

Effect of hormones on some biochemical composition of *Anabas testudineus*

Dr. Ramesh G. Konnur, Department of Zoology ,SSBM First Grade college,

Badami (Bagalkot dt.),KARNATAKA -587201,INDIA

Email : rgkonnur@gmail.com.

Treatment of testosterone and L-thyroxine bring about significant increase in water content as compared to control while progesterone and hydrocortisone failed to bring any significant change in water content .Protein content showed higher values in testosterone and lower values in hydrocortisone and L-thyroxine treated group as compared to control. Lipid showed lower and higher values respectively in testosterone & L-thyroxine treated group as compared to control. Carbohydrate content showed lower values after the treatment of testosterone & L-thyroxine as compared to control. Ash content showed lower values in all the hormone treated animals as compared to control.

1. Introduction

Fish culture is a complicated process. Now a days, profitable fish culture has become purely technical and scientific because a number of environmental factors affect the fish culture programmes. The biochemical composition of fish does not remain constant, it is subject to change at different times and under different ecophysiological conditions. It would be beneficial if we know when and under which conditions the fishes have maximum biochemical constituents in their body.

Some works in relation to the biochemical composition of different fishes have been carried out by different workers (Idler & Bitnerr, 1960 , Wagh 1986, Prasad et al .1983 & Yasmine et al 1993, Cataldi et al 2002, Garg, 2007). But work on biochemical composition of *Anabas testudineus* has not been carried out as yet .Investigations of this kind in commercially important and cultivable species of fish will therefore, be of great significance and as such *Anabas testudineus* has been selected as the material for the present study.

In the present study investigations have been carried out so as to know the effect of hormones on body weight and some biochemical constituents (viz, water, protein, carbohydrate, lipid and moisture content)

.....

Keywords: Thyroid hormone, Hydrocorticosterone, Adrenaline ,Biochemical composition, Body weight, Growth, Physiological doses.

2

Works on calorogenic action of thyroid (Mansfield 1949, Hoar 1959; Robertson et al 1961, Gabos et al 1978, Yamano K 2005), gonadal hormones (Polder 1971, Sindhu and Pandian 1984) and adrenocortical hormones (Idler and Bitnerr, 1960 Sundaraj and Goswami 1969 and Polder J W 1971, Sindhu and Pandian 1984) in fishes gave direct attention to investigations. which have shown that in the Pacific salmon, the 17-hydrocorticosterone titer in the blood progressively increases in fish as they migrate from sea to spawning grounds. Sindhu and Pandian (1984) studied the effect of administering different doses of 17-methyl testosterone in *Heteropneust fossilis*. They observed that this steroid acts as an appetite stimulant and consequently both feeding and growth rate increased. The blood volume decreased considerably on treatment by hydrocorticosterone in *H. fossilis* (Sindhu and Pandian, 1984).

The present study incorporates information on the effect of hormones on some biochemical compositions in a commercially important fresh water fish *Anabas testudineus*.

2. Materials and Methods

Live specimens of *Anabas testudineus* (Bloch) were collected from the local fish tank and were transported to the laboratory under controlled conditions. In the laboratory the fishes were treated with potassium permanganate for few minutes and transported to glass aquarium. Unhealthy and injured fishes were rejected. The fishes were fed daily with pellets (containing rice bran, groundnut oil cake mixed with flour) during a minimum acclimation period of one week to the laboratory conditions. Laboratory maintained specimens of both sexes were used for this study and desired data were collected. During experiments aquarium water was regularly aerated, to provide an optimum level of dissolved O₂ to the experimental animals.

Fishes were divided into five groups, each comprising of six fishes. Each group of fishes were kept in separate aquarium with regular feeding and monitoring other parameters.

The hormones used in this investigation are as follows

- (i) Thyroxin
- (ii) Hydrocortisone
- (iii) Testosterone
- (iv) Progesterone
- (v) After acclimatizing the fishes for the required number of days, injection was given intraperitoneally on the abdominal side just in front of the pelvic fin.

