega oils, protein and iodine. Prawns, crabs, squid, and octopus, are just as packed with vitamins, minerals and fish oils as fish like salmon or cod. They all contain Omega-3 – an essential fatty acid known to help with heart health. A varied and healthy diet is a prerequisite for good health. Children, young people, pregnant women, in particular, eat little fish. A good nutritional status is of particular importance for these vulnerable

groups (The Norwegian Ministry of Trade, Industry and Fisheries, 2014; McManus, Howieson, & Nicholson, 2009).

The study confers innovative and exclusive facts to the subject that seafood spider conch can be made into savory and healthy products. The spider conch as the main ingredient offers healthy and nutritious benefits when it is integrated into the production of sauce, spread, and patty. The spider conch market continuously grows for the culinary properties or practices. According to Food Database and calorie counter of USDA, it has 165 total calories for every one cup slice of spider conch. Although the spider conch may be served in many ways, the most popular are conch fritters, chowder, salad and cracked conch (USDA, 2011).

Spider conch sauce adds a savory flavor to many dishes, making it an ideal choice for flavoring meat and vegetables (Schweid, 2013; Janer, 2008). The sauce can be a staple food for Filipino family-style cooking (Nam, Jo & Lee, 2010; Hutton, 2005; Laudan, 1996). It is also found in familiar Chinese-American dishes such as beef with stir-fried vegetables. A typical example in the market is the oyster sauce, which can also be used as a topping for some dishes. For the spread, it is good to complement with sandwiches so as to balance the carbohydrates and protein; an alternative product from tuna and chicken spread which are common in the market.

Seafood continues to play a vital role in adapting and developing the menu for a particular dish (Amira, 2009; Knap *et al.*, 2002; Hall & Mitchell, 2000). The best method of cooking should achieve its task efficiently and with no problem regarding food poisoning (Jevšnik, Hlebec, & Raspor, 2008; Wilcock, Pun, Khanona, & Aung, 2004). It should also provide health benefits and enhance the presentation of a dish product. Healthy dishes made from seafood transform an ordinary meal into an extraordinary one (Pollan, 2009; Hanefors & Mossberg, 2003). Normally, sauces and condiments are the exclamation point to a meal, adding flavor, moisture, and a certain visual appeal (Klosse, 2013; Fulton, 2006; Raghavan, 2006). Spice blends lend unique and distinctive flavor to a variety of dishes and are endlessly customizable (Parsons, 2011; Gold & Stern, 2010).

FRAMEWORK

This study was based on the SCIMPO (Single Commodity Input Multiple Products Output) models by the Philippine Women's University – Manila. (Minutes of the 32nd Weekly Forum Meeting by Management Association of the

Philippines (MAP) 5). PWU developed the SCIMPO Technology which means using all and wasting none. SCIMPO technology was applied mainly to bananas and coconuts where all parts were used: peelings, trimmings, meat, trunk, leaves, etc.

SCIMPO system was used in which all parts of spider conch were made into new products at no waste at all. The juice was developed into a delicious sauce while the meat from spider conch made into a flavorful sandwich spread and patty as primary products of this study, while the shell was used as the souvenir for the incoming tourists.

Spider Conch, known as "saang", is a genus of giant sea snails sometimes known as spider conchs with a maximum shell length up to 29 cm, and average length stands for 18 cm. They are not endangered, and they are a common source of protein for many seaside residents in Cebu, Bohol, and the rest of the Visayas. Natives have collected diversified types of seashells, extracted their meats, and added them to their diet and while eating "specimen" shells might be unusual to some people, they are not different from eating clams, mussels, snails, etc. There was a time when the Philippine seas were teeming with these shells, and they were a source of protein, as well as the shells going into various handicrafts or being exported to other countries.

Spider conch shellfish is thick, robust and has different shapes for male and female. From the air, Cebu looks like the back of a crocodile half submerged in water. Waters teeming with fresh bounty surround it all. Olango Island of Lapu-Lapu District has been the agricultural estate of spider conch that supplies many hotels and restaurants in Lapu-Lapu City as well as in Cordova, part of Cebu City, Philippines.

