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# A Study on Hematological and Biochemical Parameters of Major Carps

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***Abstract - Artificial meal preparation, aquaculture research and practise, and several medicinal plants and their chemical components are employed as immunostimulants. Inhibiting microbial infections and stimulating immunity are two functions shared by many herbal plants. Certain biochemical indicators are also directly affected by fundamental ecological variables as feeding regime and stocking density. Stimulin is a one-of-a-kind, potent cocktail of immunological stimulatory chemicals isolated from natural sources with a high capacity to activate the nonspecific defence mechanism in fish and prawns. Modulating the immune system in this way makes the host more resistant to pathogen-caused illnesses. Stimulin causes changes in the number of haemocytes, induces encapsulation responses, inhibits the adhesion of germs to the stomach, and influences clotting reactions, among other things.***

***Keywords - Hematological, Biochemical Parameters, Major Carps***

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## INTRODUCTION

Farmers rely heavily on aquaculture as a source of revenue. Yet, the sustainability of aquaculture is threatened by the frequent incidences of infections and illnesses due to the fast and frequently unregulated expansion of aquaculture. Diseases in fish are a growing concern as intensive breeding techniques advance and aquaculture production, trade, and population all rise.

The fishing industry in India is a booming business with a wide range of available resources and promising future prospects. The fishing industry, along with agriculture, was not given its due until after India gained her freedom. India is a big exporter of seafood throughout the globe. Several studies have underlined the vital role that inland fisheries play in ensuring the nation's food supply and bolstering local economies.

Fish is a vital source of protein and micronutrients, and improve the quality of protein in largely vegetable and starch – based diets by providing essential amino acids. Fish is also rich in Iron, Zinc, Magnesium, Phosphorous, Calcium, Vitamin A and Vitamin C, and marine fish is a significant source of iodine. Fish are a vital source of these nutrients for many people, and little low - value fish, which are typically eaten by the rural poor, supply more minerals than the same grade of meat or big fish, since they are swallowed whole, with the bones intact. Fish also include fatty acids which are needed for the development of the brain and body, and are especially critical for the diets of newborns, children and pregnant and breastfeeding mothers (FAO, 1999; World Fish Center, 2005; FAO, 2006). (FAO, 1999; World Fish Center, 2005; FAO, 2006).

Moreover, the soil properties of the pond bottom have a significant impact on some factors of pond water quality. Ponds with acidic water, which are often situated on acidic soils, can not support healthy fish populations, although liming may remedy this problem. Since it has such a profound effect on aquatic life, water temperature is a crucial physical feature of each aquatic environment. For home, environmental, industrial, and agricultural uses, it also influences a variety of water quality factors (Parashar et al., 2007).

### Growth

Fishes are particularly useful organism to utilize in bridging the gap between behavior and physiology. Fish comprise the most species vertebrate order with over 25,000 species and an unrivaled diversity in life history patterns breeding system, sensory system as well as environment requirement. Hence fish provides an almost endless test bed for either single species studies or comparative analysis of link between behavior and physiology (Katherine et al., 2006).

Many biological activities are regulated in seasonal manner by the interaction of organism wit this environmental factors that translate into internal changes which in turn affected behavior, feeding and reproduction (Sumpter, 1997; Cerda Reverter et al., 1998; Herrero et al., 2005).

Numerous studies has been reported growth enhancing effects of extended and constant light photoperiod regimes in a variety of species including Atlantic salmon (Saunders and Henderson, 1988; Villarreal et al., 1988; Saunders and Harmon, 1988; Stefansson et al., 1989; Krakenes et al., 1991; Hansen et al., 1992; Oppedal et al., 1999), largemouth bass, Micropterus salmoides (Petit et al., 2003), Japanese medaka, Oryzias latipes (Davis et al., 2002), Atlantic halibut, Hippoglossus hippoglossus, (Jonassen et al., 2000; Norberg et al., 2001), turbot, Scophthalmus maximus, (Imsland et al., 1995, 1997), haddock, Melanogrammus aeglefinus (Tripper and Neil, 2003), European sea bass, Dicentrarchus labrax, (Rodriguez et al., 2001) and gilthead sea bream, Sparus aurata, (Kissil et al., 2001).

**Haematology**

Blood is an excellent indicator tissue of toxic stress (Zutshi et al., 2010). Its role as a supplier of essential nutrients, ions, gases, and endocrine factors, coupled with its function as a reservoir for excretory products of metabolism, means that alterations in blood parameters are often reflective of the overall toxic impacts of environmental contaminants (Das and Mukherjee, 2003; Petri et al., 2006). Blood parameters are closely related to the response of the animal to the environment, an indication that the environment where fish lives could exert some influence on the hematological characteristics (Gabriel et al., 2004). They can provide substantial diagnostic information once reference values are established under standardized conditions (Rey Vázquez and Guerrero, 2007). Osman et al. (2010a) have reported the usage of blood parameters as useful tool for the measurement of physiological disturbances in stressed fish which would provide information about the level of damage caused by the pollutant in fish. Since there is a close relationship between the circulatory system of fish and the external environment (Cech et al., 1996; Wendelaar Bonga, 1997), the effect of external stressors and toxic substances on exposed fish could be made evident through clinical diagnosis of fish physiology.

