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The Effect Of Crushed Crab Exoskeleton Powder On The Characteristics Of Crab Meatballs

MARRECIL B. ENOT*

Assistant Professor I, Bohol Island State University-Main Campus,
Tagbilaran City, Bohol Philippines
Email: marrecil.enot@bisu.edu.ph

Abstract

Meatballs consist of a blend of minced meat, seasonings, and occasionally additional components such as crab shell powder. The primary focus of this investigation aimed to assess how the introduction of crab shell powder impacts the excellence of crab meatballs across three distinct treatment variations:T1 with 30 grams, T2 with 60 grams, and T3 with 90 grams were the designated quantities. This study delved into evaluating the effects on color, taste, scent, and consistency. Additionally, its objective extended to establishing noteworthy variations in the preferences of respondents among various compositions.The investigator utilized an experimental approach in conjunction with a survey questionnaire. The collected data were organized through the calculation of weighted averages and analysis of variance, enabling the identification of notable distinctions in the preferences expressed by respondents across the three treatments.The research engaged a total of seventy-five (75) participants, encompassing individuals from the fields of Food Technology, instructional staff, and professional chefs. As revealed by the outcomes, the most favorable concoction was Treatment 2, containing 60 grams of crab shell powder, exhibiting an average weighted mean of 7.69, indicative of a "strong preference."Therefore, crab meatballs possess the potential to be regarded as a viable option for inclusion on dining tables, contributing to diverse culinary experiences and serving as a prospective source of revenue for entrepreneurial ventures.

Keywords crab shells powder, crab, meatballs.

INTRODUCTION

Meatballs find widespread presence on menus across hotels, resorts, and dining establishments, gracing diverse events. Nonetheless, the

excellence of these meatballs hinges on the constituents employed. Hence, the notion to incorporate both crab meat and crab shell powder arises, aiming to elevate the flavor and nutritional worth of the meatballs. Due to the relatively high cost of crab meat, it is used sparingly, with a greater proportion of crab shell powder being utilized owing to its cost-effectiveness and ample availability.

Crabs are available in the locality because they lived and survived in the wild, like in mangroves or in river banks with fresh brackish and salty waters. They are also cultured in ponds in order to have a large volume of production and are widely common in the market.

These can be prepared in various ways. However, no matter how crabs are prepared, only the crab meat is utilized, thereby throwing away the shells. Likely, crab shells have thought to be of no value because these are underutilized in hotels and restaurants serving crabs. The shells are considered garbage which may cause additional waste when they are not disposed properly.

It is in this context that the researcher was challenged to choose crab shells as added ingredient in meat balls production because of its availability in the market and distinct sources from hotels and restaurants, particularly the shells of the blue swimming crab (Portunus pelagicus) or Lambay as named by the locals. This type of species is abundant and commonly served by most of the hospitality service providers. Besides, Bennet (2015) cited that the shell of blue swimming crab is thin and soft compared to other species and can easily be pulverized.

Therefore, the researcher thought of the possibility of utilizing the crab shells as an additional ingredient in the preparation of crab meat balls and further determine the influence of crab shells powder on the quality of meat balls.

OBJECTIVE

The central objective of this research was to incorporate the plentifully available crab shell powder into crab meatball preparation. The investigation sought to evaluate the impact of crab shell powder on the caliber of Crab Meatballs through three distinct treatments, considering aspects like color, taste, aroma, and texture. Moreover, the study aimed to discern notable variations in respondent preferences across diverse formulations. The research was executed at Bohol Island State University-Main Campus in Tagbilaran City during the Academic Year 2017-2018.

METHODOLOGY

This study used experimental research design and descriptive research method. Experimental design was being considered for the study because the researcher was manipulating the experimental

variables, the crab shells powder, and mixed it with other ingredients to produce quality flavored of meatballs. Descriptive method was also utilized since the researcher had to find out the influence of crab shells powder on the quality of crab meatballs in descriptive and preference tests in terms of color, flavor, odor, and texture. Shelf life was observed at both room and chilled temperatures. An analysis on its nutritional value was also conducted.