Actual copulation and egg laying of Spider conch were observed for the first time in the Philippines under laboratory conditions in the months of October to December 2011, March to May 2012 and August to December of 2012. Actual copulation in the laboratory was witnessed only once where the male and female spider conches faced each other with their marginal digitations somewhat interlocking. Throughout the observation period, there were egg layings that were observed one to five days before or after a full moon. There were also instances that egg laying happened during or one to five days before or after a new moon. The laid egg masses varied in size and consisted of transparent capsules with brownish to bright yellowish embryos inside. Most of the laid eggs were found in the early morning, indicating that spawning had occurred during nighttime. However, actual daytime spawning or laying of the egg mass was also observed in

the laboratory. When laying the egg mass, the female extended out its foot and proboscis while positioned on its side with the marginal digitations facing up. A continuous strand of gelatinous filament that contained the eggs was laid through the spawning period of spider conch where the egg groove and runs through the foot. The female attached the egg filament to algal strands and available substrate in a maze of a continuous coil with no particular pattern forming an egg mass. One of the medium-sized egg masses was carefully uncoiled for length measurement and was found to be approximately 10 meters. The laying of an egg mass with this length was completed in 7 hours. After laying, the female stayed near the egg mass, almost motionless. Some females were also found (Hamel & Mercier, 2006).

Determining the size at sexual maturity of the organism can provide information that could be used as the basis for recommending a minimum legal size for collection. Furthermore, information on the spawning season can be used in aquaculture efforts as well as a basis for regulated collection or the establishment of open and closed seasons as possible means to be explored for sustainable management of spider conch. Culture farms are also being established for aquaculture and reseeding wild populations. For spider conch, a study was initiated at the Visayas State University, Philippines to address the paucity of information for sustainable management. No data on the reproductive biology of spider conch is yet available in the Philippines or elsewhere. The paper presented results on spawning period and size at sexual maturity of the spider conch, including spawning observations in the laboratory (Hamil & Mercier, 2006).

Researchers from the Institute of Tropical Ecology at Leyte State University (LSU), Philippines recently conducted a detailed investigation of the inter-island waters of Leyte and Samar to determine significant sources and suitable sites for monitoring and field sampling of seafood (Germano, Cesar, Mazo, & Melgo, 2003). Their main agendum was to come up with an inventory to estimate the volume of catch, threats, frequency in markets and source sites and information availability. Meanwhile, three criteria were used to determine priority-fishing grounds for monitoring and field surveys: catch volume, the number of commercial species present, and accessibility and safety of commercially important marine invertebrates in Leyte and Samar. The inventory was completed using structured surveys and interviews in markets of different coastal barangays, municipalities, and cities throughout the region.

Bread fortified with iodized salt can provide enough iodine to avoid low thyroid activity for most people, without the need to add iodized salt to their

diet (Victoria, 2016). Salt contributes to hypertension (high blood pressure), and there are efforts globally to encourage people to eat less salt by avoiding adding salt in cooking and at the table. In the previous years, low dietary levels of iodine appeared to be a problem only in developing countries. However, some researchers reported that iodine intake levels in Australia have dropped considerably, perhaps by as much as half, over the past few decades (Department of Health & Human Services, State Government of Victoria, Australia, 2016). Ongoing research is looking at the problem and what might be done about it.

OBJECTIVES OF THE STUDY

The study aimed to develop healthy alternative products such as sauce, spread, and patty with spider conch as the main ingredient. Specifically, the study sought to: 1.) determine the acceptability test of the spider conch; and 2.) explore the significance difference among the formulated; 3.) identify theoretical nutrient content of the most acceptable product and actual protein content of the fairest spider conch products; 5.) determine the percentage of RENI for protein and iodine required for adults (yuppies) satisfied by one serving of the developed products; and 6.) compute the direct material cost of the most acceptable products.

METHODOLOGY

The experimental research design was used in the study to determine the most acceptable formulation of healthy dishes. Experimental research is a question about cause and effect relationship under controlled conditions. The study consisted of five stages.

Stage 1 was the formulation and standardization of healthy products using spider conches such as sauce, spread, and patty. Stage 2 dealt with the sensory evaluation of the developed good using hedonic scaling. Stage 3 was the statistical analysis of the mean panel scores. Stage 4 consisted of theoretical computation of nutrient content of the most acceptable set, and Stage 5 was the calculation of the direct material cost of the best set of test.

Step 1: Formulation and Standardization

Spider conch as the primary ingredient was harvested at the Olango Island, Lapulapu City, Cebu and neighboring island, Bohol. The meat was removed

from the shell after boiling. Three products from the spider conch were made. Other ingredients for the three dishes were bought at a commercial market.