Blood cell responses are important indicators of changes in the internal and/or external environment of animals. In fish, exposure to chemical pollutants can induce either increases or decreases in haematological levels depending on fish species, age the cycle of the sexual maturity of spawners and diseases (Luskova, 1997; Elahee and Bhagwant, 2007).

It is well known that blood sampling, laboratory techniques, seasonal variations, size, genetic properties, sex, population density, lack of food supply, environmental stress and transportation could affect hematological data (Orun and Erdemll, 2002; Arnold, 2005; Caruso et al., 2011). Numerous studies have investigated the alterations in the haematological profile of freshwater teleosts as biomarker in pollution monitoring (Atamanalp et al., 2002a; Mushigeri and David, 2005; Banaee et al., 2008; Li et al., 2011; Sonne et al., 2012).

**Haematological parameters**

Works on haematology of Indian fishes are relatively recent in origin with literature is and confined mainly to air breathing fisher as they can be easily maintained in laboratory. The first work on haematology of Indian fish was published by Dhar in (1948) . This was preliminary work on the morphology of corpuscles erythrocytes and leucocytes count and clotting time of an air breathing fish (Channa) *Ophicephalus punctatus.*

The hematocrit (Ht or HCT) or packed cell volume (PCV) or erythrocyte volume fraction (EVF) is the proportion of blood volume that is occupied by red blood cells. In mammals, hematocrit is independent of body size (source- wikipedea). Various worker have discussed the haematocrit value in their studies like Siddiqui and Naseem, (1978) in Labio rohita, Kumari et al., (1989) worked on Cyprinus carpio, Pretson, A., (1960) on Plaice (Pleuronects platessa L), Sano (1963) and Einszporn–Orecka (1970) in cultured trout. Some Indian worker also observed PCV value in different type of fishes some are Pradhan (1961), Banerjee(1966), Quayyum and Naseem (1967) Srivastava(1968 (1) Khan and Siddiqui (1970), Joshi and Tandon (1977), Mishra et al., (1977), Pandey and Pandey (1977), Prasad et al., (1978) Joshi et al., (1980) and Jawad, et al., ( 2004).

Baxhall and Daisely (1973) have reported the possibility of using haematocrit as a tool in aquaculture. Jawad ,L.A. (2004), worked on Indian shad Tenualosa ilisha he concluded that two factors are probably responsible for the rise in Haematocrit value (A) Environmental factors (B) Physiological factors.

**Biochemical parameters**

According to Islam and Joaddar (2005), consumption of fish provides important nutrient to a large number of people worldwide and makes a very significant contribution to nutrition. Guha (1962), described the fish protein as high class protein comparable to those derived from other animal sources.

The frequency of changes in the composition in the biochemical constituents of any organization varies with the variation of the environment changes Islam and Joaddar (2005).

Lovern and Wood (1937), estimate the amount of moisture, protein and fat contents from the flesh of herrings. Del Riego (1948) pointed out the value of protein content which varied seasonally in Atlantic sardine.

Masopust (2000), biochemical profiles also provide important information about the internal environment of the organism.

Some important studies of biochemical composition of various fish have been done by Thurston et al., (1959), Mannan et.al., (1961), Mayer,(1962), Stansby and Hall (1967), Kinsella et. al., (1978), Sorlova and Mishura, (1990), Eid et al., (1992), Das and Mishra.,(1994), Shivakumar et al., (1994) Datta and Chaudhari, (1994), Chaudhari and Datta (1996) have already studied the biochemical composition of some common fishes of India.

Banerjee, et al., (1997) has been studied on the air breathing fish Boleophthalmus boddaerti for its lipids and fatty acids of body flesh .Lohner et al., (2001), suggested that chronic stress decreased cholesterol levels to lower than the normal range in sunfish populations.

The chemical composition of fish varies greatly from one species and one individual to another depending on age, sex, environment and season. The variation in the chemical composition of fish is closely related to feed intake, migratory swimming and sexual changes in connection with spawning.

Among the biochemical parameters, plasma glucose and protein are extensively used to assess the impacts/stress stimulated by environmental contaminants (El-Sayed et al., 2007; Remyla et al., 2008; Lavanya et al., 2011). Carbohydrate and protein play pivotal role major physiological events as energy precursors for fish under stress conditions (Sornaraj et al., 2005). According to Chavin, (1973) blood glucose and hepatic glycogen can be utilized as a parameter of stress response, as it is rapid, practicable and quantitative. One of the major constituents of bioenergetics in animals comprise of glucose which transforms to ATP, the energy molecule. Its presence in high concentration in blood is indicative of an organism in stress as it metabolically assists it to cope up with an increased energy demand caused by stress (Lucas, 1996; Teles et al., 2007). Ramesh (2001) have suggested that plasma glucose, liver and muscle glycogen can be suitably used for monitoring the stressful conditions caused by the pollutants in the environment. The plasma glucose concentration in circulation is a function of its production versus absorption by tissues. In a stress situation, glucose production provides energy substrates to tissues, in order to cope with the increased energy demand.

