ISSN 2278-7763

EFFECT OF STARVATION ON BIOCHEMICAL COMPOSITION OF *Anabas testudineus* (BLOCH)

Dr.Ramesh G.Konnur And Prof. Shivakumar S.Iragoud, Department of Zoology, SVPVV's SSBM First Grade College,BADAMI-587201,Karnataka State, INDIA
Emailrgkonnur@gmail.com & skiragoud@gmail.com

Abstract:

The effect of starvation on *A. testudineus* lead to a significant increase in water content. Protein, lipid & carbohydrates were gradually decreased during the period of starvation, it indicated an inverse relationship with water. The ash content of fish also steadily increased with increase in period of starvation. Increase in water content was 75.45% on zero day to a value of 83.48% on 30th day of starvation. Protein decreased from 18.69-14.86% and lipid from 1.70-0.31% & carbohydrate decreased from a value of 3.48-0.72%. Ash content increased from 0.68-2.14% on 18th day and finally decreased to 0.63% on 30th day of incubation.

Introduction:

Fish culture is a complicated process. Now a days profitable fish culture has become purely technical & scientific, because a no of environmental factors affect the fish culture programmes. The biochemical composition of the fish does not remain constant. It will be fruitful to know when & under which conditions the fishes have maximum biochemical constituents in their body to gain the highest yield of cultivable fishes.

A perusal of literature indicate that a detailed investigations on changes in biochemical constituents & calorific values in relation to various parameters are carried out. Viz., the body weight, sex, season, nature of food, locality, starvation, water temperature, natural photoperiod & pollution load etc. in culture fishery (Kitchell et al. 1977, Wheatherley A.H.& Gill H.S.1983, Smin A et al. 1990 ,Pandey B.N et al.1991,Yasmin et al 1993). In spite of preceeding investigations, there is paucity of similar works on *Anabas testudineus* (except Pandey et al. 1981, Konnur,2012). Investigations of this kind is commercially important and of great significant to attain the maximum yield of cultivable fish.

In the present study, detailed investigations have been carried out on *A.testudineus (*bloch) with reference to changes in its body weight and some biochemical composition due to starvation.

Keywords: Starvation, Biochemical composition, Ash content, Calorific value, Body weight.

ISSN 2278-7763

Materials and Methods:

Live specimens of *Anabas testudineus* (bloch) were maintained in the laboratory in glass aquaria. The sick and injured fishes were rejected. The fishes were fed with pellets containing rice bran and GNK (ground nut oil cake) mixed with flour. They were acclimatized to laboratory conditions in seven days. Laboratory maintained specimens of both sexes (male & female) were used for the study and subjected to experimental studies. During experiments water of the aquarium was regularly aerated and replenished to maintain the dissolved oxygen level at saturation point (5 to 6 ml/l).

To study the effect of starvation on biochemical composition , the experimental fishes were kept starved. They were sacrificed on 6^{th},12^{th},18^{th},24^{th} and 30^{th} day of their starvation for estimation of biochemical constituents. Adult fishes of *A. testudineus* were dissected to isolate various organs like liver, kidney & heart etc,. The organ or tissue to be analyzed was weighed on electronic monopan balance for maximum accuracy. The methods adopted for estimation of values of water, protein, lipid, carbohydrate & ash were the same as in Konnur (2012).

Observations:

The data are summarized in the table. The data shows the results of effect of 30 days of starvation on biochemical constituents in *Anabas testudineus* (bloch). A perusal of the data indicate that, water content gradually increased from a value of 75.45% on zero day to a value of 83.48% on 30^{th} day of starvation. Protein, lipid and carbohydrate content gradually decreased during the period of starvation. Protein decreased from 18.69-14.86%, lipid from 1.70-0.31% and carbohydrate decreased from a value of 3.48-0.72%. Ash content increased from 0.68-2.14% until 18^{th} day, then decreased to 0.63% by 30^{th} day of starvation.

ISSN 2278-7763

TABLE I

Effect of starvation on Biochemical composition in *Anabas testudineus* (bloch).

N=6, Body wt.45+1.5= S.E.M.

SL.NO.	Period of Starvation (in days)	Percentage composition (%)				
		Water	Protein	Lipid	Carbohydrate	Ash
1	Control	75.45±0.13	18.69±0.12	1.70±0.11	3.48±0.15	0.68
2	6th day	76.58±0.15	18.56±0.11	1.50±0.15	3.00±0.11	0.36
3	12th day	77.54±0.12	17.54±0.15	1.00±0.12	2.86±0.15	1.48
4	18th day	78.18±0.13	16.88±0.13	0.88±0.13	1.92±0.08	2.14
5	24th day	82.11±0.15	15.15±0.12	0.52±0.08	1.00±0.08	1.22
6	30th day	83.48±0,11	14.85±0.15	0.31±0.15	0.72±0.15	0.63

