PROXIMATE AND FATTY ACID PROFILE OF BROOD FISH, EGG AND LARVAE OF *OMPOK BIMACULATUS*

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Abstract

The proximate and fatty acid composition of *Ompok bimaculatus* (pabda) brood fish, egg and larvae were assayed to have an insight of the nutrient metamorphosis during early life of the species vis-a-vis parental nutrient composition. The collected brood fish, eggs and larvae were analyzed for proximate and fatty acid composition. The data revealed that the crude protein, fat and ash content respectively of brood fish, egg and larvae were 14.40 ± 0.07 , 25.90 ± 0.20 , 12.23 ± 0.88 (%); 1.06 ± 0.07 , 0.64 ± 0.15 , 0.42 ± 0.04 (%) and 2.33 ± 0.05 , 1.61 ± 0.10 and 1.79 ± 0.04 (%). The crude protein content was significantly ($P < 0.01$) higher in *O. bimaculatus* egg when compared to brood fish and larvae. Fatty acid composition revealed that the saturated fatty acid (SFA) content (% of total fatty acid) of the brood fish, eggs and larvae were 88.48 ± 0.66 , 76.04 ± 0.98 and 48.60 ± 0.66 (%); and SFA content was significantly ($P < 0.01$) higher in the brood fish. The poly unsaturated fatty acid (PUFA) content (% of total fatty acid) of brood pabda, eggs and larvae were 4.52 ± 0.03 , 10.05 ± 0.02 and 33.35 ± 0.40 (%), respectively. The PUFA, eicosapentaenoic acid (EPA) and docosahexaenoic (DHA) contents were significantly ($P < 0.01$) higher in larvae in comparison to brood fish and egg. The study indicated that crude protein content was higher in egg whereas, PUFA, EPA and DHA content were higher in larvae of *O. bimaculatus*.

Key words: Egg and brood fish, Fatty acids, Larvae, *Ompok bimaculatus*, Proximate composition

INTRODUCTION

Ompok bimaculatus, the catfish (Bloch, 1794), locally known as pabda (butter catfish), belonging to the family Siluridae of the order Siluriformes is an indigenous freshwater small fish (Banik and Malla, 2014). Banik *et al.* (2012) studied that this catfish is commonly available in ponds, rivers, in streams, beels, inundated fields as well as streams and lakes with an extensive geographical distribution in India. In recent times, this fish species is facing high risk of extinction due to over exploitation. According to Conservation Assessment and Management Plan (CAMP) report, the *Ompok bimaculatus* has

been listed among the 97 endangered fish species of India (CAMP, 1998). As per IUCN (International Union for the Conservation of Nature and Natural Resources) the species is within threatened category (IUCN, 2014) due to restricted distribution and reduced abundance (Lakra *et al.*, 2010). Moreover, because of its economic importance and being a potential candidate species for aquaculture, conservation of this fish is very much important (Ayyappan *et al.*, 2001). As the fish is rich in lipoprotein, easily digestible low fat content and has soft bony structure, it is well preferred by the people of West Bengal, Bihar and North East India. It

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provides superior quality of protein to that of meat, milk, eggs and well balanced essential amino acid profile and fatty acids (Gokhan and Hikme, 2011). Consumption of pabda fish can play a significant role to prevent the disease associated with protein-calorie malnutrition (Beveridge *et al.*, 2013). Butter catfish is an excellent source of n-3 and n-6 fatty acids, vitamin and minerals; it helps to increase body energy as well as popular diet for health development (Paul *et al.*, 2019). Therefore, in the present study, the assessment of different nutritional parameters such as proximate and fatty acid composition of *Ompok bimaculatus* brood fish, egg and larvae were studied to have a knowledge of nutrient metamorphosis during early stages of larvae vis-a-vis parental nutrient profile. Hence, the objective of the study is to assess the nutrient profile of pabda during different metamorphosis stages.

