

## 7. RESULT

### 7.1 Proximate nutritional composition in *Bellamyia bengalensis*

#### 7.1.1 Availability of common nutritional parameters

According to the result (Table 12) of nutritional parameters in the muscle tissue of *B. bengalensis*, it was evaluated that, there a satisfactory amount of protein was present i.e.  $48.65 \pm 0.85\%$ . This protein content was second highest among the all estimated values. The Moisture content was indicating highest  $82.1 \pm 0.06$  among the all estimated parameters, in the muscle flesh of *B. bengalensis*. Whereas, ash content was indicating lowest  $3.92 \pm 0.15\%$ , among the all estimated values. Carbohydrate and fat content in the flesh of *B. bengalensis* were observed  $39.78 \pm 0.25\%$  and  $3.92 \pm 0.31\%$  respectively.

**Table 12 :** Available common nutritional parameters in *B. bengalensis*

Name of Species	Protein (% d/w)	Fat (% d/w)	Carbohydrate (% d/w)	Ash (% w/w)	Moisture (% w/w)
<i>Bellamyia bengalensis</i>	$48.65 \pm 0.85$	$5.23 \pm 0.62$	$39.78 \pm 0.25$	$3.92 \pm 0.15$	$82.1 \pm 0.06$

(Values are mean  $\pm$  SD), n=10

#### 7.1.2 Amino acid composition in the muscle tissue of *Bellamyia bengalensis*

Among the essential amino (EAA) acids (Table 13), Threonine ( $18.89 \pm 0.88\%$ ) gave highest result while sulphur containing Methionine ( $0.61 \pm 0.39\%$ ) indicated lowest result. Among non essential amino acid Glutamic acid ( $7.93 \pm 0.61\%$ ) made highest result, while Glycine ( $1.85 \pm 0.36\%$ ) indicated lowest result. The amount of amino acids Tryptophan and Proline could not be determined. Thus significant level ( $P < 0.05$ ) of essential amino acid were  $66.96\%$ , which was isolated from *B. bengalensis*. So according to chemical structure of amino acid monoamino carboxylic (glycine, alanine,

valine); mono-amino dicarboxylic (aspartic and glutamic acids);  $\beta$ -hydroxyamino carboxylic (serine and threonine); basic (lysine, histidine, arginine); sulfur-containing (methionine and cysteine); ring-containing (phenylalanine, tyrosine) and leucines (leucine and isoleucine) (Zhelyazkova *et. al.* 2006) were identified to confirm their presence.

**Table 13 :** Amino acid composition in the muscle tissue of *B. bengalensis*

<b>Amino acid composition</b>	<b>Quantity (d/w) (gm./ 100 gm. of Protein)</b>
Aspartic acid*	6.59± 0.72
Glutamic acid**	7.93 ± 0.61
Serine	7.62 ± 0.45
Histidine <sup>ea</sup>	6.19 ± 0.50
Glycine	1.85 ± 0.36
Threonine <sup>ea</sup>	18.89± 0.88
Arginine <sup>ea</sup>	5.61 ± 0.59
Alanine	8.64 ± 0.23
Tyrosine <sup>ea</sup>	1.90 ± 0.60
Valine <sup>ea</sup>	3.66 ± 0.12
Methionine <sup>ea</sup>	0.61 ± 0.39
Cysteine <sup>ea &amp; ea</sup>	0.84 ± 0.82
Isoleucine <sup>ea</sup>	2.70 ± 0.33
Leucine <sup>ea</sup>	7.51 ± 0.26
Phenylalanine <sup>ea</sup>	2.10 ± 0.36
Lysine <sup>ea</sup>	16.13 ± 0.51
<b>% of essential amino acid</b>	<b>66.96 (including Cysteine)</b>

\*aspartic acid + asparagine, \*\*glutamic acid + glutamine, ea- essential amino acid, ea- essential amino acid for children, ea- sulphur containing essential amino acid, Tyro+Phyala = Tyrosine+Phenylalanine, Values are mean  $\pm$  SD, n=10