3

The dosage of different exogenous hormones and number of treatment have been enlisted in table 1. Fishes of control group were injected with normal saline.

The difference of significance if any was calculated by student 't' test at the level of 5%.

ESTIMATION OF MOISTURE

The difference between wet and dry weight gave an estimation of total moisture content (TMC).

ESTIMATION OF LIPID

Soxhlet apparatus (500 ml capacity; Augustinsson,1966) was used to extract the lipid from dried fishes.

ESTIMATION OF PROTEIN

Protein estimation was carried out by using DUMAN'S method (Bernad,1954) by estimating total nitrogen and then converting it to obtain protein(Dowgialo,1975).

ESTIMATION OF THE ASH CONTENT

To obtain the ash content the powder of the body was kept in Muffle furnace (Weinberg,1971) between 500-600 degree Celsius for about 4-6 hrs.

ESTIMATION OF CARBOHYDRATE

The difference between net weight of fish and some total weight of moisture, lipid, protein and ash gave an estimation of total carbohydrate content, because in the muffle furnace the total carbohydrate content (TCC) is also burnt.

4

Table 1. Effect of hormones of changes in biochemical composition in *Anabas testudineus* (Bloch) body wt .50±1.5g; N=6;±=S.E.M

Sl No	Condition	Dose(mg/100g)	Injection in No.of Days	Water %	Protein %	Lipid %	Carbohydrate %	Ash %
1.	Control	-	-	75.45±0.13	18.69±0.12	1.7±0.11	3.48±0.15	0.68
2.	Testosterone	1.0	4	77.34±0.15	20.18±0.15	0.98±0.13	1.10±0.10	0.40
3.	Progesterone	1.0	4	75.95±0.13	18.48±0.19	1.85±0.16	3.15±0.22	0.57
4.	L-thyroxine	0.60	4	77.25±0.15	17.29±0.15	2.60±0.15	2.58±0.24	0.28
5.	Hydrocortisone	1.0	4	74.89±0.14	19.64±0.09	1.95±0.11	3.00±0.21	0.52

3 . Results

The data showing the effects of hormones on biochemical constituents in *Anabas testudineus* are presented in the table. The perusal of this table indicate that treatment with testosterone and L–thyroxine bring about significant increase in water content as compared to control ,while progesterone and hydrocortisone failed to bring any significant increase in water content. Protien content showed higher values in testosterone and hydrocortisone treated fishes and lower values in L-thyroxine treated group as compared to control. Lipid showed lower values as compared to control. Carbohydrate content showed lower values after the treatment of the testosterone and L-thyroxine as compared to control.

5

4 .Discussion

The work on the calorogenic action of thyroid and adrenocortical hormones in fishes is almost negligible. A perusal of literature indicates that there is very little information regarding the fish physiology .Fish endocrinologists stated their work as early as 19th century .The progress and breakthrough have been effective but slow.Dreyer (1994) studied the action of drugs on autonomic nervous system of elasmobranchs and he stated that ,adrenalin cause relaxation of gut in teleosts. Ostlund (1954) worked on the effects of certain biologically occurring substances on the isolated intestine of fish and found that adrenalin relaxed the intestine. Sundararaj and Ramaswamy(1958) studied the seasonal variation and reported the presence of gonadotropins in *H .fossilis*.Burnstock (1958) studied the effect of drugs on the spontaneous mobility as well as response to stimulation of the extrinsic nerves of the gut of teleostician fish- *Salmo trutta* . Smin et al (1990) studied the role of some hormones and pharmacological drugs on the somatic and linear growth in the fresh water teleostician fish-*H.fossilis* .Smin et al (1990) studied the role of some hormones and pharmacological drugs on body composition in *Clarias batrachus* .Yasmin et al (1990) also studied the role of some hormones and pharmacological drugs on protein content and calorific value in *C.batrachus* and *H.fossilis*. Jadav Baskar Laxman (1991) worked on the effects of steroid hormones on the growth and biochemical composition of the fish –Mullet- *Liza parsia*(Ham.) suggests that, steroid hormones promote faster growth and increase in the food conversion efficiency.

