

Protein Enriched Noodles Using Aramang Powder

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Abstract The study generally aimed to formulate noodles enriched with aramang powder and evaluate the acceptability. It specifically aimed to determine the sensory qualities of the formulated noodles as to the color, odor, and taste, and determine the consumer's acceptability. Three noodles formulations were prepared as follows: treatment 1 (with the addition of 5 grams aramang powder), treatment 2 (with the addition of 10 grams aramang powder and treatment 3 (with the addition of 15 grams aramang powder). Sensory evaluation was done using 10 semi-trained laboratory panelists to evaluate the quality of the product. Consumer acceptability was also conducted using 50 consumer respondents to determine the acceptability of the product. Results of the study revealed that there is a significant difference in color, odor, taste and general acceptability of the noodles enriched with aramang powder using the three (3) concentrations of aramang powder. Based on the result of the sensory test (sensory evaluation), treatment 3 using 15 grams of aramang powder was the best having the following qualities/attributes slightly dark cream in color, slightly strong aramang odor, and moderately strong aramang taste with overall acceptability of "liked very much" with a likeness score of 6.92. The level of acceptability of the newly formulated protein-enriched noodles was evaluated as "liked very much", with a mean score of 6.92.

Keywords Aramang Powder, Noodles, Sensory Qualities, Consumer's Acceptability

1. Introduction

Nematopalaemon tenuipes, locally known as "Aramang" is a soft-shelled red shrimp species endemic to the coastal area of Aparri Cagayan that has a major contribution to the income and livelihood of many fisherfolks in the area. The species is a commercially and ecologically important marine resource of the municipality and it is dubbed as its "One Town One Product" (OTOP). It also serves as a food source for other marine species like hairtail and croaker [1]. This species of shrimp was harvested abundantly all year round using a motorized boat with modified fishing gear and other paraphernalia locally known as "bannuar" or "saplar". However, thru Municipal Ordinance number 2015-151, a closed season for the catching of aramang in the municipal waters of Aparri, Cagayan was declared which was set every September 1 to November 15 of each year. Thus, aramang must be processed or undergo post-harvest technology, which is concerned with the utilization of catch. Post-harvest can be interpreted to mean all techniques and processes done on the fish or shrimps after catching whether or not a change in physical and chemical form occurs [2]. With this developed aramang – enriched products, it would in one way or another make available aramang products during the closed season thru the utilization of the developed aramang powder. Aramang contains essential nutrients necessary for growth and development, making it a target commodity for post-harvest technology.

Fish protein concentrate has been highly studied because of its nutritional characteristics and its potential for human

consumption [3]. There is also existing fish protein concentrate developed by different researchers such as flour made from the heads and bones of tilapia [4]; mixed powder from *Leiognathus* sp. [5]; and tilapia bone powder [6]. There is no existing protein concentrate using shrimp that can be utilized as a condiment or additional ingredient for other food preparations since shrimp is a unique source of carotenoid astaxanthin. It is also an excellent source of selenium and vitamin B12. This shellfish is a very good source of protein, phosphorus, choline, copper, and iodine. Thus, the formulation of aramang powder was conducted by Cagayan State University which utilized aramang. Aramang powder is made from soft-shelled red shrimp which has been steamed, sun-dried, and then ground creating a powder with a desirable aroma and taste or has a full intense shrimp flavor. The nutritional values of aramang powder are the following: moisture content 13.57%, ash 11.17%, fat 0.05%, crude protein 68.87%, carbohydrates 6.3%, and sodium 296.61 mg/100g [7]. The aramang powder is similar to a fish protein concentrate which is produced from edible parts of fish, which is properly dehydrated and milled into flour. It is otherwise referred to as fish flour. It has an attractive color, pleasant odor, and reduced moisture content which enable it to have a relatively long shelf life. Nutritional studies have shown that fish protein concentrate can be added to the weaning food of growing infants and nursing mothers [8].