### **7.1.3 Fatty Acid composition in the muscle tissue of *Bellamya bengalensis***

The compositions of fatty acid (FA) in the muscle tissue of *B. bengalensis* were listed in Table 14. Among the SFAs predominant was palmitic acid (16:0) (36.78±1.28 %) while Lauric (12:0) was in lowest end (2.08±0.65 %). Beside the pamic acid, stearic acid (18:0) (8.82±0.59 %) and myristic acid (14:0) (5.19±0.12 %) were isolated in a significant amount. The total estimated value of total SFA was 52.87%. Among the

MUFAs only oleic acid (18:1) and erucic acid (22:1) indicated their presence in the amount of  $16.22 \pm 0.92$  % and  $3.67 \pm 0.53$  % respectively. The estimated value of total MUFA was 19.89 %. The total estimated score of PUFA group was 11.30 %. Where, docosahexaenoic acid (DHA) (22:6n-3) made maximum percentage ( $5.03 \pm 0.76$ %) and eicosapentaenoic acid (EPA) (20:5n-3) was in minimum end ( $1.28 \pm 0.26$ %), while  $\alpha$ -Linolenic acid (ALA) (18:3n-3) scored  $2.87 \pm 0.61$  %. In n-6 series only lenoleic acid (18:2n6) was isolated ( $2.12 \pm 0.76$  %). The isolated n-3 and n-6 ratio was found 4.33.

**Table 14 :** Fatty Acid composition in the muscle tissue of *B. bengalensis*

<b>Fatty acids composition</b>	<b>Quantity (d/w) (gm./ 100 gm. of Protein)</b>
12:0	$2.08 \pm 0.65$
14:0	$5.19 \pm 0.12$
16:0	$36.78 \pm 1.28$
18:0	$8.82 \pm 0.59$
22:0	0.0
<b><math>\Sigma</math>SFA*</b>	<b>52.87</b>
18:1	$16.22 \pm 0.92$
22:1	$3.67 \pm 0.53$
<b><math>\Sigma</math>MUFA**</b>	<b>19.89</b>
18:2 (n-6)	$2.12 \pm 0.76$
18:3 (n-3)	$2.87 \pm 0.61$
20:5 (n-3)	$1.28 \pm 0.26$
22:6 (n-3)	$5.03 \pm 0.76$
<b><math>\Sigma</math>PUFA***</b>	<b>11.30</b>
<b>(n-3) / (n-6)</b>	<b>4.33</b>

\*SFA-Saturated fatty acid, MUFA\*\*-Mono unsaturated fatty acid, PUFA\*\*\*-Poly unsaturated fatty acid, Values are mean  $\pm$  SD, n=10

#### **7.1.4 Vitamin Analysis in the muscle tissue of *B. bengalensis***

Both water-soluble and fat-soluble vitamins were isolated from the flesh of *B. bengalensis*. The estimated, the fat-soluble vitamin A and D in *B. bengalensis* were  $327.63 \pm 1.73 \mu\text{g}/100 \text{ g}$  and  $7.21 \pm 0.91 \mu\text{g}/100 \text{ g}$  respectively at significant level ( $p < 0.05$ )

(Table 1). While, water-soluble vitamin B<sub>5</sub> and B<sub>12</sub> were 8.62±1.36 mg/100 g and 19.31±0.97 µg/100 g respectively, at significant level ( $p < 0.05$ ) (Table 1).