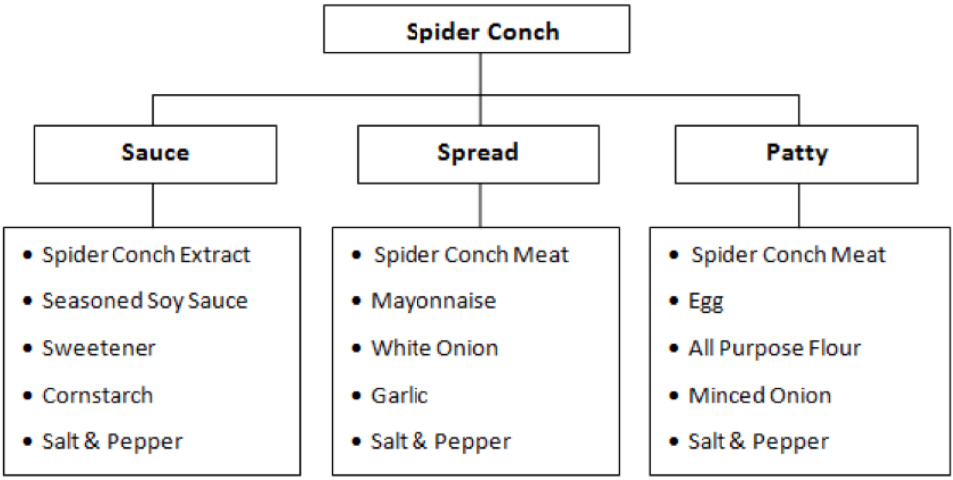

Figure 1. Structure of nutritious spider conch products

The preparations and cooking were done at the University of Cebu – Main Campus, HRM Department, Cebu City. A series of preliminary trials was conducted using varying amounts of spider conch extract and meat in each dish. During the preliminary tests, the spider conch extract was used in the making of the sauce, while spider conch meat was used in the making of the spread and patty products based on its original recipe. There was five lots substitution used in this study which is Lot 1 with 100% as control, Lot 2 with 90%, Lot 3 with 80%, Lot 4 with 70%, Lot 5 with 50% spider conch juice and meat (see Tables 1 – 3).

Table 1. Spider conch sauce experimental lots

Ingredients	Spider Conch Sauce				
	Lot 5 100%Control	Lot 4 90%	Lot 3 80%	Lot 2 70%	Lot 1 50%
Spider Conch Extract	240ml	216ml	192ml	168ml	120ml
Seasoned Soy Sauce	30ml	30ml	30ml	30ml	30ml

Sweetener	10g	10g	10g	10g	10g
Cornstarch	15g	15g	15g	15g	15g
Salt	3g	3g	3g	3g	3g
Pepper	2g	2g	2g	2g	2g
Total	300ml	276ml	252ml	228ml	180ml

Table 2. Spider conch spread experimental lots

Ingredients	Spider Conch Spread				
	Lot 5 100%Control	Lot 4 90%	Lot 3 80%	Lot 2 70%	Lot 1 50%
Spider Conch Meat	150g	135g	120g	105	75g
Mayonnaise	100ml	100ml	100ml	100ml	100ml
Garlic	45g	45g	45g	45g	45g
White onion	50g	50g	50g	50g	50g
Salt	3g	3g	3g	3g	3g
Pepper	2g	2g	2g	2g	2g
Total	350g	335g	320g	300g	275g

Table 3. Spider conch patty experimental lots

Ingredients	Spider Conch Patty				
	Lot 5 100%Control	Lot 4 90%	Lot 3 80%	Lot 2 70%	Lot 1 50%
Spider Conch Meat	500g	450g	400g	350g	250g
All Purpose Flour	65g	65g	65g	65g	65g
Egg	65g	65g	65g	65g	65g
Mince Onion	65g	65g	65g	65g	65g
Salt	3g	3g	3g	3g	3g
Pepper	2g	2g	2g	2g	2g
Total	700g	650g	600g	550g	450g

Tables 1 to 3 showed the experimental lots of the three suggested products such as sauce, spread, and patty were spider conch in varying proportion was the main ingredient while the rest of the ingredients were kept constant.