The brood fish (average wt. 168.60 ± 5.38 g), its egg and larvae (average wt. 0.70 ± 0.04 g) were collected from ICAR-Central Institute of Freshwater Aquaculture, Kalyani field station. The collected samples of brood, eggs and larvae of *Ompok bimaculatus* were iced immediately for further analyses of proximate composition and fatty acid profile. Sampling procedure and sample preparation were done as per the standard methodology of Sankar *et al.* (2010). Proximate composition of brood fish, eggs and larvae were done as per AOAC (1990). The samples were analyzed in triplicate. Extraction of pooled samples (30 g for fresh tissue) for fatty acid analysis was done as per Folch *et al.* (1957). Preparation of fatty acid methyl esters (FAME)

was done as per Metcalfe *et al.* (1966). The prepared samples were quantified by injecting into Gas Chromatograph (GC) (Perkin Elmer; CLARUS 480). GC operating software 'Total Chrome' was used and identification of individual fatty acid was done by comparison of retention time to those of standards (SUPELCO, Cat. No. 47885-U). The data were analyzed by one way ANOVA as per Snedecor and Cochran (1994) and the least significance difference (LSD) was used for comparison of the mean values.

The proximate composition of pabda brood, egg, and larvae are presented in Table 1. The study revealed that the crude protein content was significantly ($P < 0.01$) higher in pabda egg. The moisture, fat and ash content was significantly ($P < 0.01$) higher in brood pabda fish. However, the moisture content did not differ significantly with pabda brood and pabda larvae (LSD: 2.72). Vishwanath and Lilabati (1995) reported higher moisture content (80%) in *Wallago attu* which belongs to the same family (Siluridae). Crude protein content of brood fish, eggs and larvae were 14.44 ± 0.07 , 25.90 ± 0.20 , 12.23 ± 0.88 (%), respectively. The protein content of pabda brood fish was lower than the protein content of *O. pabda* (16.20%) and *Anabas testudineus* (16.91%) as reported by Bogard *et al.* (2015) and Paul *et al.* (2017), respectively but comparable to the protein content of *O. bimaculatus* as reported earlier (Paul *et al.*, 2018). In the present study the fat content of *O. bimaculatus* was lower than the earlier report (Bogard *et al.*, 2015; Paul *et al.*, 2018). The ash content of pabda in the present study was also in agreement with earlier reports (Paul *et al.*, 2018).

Table 1. Proximate composition (% as such basis) of pabda brood, eggs and larvae

Particulars	Pabda brood	Pabda eggs	Pabda larvae
Moisture	80.09 ± 0.64^b	61.84 ± 1.40^a	82.02 ± 0.62^b
Crude protein	14.44 ± 0.07^a	25.90 ± 0.20^b	12.23 ± 0.88^a
Crude fat	1.06 ± 0.07^b	0.64 ± 0.15^a	0.42 ± 0.04^a
Total ash	2.33 ± 0.05^b	1.61 ± 0.10^a	1.79 ± 0.04^a

Data presented as Mean $\pm$ standard error, Superscripts ^{ab} in a row differs significantly ($P < 0.01$)

The fatty acid profile obtained by GC analysis are presented in Table 2. The saturated fatty acid (SFA) content of brood pabda, eggs and larvae were 88.48 ± 0.66 , 76.04 ± 0.98 and 48.60 ± 0.66 (%), respectively. The SFA content

of pabda brood fish as reported in this study was similar to earlier report (Paul *et al.*, 2015). Nandi *et al.* (1999) reported that the myristic acid was the most abundant SFA in catla and mrigal eggs. The tasty flavour of

Table 2. Fatty acid (% of total fatty acid) composition of pabda brood, egg and larvae

