

## Variation in Proximate Composition of Moisture, Proteins and Fat in Three Exotic Major Carps

Rajesh,<sup>1</sup> Shishir K. Verma<sup>2</sup>

<sup>1</sup>(University Department of Zoology, LNMU, Darbhanga, Bihar, 846004)

<sup>2</sup>(University Department of Zoology, LNMU, Darbhanga, Bihar, 846004)

**Abstract:** The present study relates to proximate composition with reference to moisture, protein and fat in three species of exotic major carps i.e. **Silver carp** (*Hypophthalmichthys molitrix*), **Common carp** (*Cyprinus carpio*) and **Grass carp** (*Ctenopharyngodon idella*) in Darbhanga region. **Silver carp** is a freshwater species living in temperate conditions (6-28°C) and mainly feeds on Phytoplankton and occasionally Zooplankton. **Common carp** live in the middle and lower streams of rivers and in shallow confined waters, such as lakes, water reservoirs and thrives well in warm water condition. This species feed all type of content present in water bodies and known to be omnivorous. **Grass carp** is a sub-tropical-to-temperate species and herbivorous in nature. Analysis for moisture, proteins and fat content was done by following AOAC, 2000. The initial studies suggests that moisture content was maximum in silver carp followed by Grass carp and Common carp (76.5±1.36, 74.1±3.59, 70.3±1.34 respectively). Similarly Protein content was maximum in silver carp followed by common carp and grass carp i.e. (16.3±1.33, 13.4±0.55, 12.1±3.14 respectively). However fat content reflected variable trend being maximum in common carp (6.1±0.49) followed by grass carp (5.9±1.06) and minimum in silver carp (4.0±1.06). It appears that the present proximate composition in fish flesh relates to the feeding habit of fishes. Further studies in this regard is under way.

**Keywords:** Proximate, feeding habits, exotic major carps.

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### I. Introduction

Fish meat is a staple food item due to its importance both nutritionally and medically. Fish is easily digestible because of short muscles and deficiency of scleroprotein and elastin (Cirkovic *et al.*, 2012). Protein of fish is more beneficial for human health and it has free amino acids (Buchtova *et al.*, 2010). The nutrient quality is dependent on their kind of food and feeding behaviors. Watermann (2000) conducted a research on the proximate composition of fishes and explored that the measurement of proximate contents like protein, carbohydrates, lipids, moisture and ash contents is often necessary to ensure that they meet the requirements of food regulations and commercial specifications. Every component of the body works as good indicator for specific contents (Chatta *et al.*, 1993). Moisture content and water indicates its energy contents relatively such as lipids and protein, in other words water is inversely proportional to these two such as lower percentage of water mean a greater amount of lipids as well as protein and vice versa (Anthony *et al.*, 2000). However, these are not fixed values as they differ considerably, inter specifically and intra specifically. It also varies on the basis of age, size, physical activity, feeding season, reproductive status, fishing season and sexual condition (Deegan, 1986). Fishes also have an organoleptic values on account of its taste, high growth upholding values and is easily digestible (Bowman and rand, 1980). Fish gained high attention due to its effectiveness in cancer, heart ailment, wound healing and prolonging life expectancy studied by Buchtova *et al.* (2010), Cirkovic *et al.* (2012), Deegan (1986), Dhanpal *et al.* (2011) and Jhingran and Pullin (1985)

*Hypophthalmichthys molitrix* commonly known as Silver carp, is a warm water fish. Frimodt in 1995, points out that this species is famous for being consumed. Silver carp can resist against disease, stress and it develops more rapidly. This fish is highly producible, because of its ability to survive under rough environment. Silver carp is commonly produced with some other Asian carps including *Catla catla* in polyculture (Kolar *et al.*, 2005). The average length of silver carp is 60-100 cm. While its maximum length is 140 cm and can attain a weight upto 50 kg (Maccracken, 2016). This carp is filter feeder and possess a particular device for feeding which may filter even tiny particles measuring of 4 µm. Willink in 2009 studied that its food include Zooplankton and detritus.

*Cyprinus carpio* popularly known as Common carp is a fresh water exotic major carp. According to Tokur *et al.* (2006), Common carp became wide spread throughout the world due to its rapid growth and easy farming. Kim *et al.* in 2001 explained that common carp is economically important fish for stock enhancement. The *C. carpio* is cyprinid fish and live in medium or lower zone of water in rivers and ponds. Their habitations

are mostly grassy zones with a dark bottom. Carp in fry and fingerlings stage consume zooplankton. During adult stage they become benthic feeders and feed on other animals and plants.

