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STUDY ON PROTEIN LOSSES AND TOTAL VOLATILE BASE NITROGEN (TVBN) OF FRESH WATER PRAWN (GALDA) IN THE SHRIMP VALUE CHAIN OF BAGERHAT REGION, BANGLADESH FOR THE DEVELOPMENT OF SEA FOOD QUALITY

A. Chakrabortty[1*], M. A. Aziz[1] and M. A. Rashad[2]

[1]*Department of Chemistry, Khulna University of Engineering & Technology, Khulna-9203, Bangladesh.*
[2]*Fish Quality & Inspection, Department of Fisheries, Khulna, Bangladesh.*

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ABSTRACT

The present study was conducted to assess the quality loss of shrimp (Macrobracium rosenbergii) known as Galda in the value chain of Bagerhat region. The investigation was carried out in December 2011 to February 2012. The study was undertaken in twelve selected shrimp farms, four faria, four depot and five factory receiving point of different locations, viz. Fakirhat, Bagerhat Sadar, Mollahat and Sharankholla in Bagerhat region. Quality assessment included proximate analysis of Protein parameters and Biochemical assessment {Total Volatile Base Nitrogen (TVB-N)}. Protein loss of Shrimp were 19.94%, 20.55%, 20.03% and 18.74% respectively in Fakirhat, Bagerhat Sadar, Mollahat and Sharankholla from farm to factory receiving point. From farm to factory receiving point, grand protein loss was 19.82%. The TVB-N value was found from 10.14 mg/100g to 19.54 mg/100g.

1. INTRODUCTION

Shrimps are one of the most economically important species in aquaculture due to their high world-wide demand. In Bangladesh, shrimp is the most expanding sector among the agro-based products including tea, raw jute, vegetables, fruits etc. Shrimp is one of main exporting product in Bangladesh. The demand of shrimp is increasing day by day in international market, at same time the culture practice of shrimp is increasing in coastal region area. Greater Khulna region (Satkhira, Khulna and Bagerhat) provided maximum amount of total foreign earnings in fish and shrimp products. Though Satkhira, Khulna and Bagerhat are the main region for shrimp culture yet Bagerhat district plays the main role in this regard. The main cultivated species in this region are *Macrobracium rosenbergii*, more commonly referred to as Galda. Bagerhat district have a great contribution about shrimp export. Exportable shrimp requires special care to retain as much as practicable its original physical appearance, odor and organoleptic conditions. It must be free from dirt, filth, pathogenic organisms, uncertified chemicals and any antibiotics even in the minutest quantity. The importing countries, particularly the EU, USA and Japan are highly conscious about food hygiene and safety. These countries will not accept any food item with doubtful quality in respect of its freshness, hygiene and safety for human health (DoF, 2011).

There is now being asked a question about the quality of processed shrimp in the international market. Due to having dissatisfaction of the international buyer of Bangladeshi frozen food products about the quality loss from shipment to taking by the importer, an intensive and comprehensive research study is a crying need in this regard. As a result Bangladeshi frozen shrimp exporters will get more currency if we can identify the correct cause and the solution. Ultimately Bangladesh will earn more foreign currency from exporting it with maintaining proper quality control.

2. EXPERIMENTAL

Biochemical (TVB-N) quality and proximate analysis (Protein) will be assessed in the laboratory. The Protein was determined by proximate analysis (kjeldhal method in wet way) and TVB-N was determined by using Conway's Micro-diffusion Technique. Both samples (normal practices and controlled study) were analyzed. Quality assessment for each step was carried out in triplicate.

Protein Determination

The standard method for determining protein compounds is the Kjeldahl method.
The process involves two steps:

a) Digestion of the sample to convert the N to ammonium sulphate.
b) Determination of nitrogen in distillation the digest sample to ammonia and collect it by NH_4BO_3.
c) Titrated with 0.1(N) HCl.

* Corresponding Author: anupamttc@yahoo.com

$$\text{Sample} - N + H_2SO_4 \xrightarrow[\text{Digestion}]{\text{Heat}} (NH_4)_2SO_4$$

$$(NH_4)_2SO_4 + NaOH \xrightarrow[\text{Distillation}]{\text{Heat}} NH_3 + H_2O + Na_2SO_4$$

$$NH_3 + H_3BO_3 \longrightarrow NH_4BO_3$$

$$NH_4BO_3 + HCl \longrightarrow NH_4Cl + H_3BO_3$$

TVB-N Determination

TVB-N was determined according to using Conway's Micro-diffusion Technique procedure stated in the manual of Siang and Kim [6]. Three Conway's units were taken which had been thoroughly cleaned with a neutral detergent to remove any containment. To the edge of the outer ring of each unit was applied the gum. Using a micropipette 1 ml of inner ring solution was pipetted into the inner ring of each unit. Into the outer ring of each unit, was pipetted 1 ml of the sample extract. 1 ml of Saturated K_2CO_3 solution was carefully pipetted into the outer ring of each unit, carefully to prevent the entering the inner ring and immediately the units were covered and closed with clip. The solution of the units was then mixed gently, to prevent any solution mixing from one ring to other. After then the units were placed.in an incubator at 45°C for 45 minutes. After this the units covers were removed and the inner ring solution, now a green color was titrated with 0.02N HCl using a burette (50ml) until green color solution turned to pink. An average titrated volume of HCl was found from the result of three titrations for each muscle sample. For each volume the TVB-N volumes were calculated. A blank test was also carried out using l ml of 1% TCA, instead of sample extract.