Since noodles are popular products due to their low cost, ease of transportation, a long shelf-life, and nutritional properties as pasta provides significant amounts of carbohydrates, protein, and complex B vitamins [9]. Thus, the purpose of this research is the development of other low-cost protein-enriched noodles using aramang powder. The utilization of aramang powder is mainly done to ensure the availability of nutritious food supplements which are essential for human health. This aramang powder or shrimp flour was used in the formulation of protein-enriched noodles.

2. Materials and Methods

Fresh *Nematopalaemon tenuipes* "Aramang" samples were obtained from the catch of aramang fishers in Aparri. Procured samples were brought to the Regional ICRM

Center Laboratory for processing and other ingredients were purchased from a retail supermarket.

2.1. Processing of Aramang Powder

The fresh aramang were washed in potable water, steamed, and sun-dried for 8 hours. The dried aramang was milled into powder to pass through a no. 355 μm sieve. The aramang powder was packed in polyethylene bags, sealed, and stored in a refrigerator.

2.2. Formulation of Protein-Enriched Noodles

The ingredients and amount of Aramang powder added in the formulation are shown in Table 1 and below is the schematic diagram of the noodle formulation (Figure 1). The formulation of the noodles enriched with "Aramang" (*Nematopalaemon tenuipes*) powder involved the following steps. First, mix in a large bowl 500 grams Class A all-purpose flour, aramang powder (5g, 10 g, 15g), and 2.5 grams salt. Mix the mixture well to evenly distribute the salt then make a well in the center of the mixture. In a separate bowl, combine the 2 pieces of lightly beaten eggs and 300-milliliter water and add this to the flour mixture and mix well. Set aside. Sprinkle a clean kneading surface with flour then turn the dough into smaller sizes that are oblong in shape. Knead and insert the dough into the noodle machine several times until the desired thickness of 2 millimeter is attained. Insert the thin dough into the cutter of the noodle machine to produce the noodles. Spread the noodles in a drying tray and dry for 4 hours under the heat of the sun.

Table 1. Ingredients of Noodles enriched with aramang powder

INGREDIENTS	TREATMENTS		
	1	2	3
Aramang powder	5 grams	10 grams	15 grams
Flour	500 grams	500 grams	500 grams
Salt	2.5 grams	2.5 grams	2.5 grams
Egg	2 pcs	2 pcs	2 pcs
Water	300 ml	300 ml	300 ml