Discussion:

Most of the fishes starve during certain period of every year, during that period they exhaust the accumulated body constituents. Creach and Safaty (1965) reported that the *Clarias batrachus* became weak and less active during the experimental period of starvation. Although many workers have published data on the body composition and calorific value (K.cal/g) of the fishes during starvation, Creach and Safaty (1965) observed in *C.batrachus* that, they became physically weak during the severe starvation period. Creach & Safaty reported that, the percentage of water increased concurrently during the period of starvation. Increase in percentage of water during the period of starvation in fishes was also reported by Borek(1958) & Wilkins(1967) .Increase in tissue water during starvation in other animals is also reported viz. in Cockroach (Wharten and Lola,1965), also in mice (Golspink 1966) and in Man (Keys et al.1947) . In the present investigation on *A.testudineus* indicated that, the percentage of water content in the total body weight of fish fluctuates between75.45 to 83.48 during starvation (seeTable 1). The percentage of water increases gradually with the period of starvation; whereas, the lipid quantity decreased

ISSN 2278-7763

proportionately with increasing starvation period. The obtained results have clearly indicated that; In *A.testudineus*, as the period of starvation increases the amount of lipid gradually decreases in this fish. It is supposed that during the period of starvation the fishes mobilize their body lipid for catabolic reactions to meet their energy demands. Wilkins (1967) also observed a reduction in the proportion of lipid (phospholipids) in *Clupia harenqua* during starvation period. Purushotam et al.(1980) while working on Taters indica observed a decrease of 130.6% in total lipid contents in brain comparison to 52.7% in liver and 51.8% in the muscle. Kumar (1988) reported in *Clarias batrachus* that the amount of lipid content of the fish body decrease with the increase in starvation period. The present findings in *A.testudineus* is consistent with the findings of Kumar (1988) in *C.batrachus*.

The gradual fall in protein percentage was observed in *A.testudineus* as long as the period for starvation increased. Lysaya (1951) observed mobilization proteins in energy metabolism during starvation as observed in *Clarias batrachus*. Leve (1970) investigated that, the impact of starvation is felt sooner in active fishes than sluggish one. There he observed breakdown of contractile proteins more rapidly than connective tissue proteins during starvation. Kumar (1988) in *Clarias batrachus* reported that as long as the period of starvation increases, so long the amount of protein decreases. Fall in protein concentration after initial rise in different tissues like –liver, gonads, fat body and brain etc., have been observed by several workers (Medford & Mackay 1978, Degani et al.1985). In the present study also similar relationship between lipid and water was observed. The water percentage increases, whereas lipid percentage decreased during the period of starvation in *A.testudineus*. Similar relationship was noted by Atwater (1988), in species of Alesa and Scomber. The proportions of lipid and are similarly related in the flesh of *Scomber scombrus*. Gradual loss in protein percentage was also observed like lipid percentage in *A.testudineus*. Herara and Munoz(1957) observed in *Sardine pitachardus* that, protein is consumed after the lipid has dropped below a critical level. Greene (1919) found that the water in the muscle of *Oncorhynchus teschanystscha* migrating upstream increases from 63.2% to 79.7% and the protein decreases, from 17% to 13.77%, but only in the final stage. Arevalo (1948) also reported a loss of protein occurring at the extremity of starvation in *Trachurus trachurus* and steady loss of lipid too. Parker & Vanstone (1966) showed that Oncorhynchus cerbscha loose lipid at first during a period of restricted food supply, and that protein is consumed later on with moderate starvation and when lipid exhausts. The body weight is maintained through the uptake of water. Wilkins (1967) showed that a reduction in the proportion of phospholipids in *Clupia*

ISSN 2278-7763

herringus during starvation coincides with a reduction in certain protein fractions indicating that a breakdown in body tissues is in fact occurring. The calorific content (K.cal/gm) of the fish is affected with the starvation. Elliot (1976) reported that, as long as the period of starvation increases, so long there is decrease in amount of calorific value (K.cal/gm).

Love et al.(1968),Kitchell et al.(1977) stated that calorific content decreases with increase of starvation period. It is concluded that *A.testudineus* exhibits inverse lipid-water and protein-water relationship during the period of starvation.

Conclsion:

Water content gradually increased from a value of 75.45% on zero day to a value of 83.48% on 30th day of starvation. Protein, lipid & carbohydrate content gradually decreased during the period of starvation. The ash content of fish is relatively stable constituting 1-3% of body wt. for first 10-12 days and then indicated a steady decline as the starvation period progresses. Overall, the ash content of fish seem to vary from 0.36 to 2.14%. There is inverse relationship between lipid (%) and water content (%) as various authors have also been reported for other fish species (Khawaja and Jafri 1968, Brett Strat 1969, Kaufman and Beyer 1972, Elliott 1976, Caraig 1977 and Mathur 1985).

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