3. RESULTS AND DISCUSSION

Protein Losses (%)

The protein content of shrimp (*Macrobracium rosenbergii*) at different stages of value chain in Bagerhat District is presented in figure 01 to 04. In figure 01 Protein losses of shrimp were observed at Fakirhat upazilla 9.91%, 5.50% and 7.34% in value chain 01; 14.16%, 5.80% and 2.79% in value chain 02; 7.07%, 5.22% and 5.66% in value chain 03; from farm – faria, faria - depot, depot - factory receiving point respectively. In figure 02 Protein losses of shrimp were observed at Bagerhat Sadar upazilla 3.83%, 10.46% and 9.27% in value chain 01; 3.93%, 8.36% and 8.08% in value chain 02; 6.06%, 8.90% and 7.28% in value chain 03; from farm – faria, faria - depot, depot - factory receiving point respectively. In figure 03 Protein losses of shrimp were observed at Mollahat upazilla 7.77%, 8.10% and 6.80% in value chain 01; 9.82%, 6.13% and 4.87% in value chain 02; 9.26%, 6.19% and 9.06% in value chain 03; from farm – faria, faria - depot, depot - factory receiving point respectively. In figure 04 Protein losses of shrimp were observed at Sharankholla upazilla 9.88%, 6.62% and 5.50% in value chain 01; 7.40%, 7.77% and 11.30% in value chain 02; 5.08%, 7.11% and 4.34% in value chain 03; from farm – faria, faria - depot, depot - factory receiving point respectively. The average Protein loss of shrimp was observed 19.94%, 20.55%, 20.03% and 18.74% respectively in Fakirhat, Bagerhat Sadar, Mollahat and Sharankholla station from farm to factory receiving point. From farm to factory receiving point in Bagerhat region, Grand protein loss was recorded 19.82%. This 19.82% of grand protein loss occurred due to size, age, sex of the shrimp along with elapse of time, handling and transportation as well as other biochemical reaction (especially decomposition) in shrimp body.

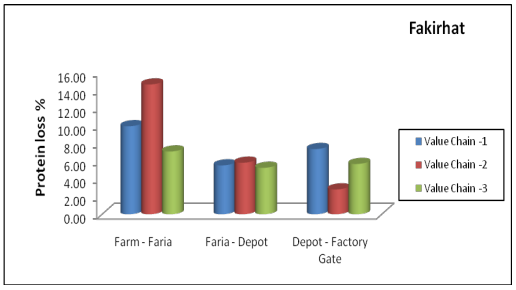

Figure 1: Protein losses at different stages of value chain in Fakirhat upazilla

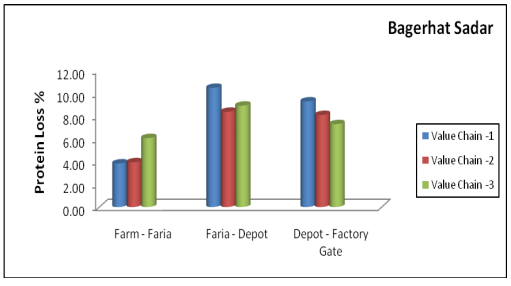

Figure 2: Protein losses at different stages of value chain in Bagerhat Sadar upazilla

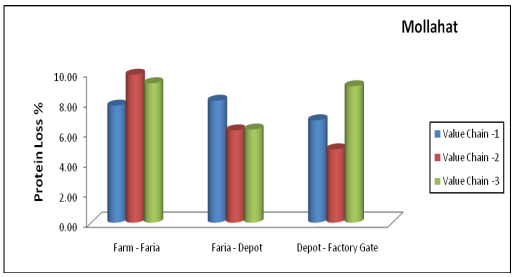

Figure 03: Protein losses at different stages of value chain in Mollahat upazilla

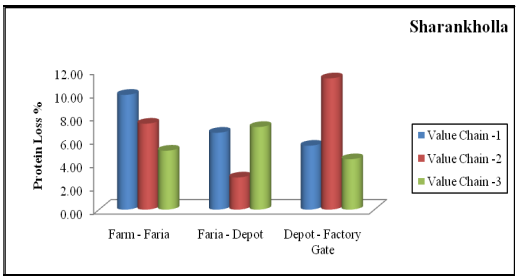

Figure 4: Protein losses at different stages of value chain in Sharankholla upazilla

Total Volatile Base Nitrogen (TVB-N) in Shrimp (*Macrobracium rosenbergii*)