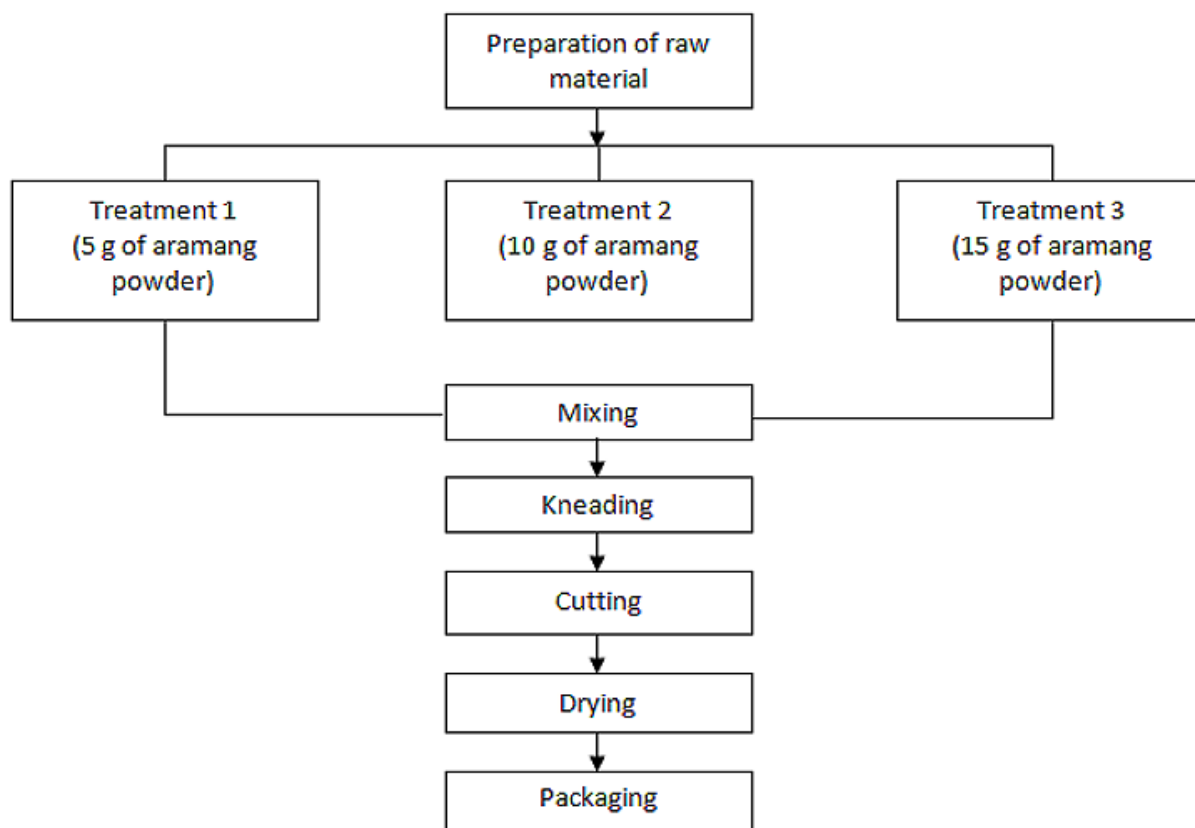


Figure 1. Schematic diagram of noodles formulation

2.3. Sensory Evaluation of Aramang Products

For the sensory evaluation, the three formulations of noodles were cooked separately for 20 minutes. Members of the panelists were selected from the post-harvest staff for the sensory evaluation activity. Sensory evaluation was conducted to determine the sensory attributes using the descriptive sensory evaluation for color, odor, and taste. The panelists were given score sheets and presented coded samples for them to evaluate. The score sheets used the 1-7 hedonic scale, wherein 7 is the highest score and 1 is the lowest. General acceptability was also conducted to determine the acceptability of the products. The panelists were also given a score sheet using the 7-point hedonic scale.

2.4. Consumer's Acceptability

The best product which was treatment 3 (with the addition of 15 grams aramang powder) was presented to the consumers composed of 50 housewives from Aparri and Sta. Teresita, 25 respondents in each municipality with a total of 50 consumers - respondents. Using the hedonic scale, score - sheets were given to the consumers for them to check the appropriate scale based on their evaluation of the product. Fifty (50) score - sheets were collected from the two (2) municipalities. Data was tabulated as to the consumer's degree of liking and/or disliking of the product.

2.5. Statistical Analysis

The data gathered was collated, tabulated, analyzed, and interpreted to answer the problems of the study. The Analysis of Variance (ANOVA) was used to determine the difference between the three concentrations of aramang powder added to the formulated products. The Duncans Multiple range Test (DMRT) was also used to determine the differences among the treatment. Frequency, percentages, and mean were used to describe the level of acceptability and sensory attributes of the formulated products as to color, odor, taste, and general acceptability.

3. Results and Discussions

3.1. Sensory Qualities of Protein-Enriched Noodles Using Aramang Powder

Sensory qualities of the noodles as affected by the amount of aramang powder added during the formulation process are shown below.

Color: The color scores of the protein-enriched noodles are shown in Table 2. The mean score of treatment 3 was 5.2 characterized as slightly dark cream color followed by treatment 2 which has a mean score of 4.3 characterized as neither dark nor light cream color and the least was treatment 1 with a mean score of 2.7 characterized as

moderately light cream color. Analysis of variance showed a significant difference among the three treatments. As shown in table 2.1, Duncans Multiple Range Test (DMRT) results showed that there is a significant difference between treatments. Based on the result, treatment 3 (with 15 grams of aramang powder) was the best as to the color of the noodles securing a score of 5.2. Using 15 grams of aramang powder in the formulation gave the desired color of the noodles. The color of aramang may have influenced the appearance of the formulated noodles. This result could be supported by the study of Goes et al. [9] where he mentioned that when adding a protein concentrate in the formulation of noodles. It may become darker in color as compared to the usual noodles, thus, the aramang powder added in the formulation affected the color of the noodles.