**Lordosis**

According to Kranenbarg sander et al., (2005), lordosis in fish is an abnormal ventral curvature of the vertebral coloumn, accompanied by abnormal calcification of the affected vertebrae.They worked on European sea bass and concluded that lordosis comprises a bulking failuar of the vertebral coloumn and a molecular response that adapts the lordotic vertebrae to a new regime.

The vertebral column of teleosts consists of a series of amphicelous vertebrae that have specific characteristics. Based on characters such as the presence of ribs, neural and haemal arches and the dimensional proportions of the vertebral body, the vertebral column may be divided into regions, using various criteria (Ford, 1937; Ramzu and Meunier, 1999; Morin- Kensicki et al., 2002).

Fishes shows all categories of spinal column deformity (scoliosis, lordosis, kurtosis) etc.High incidences of abnormalities have been reported from polluted habitats (Baumann and Hamilton, 1984; Bengtsson et al.,1985 and 1988; Loganathan et al., 1989).

A new unusual complex spinal coloumn deformity consisting of a consecutive repetition of lordosis, scoliosis and kyphosis (LSK) described in gilhead seabream (*Sparus aurata*) by. Afonsi et al., (2004), similar kind of study also done by Hattori et al., (2003) in red sea bream *Pagrus major*, they found that centrum defects had a characterstics anomaly in the verertebrae. According to Fjelldal et al.,(2006), lordosis is one of the most severe deformaties developing in reared fish, evaluating its effects on fish and aquaculture industry has been difficult to establish. Since there is no objective way of quantifying its severity and impact on the final products image and fish shape. Marques et. al. (2007) said that fishes have been recently recognized as a suitable model organism to study vertebrate physiological processes in particular skeleton development and tissue mineralization. Several factors have been implicated for the appearance of deformation in fish and can be possible be caused of environmental disturbance or toxicant. Couch et al., (1979) Backiel et al., (1984). Weis and Weis (1989); Wiegand et al., (1989); Cirady et al., (1992); Hoffman et al., (1962), Treasurer (1992), lordosis might be caused by parasites. Rucker et al.(1970), Lim and Lovell (1978), Akiyama et al., (1985), Dabrowskiet. al.(1988), Frischknecht et al. (1994), Quigley (1995) reported that lordosis caused by nutritional deficiencies. Matsui, 1934, Rosenthal and Rosenthal, 1950, Tave et al., 1983, Mair, 1992 concluded that deformaties in vertebral coloumn due to genetic basis. Lordosis may be caused by traumatic injury reported by Breeder (1953), Gunter and Ward (1961) or culture techniques Deformities may also be noninheritable congenital defects Tave et al., (1982), Dunham et al., (1991), Handwerker and Tave (1994), Tave and Handwerker (1994). Dabrowski et al., (1988) and Frischkenecht et al., (1994) suggested that vitamin C deficiency in the diet was responsible for the spinal column deformity. Romonov (1984); Leary et al., (1999) suggested this is also may be by culture technique. Peckhard et al., (2005) worked on Atlantic salmo salar and prove that the lordosis is caused by vitamine C deficiency depending upon the species.

According to George, et al., (2001), expanding available systems to categorise skeletal malformations in different teleost species, they proposed 20 types of salmon vertebral column malformations that are repetitively observed under farming conditions. As vertebral column deformities are usually diagnosedby X-ray.

Al-Harbi,(2001), studied various deformities in common carp, *Cyprinus carpi* while Eissa (2009) worked on Egyptian aquaculture fresh water teleost and concluded various type of deformaties among tham included lordosis.

Afonso et al., (2000), described 13 types of abnormalities while Taylor and Van Dyke (1985) and were examined 15 type of osteological abnormalities

Synnøve Helland, (2006) It should also help find out which deformities represent final stages and which deformities represent transitory stages including semi-operculum, spinal deformity, had head deformity, multiple- deformities, eye deformities and stumpbody. Kyphosis, scolisis, parrot head and stump body.

Houde, (1971), Barahona-Fernandes, (1982) Barbara et al., (1984), havebeen reported high frequencies of fish with deformed bodies and possibly these body deformations involve skeletal anomalies in the trunk region.

Ch. Daoulas, et al., (1991) reported that an abnormally bent spinal column could have acted to generate vertebral or neural spine malfunctions, but spinal deformity could also be the result of an existing vertebral abnormality

Barahona-Fernandes, (1982),Johnson and Katavic, (1954), has been reported that reared populations of sea-bass present an extremely high incidence of morphological abnormalities and swimbladder deficiencies,including spinal column and jaw deformations.

Gil and Fisk (1966), McKay and Gjerde (1986), Dedi et al., (1995), Kvellestad et al., (2000) and Gavaia et al., (2002), has reported that anterior and posterior deformities of the vertebral column in wild and farmed teleosts is due to either by spine curvature or by shortening of the spine, or as a combination of both curvature and shortening of spines.

## CONCLUSION

The ecological and biological characteristics of an Indian large carp population are a reflection of the link between fish and their aquatic habitat. Similar patterns of variation in feeding intensity are seen in fish of both sexes.

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