Stage 2. Acceptability Test

The different experimental lots were subjected to sensory evaluation by randomly new laboratory taste panel consisting of HRM staff, faculty members, students and chefs from selected restaurants using the 7-point and 9-point Hedonic Scales. The evaluation was conducted at the laboratory room of the HRM Department. The 7-point hedonic scale was used in rating the sensory attributes of appearance, color, texture/consistency (for sauce); mouthful (for spread); masticability (for patty), aroma and flavor while the 9-point hedonic scale was used in rating the general acceptability. The following are the levels used with their corresponding verbal description.

Table 4. The 7-Point and 9-Point Hedonic Scales

The 7-Point Hedonic Scale		**The 9-Point Hedonic Scale**	
Scale	Description	Scale	Description
7	Excellent (E)	9	Liked extremely (LE)
6	Very Good (VG)	8	Liked very much (LVM)
5	Good (G)	7	Liked moderately (LM)
4	Average (A)	6	Liked slightly (LS)
3	Fair (F)	5	Neither liked or disliked (NLD)
2	Poor (P)	4	Disliked slightly (DS)
1	Very Poor (VP)	3	Disliked moderately (DM)
		2	Disliked very much (DVM)
		1	Disliked extremely (DE)

Stage 3. Statistical Analysis

The mean panel scores of the acceptability tests were computed and subjected to statistical analysis using One-Way Analysis of Variance (ANOVA) to detect whether significant differences existed among samples regarding their sensory attributes. Scheffe's test was used as post hoc analysis to determine the significantly different variants for Single Factor ANOVA that yields a significant result.

Stage 4. Theoretical Computation of Nutrient Contents

The theoretical computation of nutrient content was conducted with the use of information from nutrition facts for spider conch and other ingredients. These data are used as the basis for the computation of the theoretical nutritional value of the healthy dishes. The vitamin content of the spider conch was computed using the Olson formula based on RENI as follows:

Vitamin = Actual Weight x Given Value / Portion Size

Stage 5. Computation of Direct Material Cost

The direct material costs of the most acceptable healthy spider conch products were computed based on the standardized ingredients formulation. Through the direct material cost computation of the product, the price was determined. All calculations are based on the existing retail prices of the ingredients in the commercial market at the time of the study.

Formulation Studies

The five experimental lots of each developed product such as the sauce (Figure 2), spread (Figure 3, and patty (Figure 4) were formulated and subjected to sensory evaluation by new laboratory taste panel.