**Table 15 :** Proximate composition of Vitamin A,D,B<sub>5</sub> and B<sub>12</sub> in the flesh of *B. bengalensis*

Name of Vitamins		Estimated Result (w/w)
Fat Soluble	Vitamin A (µg/100 g)	327.63±1.73
	Vitamin D (µg/100g)	7.21±0.91
Water Soluble	Vitamin B <sub>5</sub> (mg/100 g)	8.62±1.36
	Vitamin B <sub>12</sub> (µg/100 g)	19.31±0.97

Values are mean ± SD, n=6

## **7.2 Study about the seasonal occurrence of nutritional parameters (Protein, Carbohydrate and Fat) in the flesh of *B. bengalensis***

It was noticed that (Table 16) a significant seasonal variation among protein, carbohydrate, fat content were occurred, in the muscle of *B. bengalensis*, throughout the experimental period from the February'2011 to January'2014.

### **7.2.1 Availability of protein (%)**

In Pre-Monsoon seasons, the percentage of “Protein” were comparatively higher than that of the Post monsoon period of the same years. In Pre-Monsoon seasons the available percentages of protein were 49.36±0.83%, 49.86±0.61%, and 49.19±0.27% respectively While in post monsoon period the available percentage of protein were 43.19±0.63%, 42.97±0.70% and 42.88±0.72% respectively during the experimental period.

### **5.2.2.2 Availability of Carbohydrate (%)**

In Pre-Monsoon seasons the percentage of Carbohydrate were comparatively high than that of the Post monsoon period of same year. i.e. in Pre-Monsoon seasons the % of Carbohydrate were 37.39±0.56%, 37.52±0.45% & 37.50±0.51% while in post monsoon

period the % of Carbohydrate were  $29.86\pm 0.23\%$ ,  $29.92\pm 0.30\%$  &  $28.83\pm 0.28\%$  respectively during the experimental period.

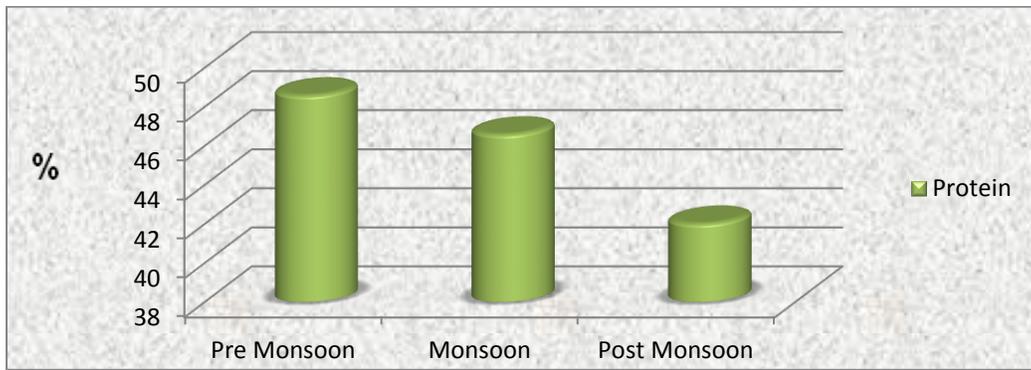
### 5.2.2.3 Availability of Total Fat (%)

In Pre-Monsoon seasons the percentage of Fat were too some extent differ from the Post monsoon period of same year. i.e. in Pre-Monsoon seasons the % of Fat were  $6.91\pm 0.21\%$  ,  $6.88\pm 0.29\%$  &  $6.90\pm 0.66\%$  while in post monsoon period the % of Fat were  $5.05\pm 0.14\%$ ,  $4.82\pm 0.71\%$  and  $5.16\pm 0.12\%$  respectively during the experimental period.