**Ctenopharyngodon idella** is a large herbivorous freshwater fish also known as Grass carp of the family Cyprinidae, native to eastern Asia. This Asian carp is the only species of the genus *Ctenopharyngodon*. The grass carp is a fish of large, turbid rivers and associated floodplain lakes, with a wide degree of temperature tolerance. Grass carp will enter reproductive condition and spawn at temperatures of 20 to 30 °C. *Ctenopharyngodon idella* feeds on aquatic weeds and terrestrial grasses and has short intestine. It manures the pond as 50% of its daily food consumed (twice of its body weight) is defecated in semi digested condition, which serves as an important source of organic manure (Muhammad Yasin Ashraf et al, 2011).

## II. Materials And Methods

**Procurement of fish:** five of each carps, Silver carp (*H. molitrix*), Common carp (*C. carpio*), and Grass carp (*C. idella*) were procured from local fish culture pond in every month. In order to ensure that every month, fishes were cultured in same habitat and feeds were available for present study (March 2019 to Feb 2020). Fishes were transported alive to the Toxicology Laboratory, were managed and analyzed separately. Proximate contents were determined by the AOAC, 2000 methods.

**Moisture:** Moisture content was determined by the procedure followed by AOAC (2000). Nearly 2g sample weight was dried in hot air oven for 18 hours at 100±2° C. After 18 hours, sample was taken out and immediately transferred to dessicator, cooled and weighed again upto constant weight.

Calculation;

$$\% \text{age moisture} = \frac{\text{wt of sample (fresh)} - \text{wt of sample (dried)}}{\text{wt of sample taken}} \times 100$$

**Crude protein:** Crude protein was determined by Kjeldahl method.

A sample of 1g along with digestion mixture containing (K<sub>2</sub>SO<sub>4</sub> and CuSO<sub>4</sub> in the ratio of 9:1) and 25ml of concentrated H<sub>2</sub>SO<sub>4</sub> was digested in kjeldahl digestion unit at 380°C temperature until Bluish Green colour was obtained. Volume of digested sample was raised upto a known volume (50 ml) and around 20ml of alkali (40% of NaOH) was added after that ammonia so released was trapped in Boric acid upto a known volume (25ml). The ammonia in boric acid was titrated against 0.014 N HCl

**Calculation: Crude Nitrogen (N<sub>2</sub> %)**

$$= \frac{0.00014 (X-Y) \times T}{A \times W} \times 100$$

X= vol. of 0.01N HCl used for sample

Y= vol. of 0.01N HCl used for blank

A= Aliquot of sample taken

W= Wight of sample

T= volume made (total)

**Protein % = N<sub>2</sub> (%) × 6.25**

**Crude lipids:** Crude lipid was determined by Soxhlet Extraction method.

About 5g of sample was put in thimble prepared by folding 22×25 cm sheet of filter paper rolled and putted in extraction thimble. Lipid was extracted in 250 ml flask of soxhlet apparatus at 60-80°C for 4 hour with 125ml of petroleum ether. Content of 125ml flask was poured to crucible weighed earlier. Excessive amount of ethwe evaporate at 80°C by keeping in a hot air oven for half an hour. Crucible was cooled in a dessicator and weighed.

**Calculation of crude lipid (%)**

$$= \frac{W2 - W1}{A} \times 100$$

W1= wt of empty crucible

W2= wt of empty crucible with extracted lipid

A= wt of composite sample taken

## III. Results And Discussion

Moisture content is one of the most proximate component that present in the carps. During the study moisture content was observed maximum in Silver carp (76.5±1.36) followed by the Grass carp (74.1±3.59) and Common carp (70.3±1.34) in table 2 and fig 1.

Moisture forms the major component of proximate composition. The measurement of some proximate profiles such as protein contents, lipids and moisture contents is often necessary to ensure that they meet the requirements of food regulations and commercial specifications (Waterman, 2000).

In major carps as well as some marine fishes generally moisture content shows inverse relationship with lipid content. In accordance with the findings of Das (1978) the present exotic carp also exhibit inverse relationship with lipid content. Das (1978)

Crude protein content was maximum observed in silver carp (16.3±1.33) followed by common carp (13.4±0.55) and Grass carp (12.1±3.14).

Fish received increased attention as a potential source of animal protein and essential nutrients for human. It should be considered that fish tissue presents elevated nutritional significance and therefore is a particularly optional dietary module. (Marichamy *et al.*, 2012).

Fish meat contains significantly low lipids and higher water content than beef or chicken and is favored over other white or red meats (Neil, 1996 and Nestel, 2000).

Crude fat content was estimated highest in common carp (6.1±0.49) followed by Grass carp (5.9±1.06) and least in silver carp (4.0±1.06).