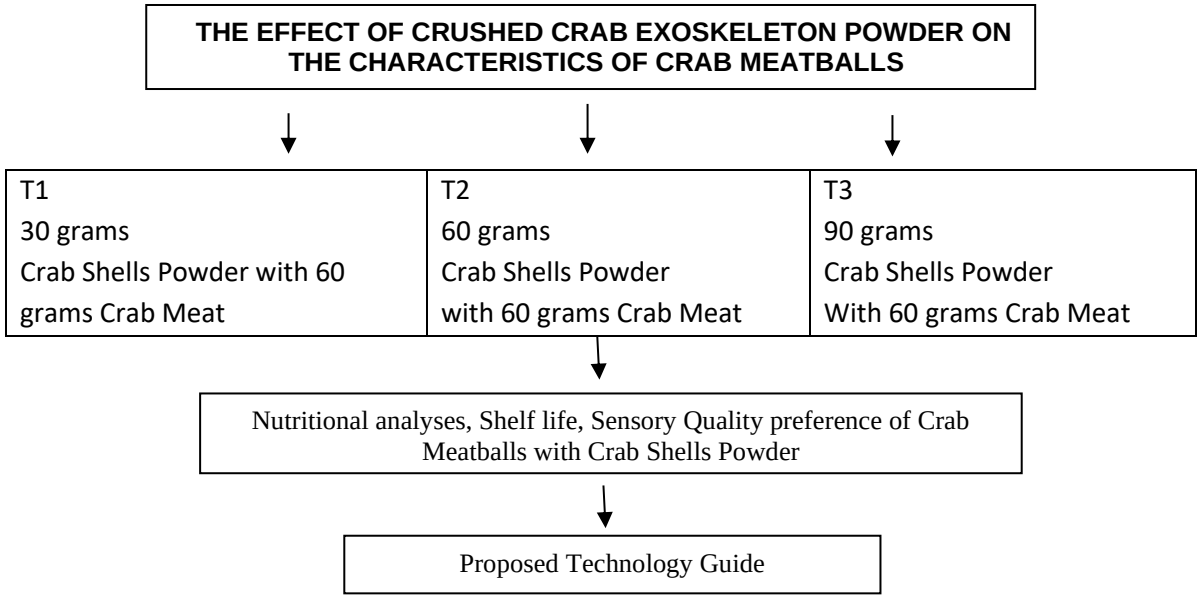

Figure 1. Theoretical and Conceptual Framework

Table 1 Sensory Characteristics of Crab Meatballs with Crab Shells Powder

Sensory Attributes	**Treatment 1**		**Treatment 2**		**Treatment 3**	
	AVM	Description	AVM	Description	AVM	Description
Color	3.37	Brown	3.11	Brown	2.43	Dull Brown
Flavor	2.51	Slightly salty	3.23	Slightly Salty	2.47	Salty
Odor	2.27	Slightly Pleasant	3.04	Moderately Pleasant	4.05	Very Much Pleasant
Texture	4.09	Tender	4.07	Tender	2.45	Delicate

Table 1 presents the respondents' description of meat balls with crab shells powder in terms of its sensory characteristics in terms of color, flavor, odor and texture. It shows that the more crab shells powder added to the crab meatballs the duller the color would be. In

terms of flavor, the more crab shells added to the crab meatballs the saltier it would be. This was due to the greater quantity of crab shells powder being used. Thus, the quantity of crab shells powder greatly affects the taste created in each treatment.

In terms of odor, it depicts that the more of crab shells powder added to the crab meatballs the more pleasant the more pleasant it would be. Thus, the amount of crab shells powder greatly affects the odor the product.

In terms of texture, treatments 1 and 2 were described by the respondents as “tender” and Treatment 3 was described “delicate” due to the greater amount of crab shells powder being used. In this case, the quantity of crab shells powder doesn’t affect much the texture of the three treatments. In general, the varying quantity of crab shells powder used in each treatment greatly affects the sensory attributes in the three treatments in terms of color, flavor, odor and texture.