Table 2. Color scores of protein-enriched noodles

PANELIST	TREATMENT		
	T1 (with 5 grams of aramang powder)	T2 (with 10 grams of aramang powder)	T3 (with 15 grams of aramang powder)
1	5	5	6
2	1	2	3
3	3	5	6
4	4	4	4
5	3	5	6
6	3	4	5
7	3	5	6
8	2	5	6
9	1	4	5
10	2	4	5
TOTAL	27	43	52
Mean	2.7	4.3	5.2

Legend: 7-very dark cream color 6-moderately dark cream color 5-slightly dark cream color 4-neither dark nor light cream color 3-slightly light cream color 2-moderately light cream color 1-very light cream color

Table 2.1. Analysis of Variance (ANOVA)

Source of Variance	Df	SS	MS	F _c	F _t
Samples	2	32.07	16.03	33.40*	3.55
Panelists	9	23.20	2.58		
Error	18	8.60	0.48		
Total	29	63.87			

*Significant at the 5% level

Odor: The odor score of the protein-enriched noodles is presented in Table 3. The mean score of treatment 3 was 4.9 characterized as slightly strong aramang odor followed

by treatment 2 with a mean score of 3.6 characterized as weak aramang odor and the least was treatment 1 with a mean score of 2.2 characterized as moderately weak aramang odor. Analysis of variance showed a significant difference among the three treatments. DMRT results showed that each treatment differs from one another as shown in table 3.1. Treatment 3 was the best as to the odor of the product. The natural/inherent aramang odor of the aramang powder must have been enhanced upon cooking which contributed to the aroma of the noodles.

Table 3. Odor scores of protein-enriched noodles

PANELIST	TREATMENT		
	T1 (with 5 grams of aramang powder)	T2 (with 10 grams of aramang powder)	T3 (with 15 grams of aramang powder)
1	1	2	6
2	5	3	3
3	2	5	6
4	1	1	1
5	3	4	5
6	2	4	5
7	3	5	6
8	3	5	6
9	2	5	6
10	1	2	5
TOTAL	22	36	49
Mean	2.2	3.6	4.9

Legend: 7-very strong aramang odor 6-moderately strong aramang odor 5-slightly strong aramang odor 4-neither strong nor weak aramang odor 3-slightly weak aramang odor 2- moderately weak aramang odor 1-very weak aramang odor

Table 3.1. Analysis of Variance (ANOVA)

Source of Variance	Df	SS	MS	F _c	F _t
Samples	2	36.47	18.23	14.82*	3.55
Panelists	9	41.70	4.63		
Error	18	22.20	1.23		
Total	29	100.37			

*Significant at the 5% level

Taste: The mean taste score of protein-enriched noodles is shown in Table 4. As seen in the table, treatment 1 has a mean of 3.0 described as a slightly weak aramang taste. Treatment 2 has 4.8 characterized as slightly strong aramang taste and treatment 3 has a mean score of 5.7 characterized as moderately strong aramang taste. Analysis of variance showed significant differences among treatments with an F value of 38.57 which is greater than

the tabulated value of 3.55 at a 5% level of significance. In table 4.1, DMRT results showed that treatment 1 significantly differs from treatments 2 and 3. Treatment 3 exhibited the best taste of noodles using 15 grams of powder described as moderately strong aramang taste.

Table 4. Taste scores of protein-enriched noodles

PANELIST	TREATMENT		
	T1 (with 5 grams of aramang powder)	T2 (with 10 grams of aramang powder)	T3 (with 15 grams of aramang powder)
1	4	4	6
2	2	3	3
3	2	6	6
4	4	5	7
5	3	6	6
6	4	5	6
7	3	5	6
8	3	5	6
9	3	4	5
10	2	5	6
TOTAL	30	48	57
Mean	3.0	4.8	5.7

Legend: 7-very strong aramang taste 6-moderately strong aramang taste 5-slightly strong aramang taste