Fatty acids	Pabda brood	Pabda egg	Pabda larvae
Butyric Acid	0.02 ± 0.01^a	0.01 ± 0.001^a	2.08 ± 0.05^b
Myristic acid (C14:0)	0.12 ± 0.01^a	0.22 ± 0.03^a	4.03 ± 0.57^b
Palmitic acid (C16:0)	87.81 ± 1.53^b	66.15 ± 0.77^a	22.52 ± 0.64^a
Arachidic acid (C20:0)	0.2 ± 0.03^a	0.05 ± 0.001^a	2.31 ± 0.12^b
Others	0.33 ± 0.02^a	9.59 ± 0.19^b	17.85 ± 0.52^c
Σ SFA	88.48 ± 0.66^c	76.02 ± 0.98^b	48.6 ± 0.66^a
Pentadecanoic acid (C15:1)	0.62 ± 0.05^b	0.4 ± 0.001^a	1.29 ± 0.015^c
Oleic acid (C18:1n9c)	0.61 ± 0.001^a	12.08 ± 0.09^c	4.29 ± 0.08^b
Elaidic acid (C18:1n9t)	6.03 ± 0.02^a	ND	11.02 ± 0.1^b
Others	0.41 ± 0.02^a	1.43 ± 0.07^b	1.42 ± 0.02^b
Σ MUFA	7.67 ± 0.12^a	13.91 ± 0.24^b	18.02 ± 0.02^c
Linolelaidic acid (C18:2n6t)	0.02 ± 0.01^a	0.06 ± 0.01^a	7.03 ± 0.08^b
Linoleic acid (C18:2n6c)	1.89 ± 0.09^b	4.25 ± 0.09^c	0.47 ± 0.01^a
γ -Linolenic acid (C18:3n6)	0.05 ± 0.01^a	0.43 ± 0.02^b	0.56 ± 0.02^c
α -Linolenic acid (C18:3n3)	0.1 ± 0.01^a	0.21 ± 0.01^b	1.58 ± 0.045^a
Eicosadienoic acid (C20:2)	0.28 ± 0.006^a	0.51 ± 0.01^b	1.4 ± 0.01^c
Eicosatrienoic acid (C20:3n6)	0.64 ± 0.02^a	1.68 ± 0.02^b	11.17 ± 0.06^c
Eicosatrienoic acid (C20: 3n3)	ND	0.05 ± 0.01^a	0.32 ± 0.02^b
Arachidonic acid (C20:4n6)	ND	0.07 ± 0.01	ND
EPA (C20:5n3)	0.73 ± 0.03^b	0.23 ± 0.01^a	2.71 ± 0.01^c
DHA(C22:6n3)	0.80 ± 0.02^a	2.56 ± 0.04^b	6.87 ± 0.03^c
Σ PUFA	4.52 ± 0.03^a	10.05 ± 0.02^b	33.35 ± 0.40^c
ω 3	1.63 ± 0.06^a	3.05 ± 0.04^b	11.5 ± 0.02^c
ω 6	2.60 ± 0.07^a	6.49 ± 0.08^b	19.23 ± 0.01^c

Data presented as Mean $\pm$ standard error, Superscripts ^{abc} in a row differs significantly ($P < 0.05$), ND- Not Detected [SFA= saturated fatty acid, MUFA = monounsaturated fatty acid, EPA = eicosapentaenoic acid, DHA = docosahexaenoic acid, PUFA= polyunsaturated fatty acid]

O. bimaculatus could be due to high content of myristic acid present in it as myristic acid is used for flavouring agents in food items (Burdock and Carabin, 2007). In the present study, palmitic acid was significantly ($P < 0.05$) higher in brood fish and it was predominant in eggs and larvae as well which was in agreement with earlier report (Paul *et al.*, 2017). The eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) content of domesticated striped bass, *Morone saxatilis* were similar to freshwater fish species as reported by earlier workers (Harrell and Woods, 1995). Among the monounsaturated fatty acid (MUFA), oleic acid and elaidic acid were significantly ($P < 0.05$) higher in pabda larvae. The poly unsaturated fatty acid (PUFA) content (% of total fatty acid) of brood pabda, eggs and larvae were 4.5%, 10.05% and 33.35%, respectively. The PUFA content of brood pabda was less than the earlier report (Paul *et al.*, 2018). However, the PUFA content of pabda egg, was similar to an earlier report (Paul *et al.*, 2015). The freshwater fish contains low PUFA compared to marine fish as marine water contains abundant natural food compared to freshwater environment (Vlieg and Body, 1988). The EPA and DHA contents were 2.71% and 6.87% in larvae; which were significantly ($P < 0.01$) higher in comparison to brood fish and egg. The EPA and DHA content of pabda eggs were higher

than that of Indian Major Carp as reported by Nandi *et al.* (1999). The DHA content of pabda egg was similar to freshwater fish as reported earlier (Paul *et al.*, 2015).

The EPA and DHA content of pabda larvae were lower than the values of Salmon fish (7.7% EPA and 14.5% DHA) as reported by Bratu *et al.* (2013). The EPA and DHA content of brood pabda were lower than the earlier report (Paul and Giri, 2019). The variation could be due to physiological, geographical and ecological factors.

The studies regarding nutritional characterization of brood fish, eggs and larvae of *Ompok bimaculatus* revealed that crude protein content was higher in egg; crude fat and ash content were higher in brood fish. However, PUFA, EPA and DHA content were higher in pabda larvae. Nutrient content of the brood fish, egg and larvae of the *O. bimaculatus* reflects the nutrient abundance of the species.

Conflict of interest: The authors declare that they have no conflict of interest.

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