In physiological doses, the thyroid hormones promote growth and protein synthesis and are therefore, anabolic in their effects. The thyroid hormone enhances the rate of cholesterol synthesis by the liver (vide; pharmacology and pharmacotherapeutics, ninth edition). Thyroxine accelerates the splitting of proteins(Mansfield 1949) and it maintains an equilibrium between protein anabolism and catabolism(Mighorst & Veen 1952). Hoar (1958) observed that treatment of thyroid preparations on both poikilotherms and homeotherms anabolic as well as catabolic effect on protein. Chatterjee(1973) is of the opinion that thyroid hormone increases both the synthesis and the catabolism of cholesterol and other lipids. It also suggests a smaller dose of thyroxine could cause protein catabolism. Gabos et al. (1973) have reported that thyroxine(T4) doesnot influence the water content of the various tissues of *Cyprinus carpio*, but reported that T.S.H. brings about significant increase ($p<0.01$) in the water content of liver. Increase in the development of digestive tract & accessory glands in Thyroxine(T4) administered of Nile tilapia *Oreochromis niloticus* fish larvae was reported by Khalil (2011). Yasmin et al

6

(1990) while working on *Clarias batrachus* and *H.fossilis* reported that the application of thyroxine increases the water content and calorific value (K.cal/g.) of the whole body.

In the present investigation in *Anabas testudineus* (Bloch) it has been found that thyroxine (T₄) causes increase in water and lipid content, but at the same time it decreases the glands in T₄ treated fishes has been investigated by Cataldi E. et al (2002). The action of testosterone, progesterone on the biochemical composition in *A. testudineus* is very significant. It increases the water and protein content but decreases the carbohydrate significantly (see table). The treatment of progesterone failed to bring any significant change in biochemical composition in fishes. The treatment of hydrocortisone bring about elevation in protein and lipid content in *Anabas testudineus* (Bloch.). The testosterone and hydrocortisone seem to have protein anabolic effect. Such results are also reported by Francis T (2000) in his studies on cat fish *H.fossilis*. Hence this finding is very important from pisciculture point of view, by adding such types of drugs into artificial feed, the fishes with high protein content could be achieved.

Acknowledgements

I am indebted to Dr. Kameshwar Prasad for his valuable guidance during this work.

My hearty gratitude is due to my daughter for her help in computing the data and DTP work of this article.

References

- Augustinsson K B 1966 Experimental Biochem: Svenskabokferget Bonniers pp 544
- Bernard LD 1954 Hawk's Physiological Chemistry Mc Graw Hill Inc. pp 1389
- Burnstock G 1958 Reversible inactivation of nervous activity in fish gut. J. Physiol. (London). B 141 pp 33-45
- Chatterjee C C 1973 Human physiology, vol ii, 8th Ed. New Central Book Agency, Calcutta, India
- Cataldi E, Albao C, Boglione A 2002 *Acipenser naccairii*, Fine structure of the alimentary canal with reference to its ontogenesis. Journal of Applied Ichthyology 18 pp 329-337