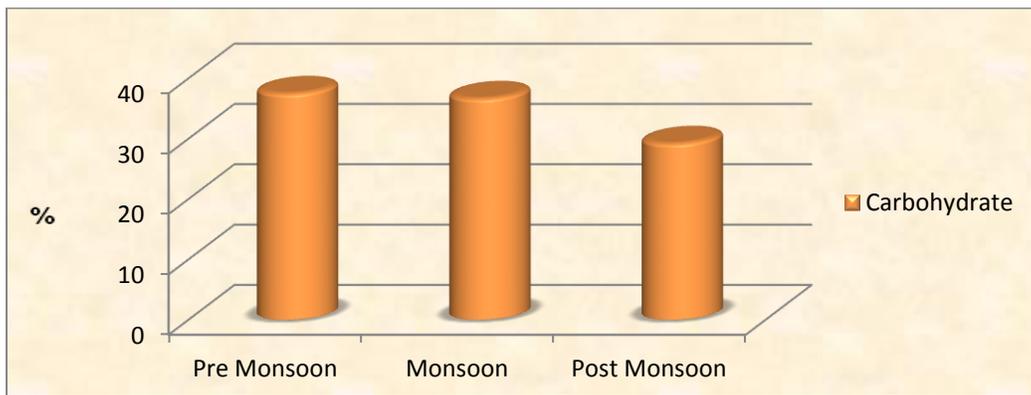
**Table 16:** Evaluation of seasonal occurrence of biochemical parameters during February'2011 to January'2014

Sl. No.	Season	Parameters	2011 (%)	2012 (%)	2013 (%)
1.	Pre-monsoon (February to May)	Protein	$48.36\pm 0.83$	$49.81\pm 0.61$	$49.59\pm 0.27$
		Carbohydrate	$37.39\pm 0.56$	$37.52\pm 0.45$	$37.50\pm 0.51$
		Lipid	$5.91\pm 0.21$	$5.88\pm 0.29$	$5.76\pm 0.66$
2.	Monsoon (June to September)	Protein	$46.12\pm 0.80$	$46.79\pm 0.52$	$46.83\pm 0.95$
		Carbohydrate	$36.65\pm 0.78$	$36.60\pm 0.77$	$36.68\pm 0.73$
		Lipid	$5.32\pm 0.87$	$5.07\pm 0.83$	$5.48\pm 0.79$
3.	Post-Monsoon (October to January)	Protein	$42.19\pm 0.63$	$41.97\pm 0.70$	$41.88\pm 0.72$
		Carbohydrate	$28.86\pm 0.23$	$29.92\pm 0.30$	$28.83\pm 0.28$
		Lipid	$5.05\pm 0.14$	$4.82\pm 0.71$	$5.16\pm 0.12$

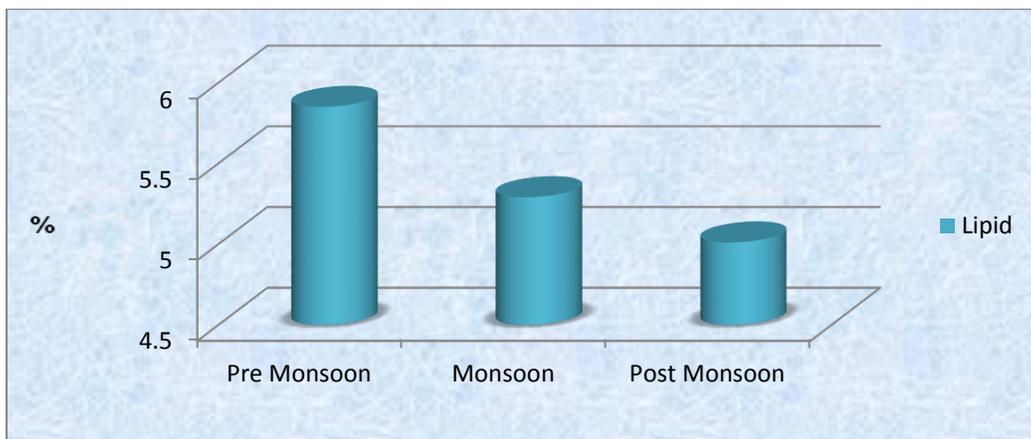
(Values are mean  $\pm$  SD), n=10



**Fig. : 15**



**Fig. : 16**



**Fig. : 17**