Table 2 Level of likeness of Meatballs with Crab Shells Powder

Sensory Attributes	**Treatment 1**		**Treatment 2**		**Treatment 3**	
	AVM	Description	AVM	Description	AVM	Description
Color	6.47	Like Moderately	7.49	Like Moderately	6.58	Like moderately
Flavor	6.8	Like Slightly	7.45	Like very much	6.01	Like Slightly
Odor	6.56	Like Moderately	7.37	Like Moderately	5.76	Like Slightly
Texture	6.53	Like Moderately	7.73	Like Very Much	6.08	Like Slightly
Average Weighted Mean	6.59	Like Slightly	7.69	Like Very Much	5.86	Like Slightly
Rank		Rank 2		Rank 1		Rank 3

Table 2 manifests the respondents’ level of preference towards the three treatments of meat balls with crab shells powder. As shown in the table, treatment 2 got the highest average weighted mean of 7.69 which described as “like very much”. It ranked first among the three formulations due to the enough quantity of crab shells powder used. Thus, treatment 2 was most preferred and most liked by the respondents in terms color, flavor, odor and texture.

However, treatment 1 and 3 got average weighted mean of 5.59 and 5.86 respectively both described as “like slightly”. It ranked 3rd in the overall ranking due to the greater amount of crab shells powder. Thus, the respondents slightly liked the color, flavor, odor and texture of this treatment.

Table 3 Difference in the Degree of Likeness of Meatballs with Crab Shells Powder

Sensory Attributes	**Computed F-Value**	**Tabular T-Value**	**Interpretation**	**Description**
	At 5% level of significance			
Color	1.50667	3.036524	Insignificant	Accept Hypothesis
Flavor	2.83423	3.036524	Insignificant	Accept Hypothesis
Odor	31.66342	3.036524	Significant	Reject Null Hypothesis
Texture	51.53166	3.036524	Significant	Reject Null Hypothesis

Furthermore, the findings indicated a noteworthy distinction among the three treatments concerning both aroma and texture. This observation was substantiated by the computed F-values surpassing the critical tabular F-value of 51.53166 at a significance level of 5%. However, to pinpoint the specific variations, additional investigation was deemed necessary, warranting the implementation of the Scheffe's Test.

Table 4 Difference on the Averages of the Level of Preference of Crab (Portunus pelagicus) **on the Quality of Crab Meatballs**

Sensory Attributes	**F’**		**(K-1) (F.05) 2(3.09)**	**Description**
Odor	T_1 vs. T_2	8.17	6.18	Significant
	T_1 vs. T_3	0.33		Insignificant
	T_2 vs. T_3	5.23		Insignificant
Texture	T_2vs. T_3	2.89	6.18	Insignificant
	T_1 vs.T_3	2.56		Insignificant
	T_1 vs. T_2	10.91		Significant

Table 4 displays the Scheffe's Test results. The table shows the Difference on Averages of the Preference Test of Meat balls with crab shells powder in the three treatments.

In terms of odor, T_1 vs. T_2 shows significant difference since the computed F-value of 8.17 is beyond the critical F-value of 6.18. It shows that the varying quantity of the crab shells powder being used in the two treatments greatly affect the flavor of the product.

In terms of texture, T_1 vs. T_2 shows significant difference which has a computed F-value of 10.91 which is beyond the critical F-value of 6.18. It shows that a slight variation of the quantity of crab shells powder can greatly affects the texture of the product.

This implies that the significant difference lies on treatment 2 which contains 30g of crab shells powder. Since, treatment 2 is most preferred by the respondents in terms of odor and texture. It proves that a well-blended mixture of any food creates an impact to the respondents' preference.