The results of TVB-N contents value of shrimp (*Macrobracium rosenbergii*) at different stages of value chain in Bagerhat region are given in figure 05 to 08. The figure shows that TVB-N contents were increased gradually from farm to factory receiving point in Bagerhat region. The values of TVB-N content in deferent value chain of shrimp were found in the range of 10.84 mg/100g to 19.34 mg/100g in Fakirhat upazilla in figure 05; 10.14 mg/100g to 19.43 mg/100g in Bagerhat Sadar upazilla in figure 06; 10.61 mg/100g to 18.52 mg/100g in Mollahat upazilla in figure 07; 10.63 mg/100g to 19.54 mg/100g in Sharankholla upazilla in figure 08. All those results were presented within the acceptable limit in concurrence with result of others investigation (Pushparajan, N. and P. Soundarapandian. 2009), (Jayasinghe P.S. *et al*. 2006), (Siang, N. C. and Kim, L. L., 1992), (Ali, M. *et al.*2005). The value of TVB-N was increasing in every value chain over passing of time. The low value of TVB-N initially was an indication quality of fresh shrimp while the high value may be due to action of autolysis enzymes and spoilage bacteria (Shewan, J.M. & Ehrenberg, R.T. 1957).

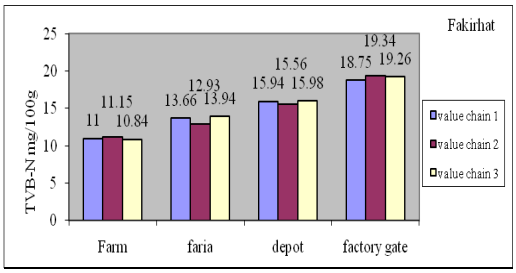

Figure 5: TVB-N contents at different stages of value chain in Fakirhat upazilla

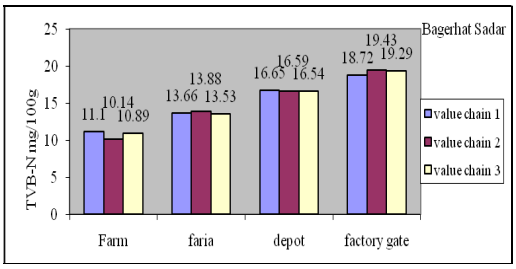

Figure 6: TVB-N contents at different stages of value chain in Bagerhat Sadar upazilla

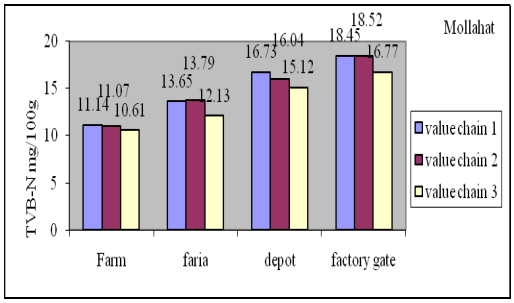

Figure 7: TVB-N contents at different stages of value chain in Mollahat upazilla

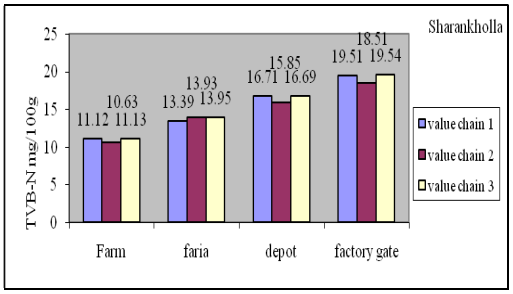

Figure 8: TVB-N contents at different stages of value chain in Sharankholla upazilla

4. CONCLUSION

The thesis address the feasibility studies of quality changes of value chain of shrimp cultivated in different area of Bagerhat region. The investigation involves measurement of Protein Losses, & Total Volatile Base Nitrogen (TVB-N). Protein losses of shrimp were observed at Fakirhat upazilla 21.11%, 21.81% and 16.91% in value chain 01, value chain 02 and value chain 03 respectively from farm - factory receiving point. At Bagerhat Sadar upazilla Protein losses were 21.87%, 21.08% and 20.65% in value chain 01, value chain 02 and value chain 03 respectively from farm to factory receiving point. At Mollahat upazilla

Protein losses were 21%, 19.47% and 22.59% in value chain 01, value chain 02 and value chain 03 respectively from farm to factory receiving point. At Sharankholla upazilla Protein losses were 20.48%, 20.14% and 15.66% in value chain 01, value chain 02 and value chain 03 respectively from farm to factory receiving point.

The average Protein loss of shrimp were observed 19.94%, 20.55%, 20.03% and 18.74% respectively in Fakirhat upazilla, Bagerhat Sadar upazilla, Mollahat upazilla and Sharankholla upazilla station from farm to factory receiving point. From farm to factory receiving point in Bagerhat region, Grand protein loss was recorded 19.82%. The results of TVB-N contents value was found from 10.14 mg/100g to 19.54 mg/100g of shrimp (*Macrobracium rosenbergii*) at different stages of value chain in Bagerhat region. The values of TVB –N content of shrimp were found within standard limit. The results obtained from this investigation will immense to help the shrimp's exporters to export improved quality shrimps. The country will be able to export safe and quality products and earned more foreign currency. It will be helpful to develop our economy and the products will be made a room in the global market.

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