The proximate content of moisture, crude protein and crude lipid in different exotic major carp studied presently has been presented in table 2. The overall findings clearly suggest that there exist a predictable relationship between the three components (moisture, protein and fat) and may be explained as:

- The lipid content decreases with increase in moisture and protein content ( Result correlated with Das, 1978)
- In early stage of life cycle the lipid content is relatively low in compared to moisture and protein. Result supported by the study done by Tokur *et al.*(2006)
- With increase in age of these fishes, there is gradual decrease in moisture and protein while the lipid concentration piles up gradually at attaining certain maturity stage (Tokur *et al.*, 2006).
- Filter feeder (silver carp) had maximum amount of moisture and protein but low content of lipid. In herbivorous (Grass carp) had moderate range of moisture and lipid and contain least amount of Protein among three exotic carp, while in omnivorous (common carp) maximum amount of lipid concentration was detect with least amount of moisture and moderate range of protein (Bhaskar and Hosokawa, 2006).

Feeding habits of exotic carps are different due to the inhabiting different zones in water bodies contain different type of food materials available for the carps. Feeding habit of silver carp is mainly on phytoplankton and occasionally on the zooplanktons whereas Grass carp feeds only phytoplankton and Silver carp feed on both i.e. phytoplankton and zooplankton (Table 1). Deviation in the feeding habits of these carp influenced the proximate percentage. Silver carp posses rich protein content indicating that it has maximum amount of Nitrogen content in their muscle. Due to rich sources of nitrogen, amino acids in this fish enhanced it's quality to take it in our diet. Rich content of moisture in silver carp also maintain freshness and quality of silver carp.

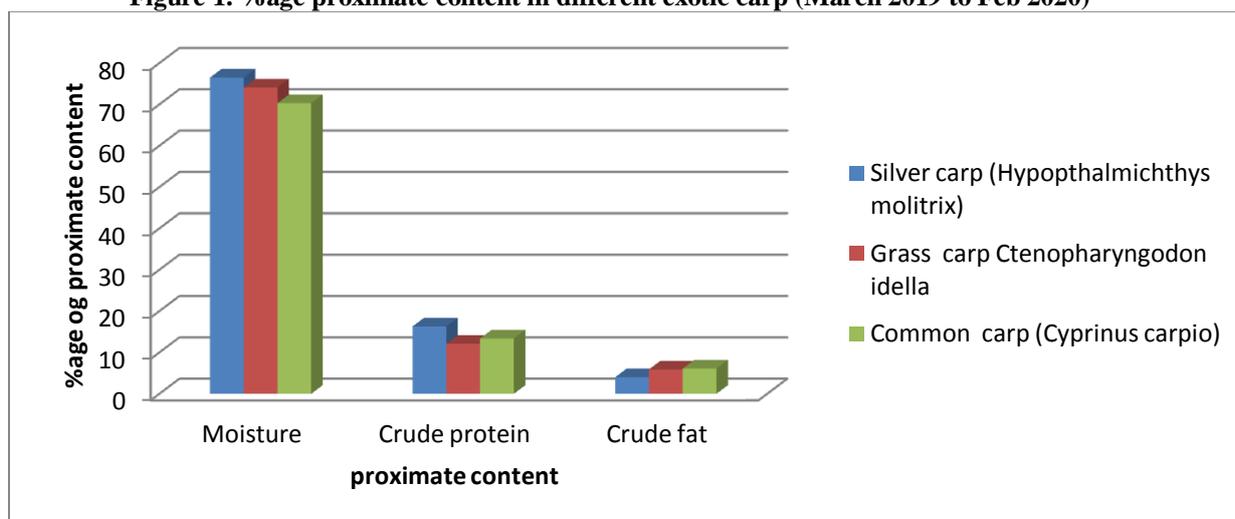
**Table 1. Feeding habits of exotic carps.**

	Phytoplankton	Zooplankton
Silver carp ( <i>Hypophthalmichthys molitrix</i> )	Mainly	Occasionally
Grass carp ( <i>Ctenopharyngodon idella</i> )	Mainly	Do not feed
Common carp ( <i>Cyprinus carpio</i> )	Commonly	Commonly

**Table 2. Overall Proximate content in different exotic carps.**

Exotic carp → Proximate content ↓	Silver carp ( <i>Hypophthalmichthys molitrix</i> )	Grass carp ( <i>Ctenopharyngodon idella</i> )	Common carp ( <i>Cyprinus carpio</i> )
Moisture	76.5±1.36	74.1±3.59	70.3±1.34
Crude protein	16.3±1.33	12.1±3.14	13.4±0.55
Crude fat	4.0±1.06	5.9±1.06	6.1±0.49

Figure 1. %age proximate content in different exotic carp (March 2019 to Feb 2020)



#### IV. Conclusion

Proximate content (Moisture, Crude protein and crude fat) in different fishes showed a significantly variable trend during the study. All these carp feeds on different kinds of food present in the pond showed in table 1. Silver carp (filter feeder) is the great source of moisture and protein whereas Common carp show maximum concentration of lipid and least amount of moisture. Grass carp (Herbivorous) show moderate range of proximate content comparing to silver and Common carp. The results provide important information regarding proximate content in exotic carp related to their feeding habits as discussed earlier.

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