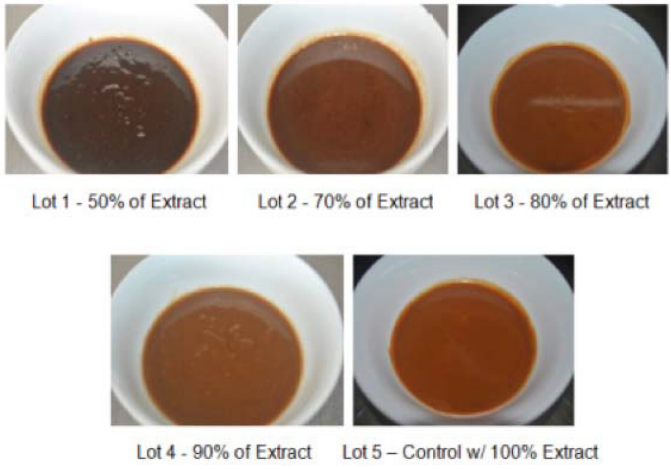

Figure 2. Experimental lots of spider conch sauce

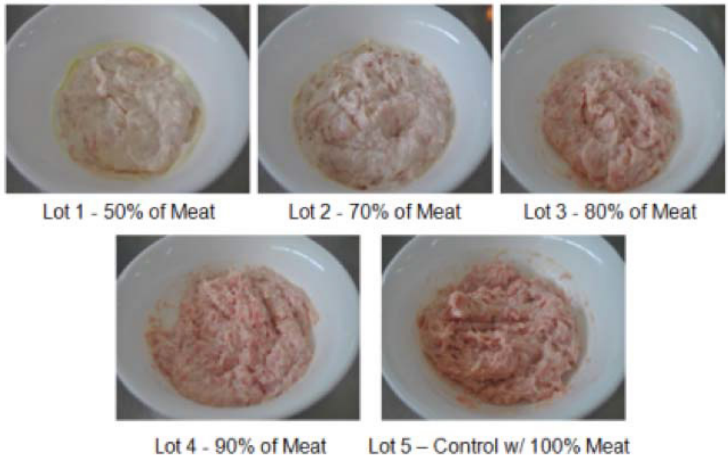

Figure 3. Experimental lots of spider conch spread

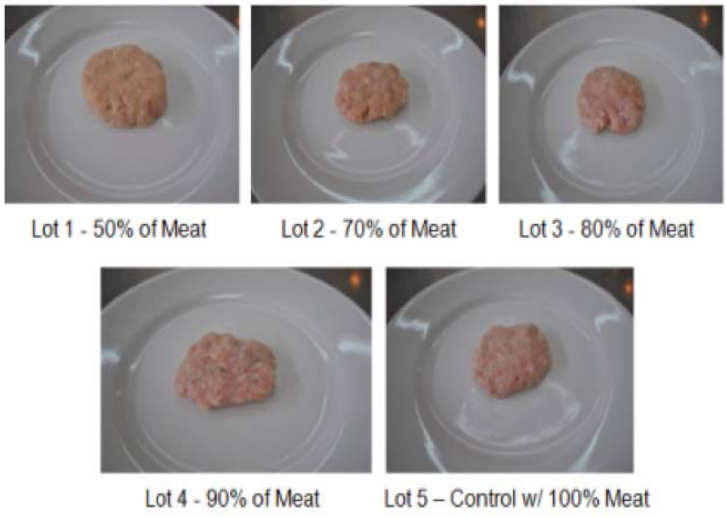

Figure 4. Experimental lots of spider conch patty

RESULTS AND DISCUSSION

Table 5. Acceptability test

Sensory Attributes	Product Variants					
	Sauce		Spread		Patty	
	Mean	Remarks	Mean	Remarks	Mean	Remarks
Appearance	5.73	Very Good	5.67	Very Good	5.83	Very Good
Color	5.73	Very Good	5.60	Very Good	5.70	Very Good
Texture	5.83	Very Good	5.47	Very Good	5.57	Very Good
Aroma	5.37	Very Good	5.13	Good	5.63	Very Good
Taste	5.37	Very Good	5.47	Very Good	5.13	Good
General Acceptability	7.00	Like Moderately	6.87	Like Moderately	6.10	Like Slightly

The table reveals that the spider conch, when produced to a sauce, spread, and patty, has very good acceptability ratings from the respondents. These data imply that respondents who tasted the products were likely satisfied with the appearance, color, texture, aroma, and taste of the spider conch products.

The table showed that the sauce variants were significantly different regarding appearance, color, aroma and general acceptability. However, no significant differences existed between the lots regarding consistency and taste. ANOVA results for spider conch spread revealed significant differences existed between the experimental lots regarding all the attributes except for taste. No significant differences existed between the lots regarding taste.

There is no significant difference between the five lot variants of spread with spider conch regarding aroma. However, the options are significantly different in terms appearance, color, texture, taste and general acceptability.

Contemporary observations of marine foraging in a variety of settings suggest that some mollusks tend to be over-represented in middens because of differential preservation relative to other mollusk species as well as other organisms (Thomas, 2002). A good storage life was not observed even towards the end of the four months. So an acceptable chutney powder can be prepared with the L. lambis meat. This will pave the way for better utilization of this under-utilized gastropod meat (Renitta, Gnanambal, & Patterson, 2006).

Theoretical Nutrients Content and Laboratory Analysis (Protein)

The theoretical nutrient contribution of the acceptable spider conch products, particularly regarding vitamins and iodine are presented in the following tables.

Table 6. Theoretical Vitamin A content of the spider conch products

Ingredients	Vit A/gms (SND) µgRE	Quantity (gm=ml)	Theoretical Vit A Content (µgRE)
A. Sauce			
Spider conch juice	29 /127	240 ml	54.8 µg
Total/Batch (300 ml)			54.8 µg
Total 60ml/pack			10.96 µgRE
B. Spread			
Spider conch meat	29 /127	150 g	34.2 µg
Garlic	12.2/136	45 g	4.0 µg
White onion	3.2/160	50 g	1.0 µg
Total/Batch (350 gms)			39.2 µg
Total 50g/pack			5.6 µgRE
C. Patty			
Spider conch meat	29/127	500 g	114.2 µg
Egg	244/50	65 g	317.2 µg
Minced Onion	3.2/160	65 g	1.3 µg
Total/Batch (700 gms)			432.7 µg
Total 70g/pack			43.27 µgRE

Source: RENI (Recommended Energy and Nutrients Intakes)
Formula: Vitamin A (µgRE) = Given Value ÷ Portion Size x Actual Weight
Per pack (µgRE) = Total batch in µgRE ÷ (entire batch in gms ÷ per pack)

The pure Vitamin A contents of the three spider conch dishes ranged from 5.6 to 43.27 vitamin A expressed as µgRetinol equivalent with the patty contributing the highest number because of the high percentage content of the meat which accounted for 73% of the total vitamin A per batch of 700 gms. On the other hand, spider conch meat contributed about 26% of the vitamin A of the patty.