7

- Dowgiallo A, 1975 Chemical composition of an animal's body and its food in Methods for ecological bioenergetics; IBP Handbook No.24, pp164-199
- Dreyer NB 1994 The action of autonomic drugs on elasmobranchs and teleosts in voluntary muscle, Arch. Int.Pharmac;78 pp 63-66
- Francis T,2000 Effect of hormones on the spermatozoa count and biochemical composition of milt of the catfish-*Heteropneust fossilis* Cheiron ,vol.29 No.3/4,PP 77-80
- Gorg SK. 2007 Effect of oral administration of L. thyroxine (T4) on growth performance, digestibility, and nutrient retention in *Channa punctatus*(Bloch) and *Heteropneustes fossilis*(Bloch),Fish Physiology and Biochemistry vol.53(4),pp347-358
- Gabos M, Pora EA and Race L 1978 Studies on cerlet.Biol. Zool. 25(1) pp39-43
- Hoar WS,1959 Comparative Endocrinology,Gorbman,Johnwiley and sons.No.4,pp123.
- Idler DR and Bitnerris I 1960 Biochemical studies in Sockeye Salmon during spawning migration.,IX Fat, Protein & water in the major internal organs and cholesterol in the liver & gonads of the standard fish.J.Fish,Res. Board Can.17
- Jadav Baskar Laxman 1991 Ph.D. Thesis on –Effect of steroid hormones on biochemical composition of fish mullet- *Liza parsia* (Ham.),Cochin univ.of science & technology
- Khalil N,Allah,H and Mousa M 2011 The effect of maternal thyroxine injection on growth, survival and development of the digestive system of Nile tilapia- *Oreochromis niloticus* larvae. Advances in Bioscience and Biotechnology 2 pp 320-329,(10)
- Mansfield G,1949 The thyroid hormones and their action.Frederck Muller Ltd.London
- Medford BA and Mackay WS 1978 Protein & Lipid content of gonads,Liver and muscle of northern Pike(*Esox lucus*) in relation to gonadl. growth., J.Fish.Res. Board Can 35,213-219-
- Ostlund J 1954 The distribution of Catecholamines in lower animals and their effect on the heart. Acta Phisiol.Scand,31,(suppl.),112 pp 1-67
- Polder JJW 1971 On gonads and reproductive behavior in the Cichlid fish- *Acquidens portaligernes*. Nethl. J.Zool.23 pp265-365
- Prasad , Pandey BN and Sinha DR 1983 Seasonal variations in fat and water contents of the Indian freshwater mud eel-*Marcoqnathus aculeatus*.Z.Tierphysiol.49(3),pp117-126

Pandey BN, Chanchal AK and Singh SB 1981 Seasonal changes & body composition of *Anabas testudineus*, Environment. India

Robertson CH, Krepp MA, Favour CB, Hane S and Thamas SF 1961 Physiological changes occurring in the pacific salmon (*Onchorhynchus shawytscha*) accompanying sexual maturation & spawning. Endocrinol. 68 pp 733-746

Sindhu S and Pandian TJ 1984 Effects of administering different doses of 17-methyl testosterone in *Heteropneustes fossilis*. Proc. Ind. Acad. Sci. (Anim. Sci.) vol. 93 No. 6 pp 511-516

Smin A, Pandey BN and Yasmin R 1990 Effect of hormones and Pharmacological drugs on water, protein & calorific values in *H. fossilis*. Inland fish soc. India

Sundaraj BI and Ramaswamy LS 1958 Gonadotropins in *Heteropneustes fossilis*, Acta. Anat, 32 pp 230

Sundaraj BI and Goswami SV 1969 Effects of Mammalian hypophysial hormones-placental - gonadotrophins, gonadal hormones and adrenal corticosteroids on ovulation and spawning in hypophysectomized fish-*Heteropneustes fossilis* (Bloch.) J. Exptl. Zool, 161, pp 287-296

Weinberg GG 1971 Methods of the estimation of production of Aquatic animals. Pp 179 London N.Y. Academic press

Wagh SB 1986 Seasonal variations in the biochemical composition of fresh water cyprinid fish *Chela cipidela* (Ham.) part-1, muscle Ind. J. Comp. Physiol. vol. 4. (1), pp 49-54

Yasmin A, Pandey BN and Yasmin R 1993 Studies on calorific values, water and protein content in *Heteropneustes fossilis* (Bloch) as an indicator for assessing water quality. Advances in Limnology (Ed. H.R. Singh), pp 299-302, Narendra Publ. House, Delhi.

Yamano K 2005 The role of thyroid hormone in fish development with reference to Aquaculture. Japan Agricultural Research Quarterly, 39(3), PP 161-168