4-neither strong nor weak aramang taste 3-slightly weak aramang taste 2-moderately weak aramang taste 1-very weak aramang taste

Table 4.1. Analysis of Variance (ANOVA)

Source of Variance	Df	SS	MS	F _c	F _t
Samples	2	37.80	18.90	38.57*	3.55
Panelists	9	14.83	1.65		
Error	18	8.87	0.49		
Total	29	61.50			

*Significant at the 5% level

General acceptability: Table 5 presents the general acceptability mean scores of the protein-enriched noodles. The table depicts that treatment 3 has a mean of 6.6 described as like very much followed by treatment 2 which has a mean score of 6.1 (like moderately) and treatment 1 with a mean score of 5.5 (like moderately). Analysis of variance showed significant differences among the three treatments with an F value of 5.26 which is greater than the tabulated value of 3.55 using the 5% level of significance. This means that the aramang powder added in the formulation affects the general acceptability of the noodles in terms of color, odor, and taste. DMRT showed that treatment 3 was significantly different from treatments 1

and 2. Furthermore, using 15 grams of aramang powder was most preferred and was evaluated as “like very much”.

Table 5. General acceptability scores of protein-enriched noodles

PANELIST	TREATMENT		
	T1 (with 5 grams of aramang powder)	T2 (with 10 grams of aramang powder)	T3 (with 15 grams of aramang powder)
1	7	7	7
2	7	5	5
3	5	6	7
4	6	6	6
5	5	6	7
6	5	6	7
7	5	6	7
8	5	6	6
9	5	6	7
10	5	7	7
TOTAL	55	61	50
Mean	5.5	6.1	6.6

Legend: 7-like very much 6-like moderately 5-like slightly 4-neither like nor dislike

3-dislike slightly 2-dislike moderately 1-dislike very much

Table 5.1. Analysis of Variance (ANOVA)

Source of Variance	Df	SS	MS	F _c	F _t
Samples	2	5.90	2.95	5.26*	3.55
Panelists	9	3.70	0.41		
Error	18	10.10	0.56		
Total	29	19.70			

*Significant at the 5% level

3.2. Consumer's Acceptability Test

Table 6 shows the consumers' acceptability test of noodles enriched with aramang powder. Sensory evaluation was used for measuring the acceptability level of the product. Acceptability of the product was based on consumers' reaction in terms of their degree of liking or disliking the given product under a given set of conditions. The consumers were composed of housewives from two municipalities (Aparri and Sta. Teresita). The protein-enriched noodles were cooked. Saute three cloves of garlic and 1 medium sized onion, add 3 cups of water, ¼ teaspoon salt and let boil for 5 minutes and add 25 grams of the aramang-enriched noodles and continue and continue boiling for 15 minutes. The cooked noodles were presented to the consumers for evaluation. Consumers were given

sensory score sheets for them to check the appropriate level of acceptability. The acceptability of the products was assessed by 50 housewives as respondents in the two municipalities and the results of their assessment are presented in the table below. The table shows that the level of acceptability was evaluated as “liked very much”.

As shown in the table below, protein-enriched noodles were evaluated by the respondents as “like very much” with an overall mean of 6.92 which indicates that the formulated products using aramang powder as a cheap source of protein were accepted by the consumers as a new product of noodles.

Table 6. Consumer’s Acceptability Test of noodles enriched with aramang powder

Housewife	Level of Acceptability						Mean
	7		6		5		
	Freq	%	Freq	%	Freq	%	
Aparri	23	46	1	2	1	2	6.88
Sta. Teresita	24	48	1	2	0	0	6.96
Total	47	94	2	4	1	2	6.92

Over – all Mean - 6.92

Adjectival Description/Rating - like very much

4. Conclusions and Future Works

Sensory qualities of protein-enriched noodles were significantly affected by the amount of powder added to the product. Based on the result of the sensory test (sensory evaluation) treatment 3 using 15 grams of aramang powder was the best having the following qualities/attributes slightly dark cream in color, slightly strong aramang odor, and moderately strong aramang taste with an overall acceptability of “liked very much” with a likeness score of 6.92.

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