Table 7. Theoretical Vitamin B content of the spider conch products

Ingredients	Vit B/gms (FCT) µgRE	Quantity (gm=ml)	Theoretical Vit B Content (µgRE)
A. Sauce			
Spider conch juice	B12 – 6.7/127	240 ml	12.7 µg
Total/Batch (300 ml)			12.7 µg
Total 60ml/pack			2.12 µgRE
B. Spread			
Spider conch meat	B12 – 6.7/127	150g	7.9 µg
Garlic	B6 – 1.7/136	45g	0.6 µg
White onion	B6 – 0.1/115	50g	0.04 µg
Total/Batch (350 gms)			8.54 µg
Total 50g/pack			1.22 µgRE
C. Patty			
Spider conch meat	B12 – 6.7/127	500g	26.4 µg
Egg	B6 – 0.6/50	65g	0.78 µg
Minced Onion	B6 – 0.1/115	65g	0.06 µg
Total/Batch (700 gms)			27.24 µg
Total 70g/pack			2.724 µgRE

Source: RENI (Recommended Energy and Nutrients Intakes)

Formula: Vitamin A (µgRE) = Given Value ÷ Portion Size x Actual Weight

Per pack (µgRE) = Total batch in µgRE ÷ (entire batch in gms ÷ per pack)

The patty has the highest number regarding µgRE with 2.72 per 70 grams because of other ingredients added to the mixture particularly, the egg while the sauce contained only 2.12 µgRE per 60 ml. and spread the lowest at 1.22 µgRE of Vitamin B every 50 grams.

Table 8. Theoretical Vitamin E content of the spider conch products

Ingredients	Vit E/gms (SND) µgRE	Quantity (gm=ml)	Theoretical Vit E-Content (µgRE)
A. Sauce			
Spider conch juice	8/127	240 ml	15.1 µg
Total/Batch (300 ml)			15.1 µg
Total/60ml			3.02 µgRE
B. Spread			
Spider conch meat	8/127	150g	9.4 µg
Garlic	0.1/100	45g	0.05 µg
White onion	0	50g	0
Total/Batch (350 gms)			9.45 µg
Total 50g/pack			1.35 µgRE
C. Patty			
Spider conch meat	8/127	500g	31.5 µg
Egg	0.5/50	65g	.65 µg
Minced Onion	0	65g	0
Total/Batch (700 gms)			32.15 µg
Total 70g/pack			3.22 µgRE

Source: RENI (Recommended Energy and Nutrients Intakes)
Formula: Vitamin A (µgRE) = Given Value ÷ Portion Size x Actual Weight
Per pack (µgRE) = Total batch in µgRE ÷ (entire batch in gms ÷ per pack)

The results illustrate the highest µgRE regarding vitamin E theoretically contained by the patty variants with 3.22 µgRE per 70 grams and followed by 3.02 µgRE of the sauce per 60 ml. and the lowest vitamin E content is the spread that contained only 1.35 µgRE per 50 grams.

Seafoods are local delicacies along the coastal region in India. These marine gastropods are not utilized by the people because of lack of awareness about the rich nutritive value of the seafood products (Renitta & Patterson, 2013).

Shellfish consumption in the Southern coastal region of Vietnam is high compared to consumption levels in other countries; it is also high compared to consumption levels of Vietnamese emigrants. Such data may be useful for further investigation on nutrition perspectives and in terms of risk assessment of shellfish contaminants (Nguyen, Picot, Tran, Carpentier, Roudot, & Parent-Massin, 2012).

Table 9. Theoretical iodine content of the spider conch healthy products

Spider Conch Dishes	µg Iodine/**gms**	**Quantity/serving (gm)/ (ml)**	**Theoretical Iodine Content (µg)**
Sauce = 100%	161/100g	60 ml.	96.6 µg
Spread = 100%	161/100g	50 gms.	80.5 µg
Patty = 100%	161/100g	70 gms.	112.7 µg

Source: RENI (Recommended Energy and Nutrients Intakes)

The sauce variants with 60 ml. of spider conch extract theoretically have 96.6 µg of iodine while the spread product contained 80.5 µg of the same nutrient. The highest iodine content was the patty with 112.7 µg per 70 grams serving portion.

