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Utilization of black tiger shrimp (*Penaeus monodon*) head meat for seasoning production

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Abstract

Shrimp by-products are a rich source of protein hydrolysate that can be used as dietary supplements. A better economic use of the shrimp head would minimize the pollution problem and at the same time maximize the profits of the processor. With pollution control norms becoming more stringent, processors are looking at utilization of these by-products for recovery of marketable by-products as an alternative to disposal. Utilization of by products for recovery of value added products not only minimizes the pollution but also improves the economy of the plant. Purpose of our research is to define the optimal drying time for shrimp head meat as well as the seasoning formula. Results are as follows: drying temperature for the black tiger shrimp head meat 70 °C in 2.5 hours to reduce its moisture to 10.5%. The main seasoning formula includes 70% salt, dried shrimp head meat 30% with some minor additives such as sodium glutamate, powder chilli, garlic, black pepper, etc. Drying time for this seasoning compound is 20 minutes.

Keywords: black tiger shrimp, head meat, utilization, drying, seasoning.ss

1. Introduction

Shrimp processing for freezing normally involves removal of head and body carapace. Processing of shrimps generates large quantities of solid wastes. The solid shrimp waste contains head and body shell accounts approximately to 40-50% of whole shrimp weight (Sachindra N.M., *et al.*, 2006). The tropical shrimps the head generally constitutes 34-45% and body shell constitutes 10-15% (Barratt A. *et al.*, 1986). These wastes contain protein (35-40%), chitin (10-15%) minerals (10-15%) and carotenoids (Sachindra N.M. *et al.*, 2008). for the industry to develop processes for by-product recovery and utilization it has to be more economically feasible than discarding by-products.

Shrimp waste is an important source of bioactive molecules and it undergoes rapid disintegration which leading to environmental pollution (Min-Soo Heu *et al.*, 2003). It is necessary to preserve the material adopting the environmentally safe techniques, prior to recovery of bioactive components such as proteins and carotenoids (Ramyadevi D. *et al.*, 2012).

Shrimp head has higher contents of fat and reducing sugars but lower protein content than shrimp meat. The digestive system is mainly inside the shrimp head. The proteolytic enzyme activities are concentrated in the midgut gland. Shrimp head waste is a rich source of chitin and also good source of protein, nutritive components and enzymes, making use of such wastes has drawn much interest from researchers in recent years. Few attempts have been made to utilize shrimp waste as a source of protein, pigments (Fereidoon Shahidi *et al.*, 1991), flour (Thiago Mendes Fernandes *et al.*, 2013), flavour compounds (Handayani A.D., *et al.*, 2008) and chitin (Redde R.H. *et al.*, 2008), Chitosan (Hur J.W. *et al.*, 1996; Asbjørn Gildberg *et al.*, 2001), Protein and pigments found in shrimp waste have been proven to be an excellent animal feed supplement (Coward-Kelly G. *et al.* 2006).

Purpose of our research is to find a new way in utilization of shrimp by-products to produce a value added product, food seasoning, not only to eliminate pollution but also increase its economics.

2. Material & Method

2.1 Material

Black tiger shrimp heads are collected from shrimp processing factories in Tra Vinh province, Vietnam. Other materials such as salt, sugar, sodium glutamate, powder chilli, garlic, black pepper are purchased in Tra Vinh local market.

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2.2 Research method

2.2.1 Survey the drying time for the black tiger shrimp head meat powder

Experiments are randomly designed with one factor, drying temperature in 70 °C; the drying time: 1h30, 2h30, 3h 30. Each sample has 200 gram and three replications. Sensory evaluation includes color, aroma, and taste. All data are statistically processed to define the significant difference to choose the appropriated drying time.

2.2.2 Survey the effect of drying time to product moisture content

Moisture content in dried seafood products is normally in range 10 – 15%. To achieve this moisture level, samples are dried under 70 °C in different durations 1h30, 2h30, 3h 30. Experiments are randomly designed with one factor, and three replications. Each sample has 200 gram. Checking parameter is moisture content in black tiger shrimp head meat. All data are statistically processed to define the significant difference to choose the appropriated drying time.

2.2.3 Survey the optimal seasoning formula

Experiments are randomly designed with one factor and three seasoning formulas. Sensory evaluation includes color, aroma, and taste. All data are statistically processed to define the significant difference to choose the appropriated seasoning formula.

2.2.4 Survey the effect of seasoning drying time

Seasoning powder is dried under 70 °C in different times: 15 minutes, 20 minutes, 30 minutes. Sensory evaluation includes color, aroma, and taste. All data are statistically processed to define the significant difference to choose the appropriated seasoning drying time.

2.3 Statistical analysis

All data are processed by ANOVA (Startgraphics) to check the significant difference via LSD.

3. Result & Discussion

Effect of drying time to the black tiger shrimp heat meat powder

Table 1: Average sensory score for the black tiger shrimp heat meat powder by drying time

Criteria	Drying time		
	1h30	2h30	3h30
Color	-0.56	0.52	0.04
Aroma	-0.72	0.60	0.16
Taste	-0.16	0.36	-0.08

To get the highest sensory value for the black tiger shrimp head meat powder, it should be dried at 70°C in 2h30.



Fig 1: Black tiger head meat powder (dried)

3.1 Effect of drying time to moisture content in the black tiger shrimp head meat powder

Table 2: Black tiger shrimp head meat after being dried

Replication	Weight (g)		
	1h30	2h30	3h30
1	70.1	58.2	51.8
2	76.8	60.1	53.8
3	72.7	58.7	52.7
Average	73.2	59.0	52.7

Table 3: Effect of drying time to moisture content in in the black tiger shrimp head meat powder

Replication	Moisture content (%)		
	Initial	1h30	2h30
1	64.9	16.9	10.9
2	61.6	21.7	10.5
3	63.4	19.2	10.2
Average	63.3	19.3	10.5

Moisture content in dried seafood is normally 10 – 15% so the drying time needed is 2h30 to reduce moisture content to 10.5%.

3.1 The appropriate seasoning formula

Table 4: Average sensory score for different seasoning formulas

Criteria	Seasoning formula		
	C1	C2	C3
Color	-0.85	0.32	0.56
Aroma	-0.85	0.24	0.60
Taste	-0.85	0.08	0.72

From table 4, we see quite clearly that seasoning formula with 70% salt: 30% dried shrimp head meat is the best one.

3.1 Effect of drying time to seasoning powder

Table 5: Average score for the drying time to seasoning powder

Criteria	Drying time		
	10 minutes	20 minutes	30 minutes
Color	-0.85	0.60	0.24
Aroma	-0.85	0.60	0.24
Taste	-0.85	0.64	0.20

Drying time 20 minutes gives the best shrimp head meat powder regarding to color, aroma, and taste.



Fig 2: Black tiger shrimp head meat seasoning

4. Conclusion

The large amount of by-products in the shrimp industry has become an economic and environmental problem. Their use would avoid waste, and should reduce environmental pollution. Since in certain regions and social status of the country population suffer from nutritional deficiencies, the creation of alternative technologies to enable fish by-product management could bring consequences for the fight against hunger, besides promoting job creation and sustainable development. Thus, the utilization of shrimp industry by-products would bring environmental and health benefits, and could be highly important for use in food.

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