Table 5 Nutritional Information of Crab Meatballs with Crab Shells Powder

Nutrients	Treatment 1	Treatment 2	Treatment 3
Ash	4.05%	3.68%	7.66%
Calories	70kcal	80kcal	70kcal
Food Energy Value	175kcal/100g	189kcal/100g	180kcal/100g
Moisture	60.6%	62.8%	57.4%
Total Fat	3g	4g	3g
Sodium	330mg	310mg	330mg
Total Carbohydrates	4g	2g	4g
Protein	7g	7g	7g

Table 5 reveals the laboratory test result of meatballs with crab shells powder. Each of these nutrients has different roles in the human body.

Based on the result of proximate analysis of 1 serving size from 30 grams of crab shells powder, for the calories, treatment 1 and 3 got the same content of calories with the weight of 70kcal while the treatment 2 got highest content of calories with the weight of 80kcal.

For the total fats, are the chief sources of essential fatty acids (EFAs), as well as carry of vitamin A, D, E, and K. Based from the test, treatment 2 gained the highest content of fats which was 4grams,

while treatment 1 and 3 got the same content of fats with the weight 3grams.

For sodium content, treatment 2 got the lowest content with the weight of 310 grams, while treatment 1 and 3 got the same content with the weight of 330 grams. Experts suggest that 3,000 mg would be a good target for healthy adults. Low sodium diets may be planned at 2,000mg, 1,000mg or even 500mg. The result showed that sodium content of each treatment is allowable and safe for eating.

For the total carbohydrates provide the chief source of energy in most diets. In the test, treatment 1 and 3 gained 4 grams weight content, while treatment 2 gained 2 grams weight content. AS a fact, it is desirable to have a total carbohydrates number of less than 200mg. The result showed that the crab meatball with crab shells powder has allowable content of carbohydrates in the diet.

Lastly the proteins, treatment 1, 2 and 3 got the same content with the weight of 7 grams. The results were lesser than 46-56 grams of protein requirement for adults. This means that it is allowable for human consumption.

RESULTS AND DISCUSSION

The shelf life of steamed Crab Meatballs with crab shells powder in chilled condition lasted only three days and two days at room temperature which was considered safe for human consumption. Treatment 2 has longer shelf-life than treatment 1 and 3, thus making it less chance to harbor microorganisms which leads to the deterioration or spoilage of a food. Because it would simply mean that too few or too much crab shells powder added affect the shelf life due to its odor.

The nutritional value of Crab Meatballs with crab shells powder was subjected for laboratory analysis in Department of Science and Technology. In terms of ash treatment 3 got the highest weight content of 7.66%. In terms of calories treatment 2 got the highest content of 80kcal.in terms of food energy value the treatment 2 got the highest weight content of 189kcal. In terms of moisture treatment 2 got the highest weight content of 62.8%. in terms of total fat, the treatment 2 got the highest weight content of 4g. In terms of sodium treatment 1 and 3 got the highest weight content of 330mg. In terms of total carbohydrates treatment 1 and 3 got the highest weight content of 4g. In terms of protein all treatment got the same weight content of 7g. The result implied that the amount of nutrients was not consistent because of the measurement of the ingredients in every treatment.

The influence of the crab shells powder on the quality of Crab Portunus pelagicus Meatballs in terms of color, flavor, odor and

texture among the three treatments. Based on the average weighted mean, the color was brown, flavor was slightly salty, odor was moderately pleasant, and texture was tender. The result implied that the color, flavor, odor and texture were classified as good quality.

Level degree of likeness of the Crab Meatballs with crab shells powder in terms of color, flavor, odor and texture among the three treatments.

The result revealed that all treatments were liked very much. However, Treatment 2 was most preferred and most liked by the respondents in terms color, flavor, odor and texture.

CONCLUSION

Based on the result of the study, the description of Crab Meatballs as influence of crab shells powder in terms of color, flavor, odor and texture among the three treatments, it showed that all treatments were acceptable to the respondents. The result showed that there is no significant difference among the three different treatments of the product. Therefore, the Meatballs with crab shells powder is compact with nutrients therefore it is a healthy meal items to serve for everyone. And demand for the production could be used for business venture.

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