Table 10. Actual protein content of the most acceptable spider conch products

Spider Conch Products	**Lots 5 (100%)**
Sauce	2.16%
Spread	8.16%
Patty	12.51%

* Department of Agriculture - RFAL

Out of 3 products, the patty got the highest protein content of 12.51%. On the other hand, results showed that the higher percentage of spider conch extract for sauce and meat for spread and patty, the more the protein content.

Percentage of RENI for Protein and Iodine Satisfied One Serving of the Developed Spider Conch Products

Table 11. % RENI for protein and iodine satisfied one serving of the spider conch products

Products	RENI for Young Adults		Theoretical Content per Serving		% RENI Satisfied per Serving	
	CHON	I2	CHON	I2	CHON	I2
Sauce	46g (women)	150 µg	1.87g	96.6µg	3-4%	64%
Spread			9.6g	80.5µg	17.21%	54%
Patty	56g (Men)		14.50g	112.7µg	25-35%	75%

Source: RENI (Recommended Energy and Nutrients Intakes)

People who are sedentary young professionals should aim to consume at least the recommended dietary allowance, or RDA, of protein each day. According to the Institute of Medicine, protein RDAs are 46 grams for women, 56 grams for men and. Protein RDAs are determined using 0.8 grams per kilogram of body weight for males and females.

The RENI recommended daily intake for iodine depended on the age and life stage. The amount needed is subtle (around one teaspoonful over a lifetime for most adults) when compared to other nutrients. It is measured in micrograms (mcg, or µg), and requirements for various age groups are shown below.

Table 12. Recommended iodine intakes for specific population groups

Population group	Reference weight kg	RNI μg/day
Infants, mo		
Birth to <6	6	90
6 - > 12	9	90
Children, y		
1 – 6	13	90
4 – 6	19	90
7 – 9	24	120
Males, y		
10 – 12	34	120
13 – 15	50	150
16 – 18	58	150
19 and over	59	150
Females, y		
10 – 12	35	120
13 – 15	49	150
16 – 18	50	150
19 and over	51	150
Pregnant women		200
Lactating women		200

If one does not get enough iodine in the diet, one may need to consider taking a supplement. For most people, an extra 50 μg per day would be sufficient. For young professionals, aged 19 – 39 years old, one serving of the most acceptable spider conch products can satisfy about 3 – 31% and 54 – 75 % of their daily protein and iodine requirements, the biggest contributor being the spider conch patty.

The recommended RENI is the daily intake set at the estimated average requirement plus two standard deviations to meet the nutrient requirements of 98% of individuals in an age- and sex-specific population group. They added that universal salt iodization (USI) remains the key strategy to eliminate iodine deficiency disorders (Andersson, De Benoist, Delange, & Zupan, 2007).

The USI is now implemented in nearly all countries worldwide, and two-thirds of the world's population is covered by iodized salt. The number of countries with iodine deficiency as a national public health problem has decreased from 110 in 1993 to 47 in 2007. Still one-third of households lack access to adequately iodized salt. Iodine deficiency remains a major threat to the health and development of populations around the world, particularly in children and pregnant women in low-income countries (Andersson, de Benoist, & Rogers, 2010).

Direct Material Costs

The sauce has a total cost of Php 66.67 (1.5 USD) for 300 ml. with the cost per serving at Php 13.35 per 60 ml. For the spread, the cost is Php 73.90 (1.6 USD) for 350 grams and Php 10.56 (0.23 USD) per 50 grams serving per portion. Patty has the total cost of Php 133.41 (3 USD) for 700 grams and a cost per serving of Php 13.34 (0.3 USD) for every 70 grams.

CONCLUSIONS

The developed spider conch sauce is a better alternative product that the commercial sauces available in the market in terms of vitamins, protein and iodine content. Theoretically, spider conch products contain more vitamins A, B, and E than the traditional counterparts.

TRANSLATIONAL RESEARCH

The outcome of the study has been translated into a cooking module, which forms part of the Cooking Manual and Procedures for HRM 2C (Food Processing and Preservation with Laboratory) students of the College of Hotel and Restaurant Management in the University of Cebu, Philippines.

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