Studies of the impact of some environmental changes and few drugs on the pigment cells of A Teleost

Preety Sinha
Assistant Professor,
Department of Zoology,
S.N.S.College, Muzaffarpur(Bihar)

Abstract : Fish is a valuable and easily accessible source of food, rich in proteins. Fishes are fanciful, fascinating wonders in nature. They are the masters of water, ubiquitous and enjoy wide ecological amplitude. They are endowed with the ability to produce light and toxic substances and exhibit physiological adaptation involving spectacular colour changes, which play important role in the defense and protection of many species as well as during sex act, namely excitement and courtship. The unique potential of physiological colour change has made them excellent experimental materials for investigation of a great variety of general biological problems. due to enormous growing population and the prevailing food scarcity in the country, the government is now taxing vigorous steps for the conservation and development of their vast fisheries resources. In recent years there has been an upsurge of interest in studying melamine pigmentation of fishes in India and d aboard.

Keywords :Fanciful, Ubiquitous, Courtship, Biological problems, Conservation.

I. INTRODUCTION

The most commonly used term, melanophor means a type of melanocyte, which in conjunction with other chromatophores, is responsible for rapid colour changes by intracellular displacement of melanosomes. Thus pigment pattern in fishes unlike that in mammals is not stable but is changeable. The precursor of melanocyte and melanophore is called melanoblast.

Pigment cells in fishes are generally of three types-

(i) reticulate or fully expanded,
(ii) stellate or partially aggregated and
(iii) puctate or fully aggregated.

The melanohore is bounded by an outer thin membrane and the inner materials consist of a nucleus and a large number of spherical dark brown granules called melanosomes, which are evenly distributed in reticulate type but in punctuate type these are withdrawn along the branches of the cell and get aggregated in the centre. Other intracellular organelles which have been reported by Franz (1940), Falk and Rhodin (1957), Fujii (1966) and Green (1968) as a result of their light and electron microscopic studies, are centrioles, mitochondria, ribosome,, vesicular smooth-surfaced endoplasmic reticulum and microtubules. The brown black melanin pigment has been found to be very dense both in visible light and in electron beam. The chromatophores in general act as the loci of activity in response to the stimulus to which they are subjected both externally and internally. The melanogenic cells of vertebrate skin are immigrant element, which migrate from the seat of their synthesis early in development to the final sites of differentiation.

Melanins are of wide occurrence in fishes. These are derived from tyrosine and are highly polymerized compounds. The enzyme tyrosinase oxidizes tyrosine to 3, 4 Dihydroxyphenyl alanine (DOPA) and then to Dopaquinone. The Dopaquinone is finally polymerisd to form melanins, which remain attached to a protein. The sites of melanin synthesis are melanocyts in both young and mature melanophores. Melanogenesis can take place in mature melanophores because morphological colour changes may involve an increase in melanin content without a corresponding increase in number of melkanin containing cells.

variable nature of tyrosinase in different fishes. The physical and chemical nature of enzyme tyrosinase is quite different in gold fish skin, *Fundulus embryos* (Spitz and Burnett, 1968) and in a variety of fishes namely shark and eel (Chen and Chavin, 1967). Chen and Chavin (!967) have reported that tyrosinase is found only in the particulate fraction in *Polypterus* (the bichir), *Lepisosteus* and *Protopterus* (the African lung-fish).

II. METERIAL & METHODS

Living & healthy specimens of *Colisa fasciatus* (Bloch and Sneider), of 10-12 gm weight groups were obtained from Sikanderpur lake, Muzaffarapur and brought to th laboratory in living condition using the water of the same lake. After a wash in 0.1% Aq. Pot. Permangante ($KMnO_4$) followed by several was with ground water4, the fish were kept in large aquaria in normal condition and photoperiod. They were provided "tubifex" as food daily att least three hours prior to change of water during storage for experimental works. The temperature of water was maintained at 24 ±2°C to avoid the effect of temperature if any fishes were divided into groups, each consisting of eight to ten fish to perform various experiments.

III. OBSERVATIONS

Colisa fasciatus(Bloch & Sneider) is an air-breathing freshwater teleost with Labyrinthiform organ. The outer surface of the skin exhibits brilliant colours-greenish blue above, whitish below and with fourteen orange stripes passing obliquely backwards and downwards from the back to the abdomen alternating with almost every other row of scales which are blue-giving it a beautiful look for aquarium fish. The fins are spotted orange and the anal fin in particular is edged with deep red. The skin and the fins (fin-rays with inter-radial membrane) are the outermost organs of defense against the surrounding environment, because these along with respiratory structures are the first target organs to come under the direct contact of any environmental eventualities. Unlike the mammalian integument, the fish skin has no generalized structural organization, which could be termed as the typical representative of fish skin. The structure of fish skin varies greatly amongst the various groups and also in relation to different niches they occupy. The fish with different body surfaces have different types of skin structures. Broadly, on the basis of scales, the fish may be divided into two groups; one, which have scales on their outer surface of the skin (scaly) and the other which are devoid of scales (scalesless). In scaly fish the scales remain deeply embedded into the outer layer (stratum laxum) of the dermis in the so-called pockets formed from the connective tissue flaps (Mittal & Banerjee, 1975).

IV. DISCUSSION

In the course of present study, pigment cells were observed in large numbers in the scales, loose connective tissue flaps and fins, which are the components of the skin of scaly fish. The present fish, *Colisa fasciatus* have ctenoid type of scales in which, the basal portion of each scale has several hooks or pine-like structures for firm attachment with the skin. The scale remains deeply embedded into the outer layer or stratumlaxum of the dermis and the connective tissue flaps form the scale pockets, which are loosely present on the outermost layer of dermis, just below the bases of the scales. The loose connective tissue flaps along with the bases of scales have large number of pigment cells. Similarly, almost all fins have certain numbers of fin rays (ventrals reduced to a single elongated filiform ray) & between the fin rays, inter radial membranes is present. These inter membrances also have pigment cells or chromatophores present either in a row or in scattered form.

In the present study, each pigment cell contains a nucleus and numerous rounded or spherical small granules, delimited externally by membrane, resembling plasma membrane. Each cell is supplied with neurofibrils. Histochemical observations indicate that the small granules present in the pigment cells or

complex co-polymerizate of oxidation products of the amino acid, tyrosine. It is a bichrome of high molecular weight and can be produced in vitro by oxidation of the amino-acid, tyrosine, with the copper protein enzyme, tyrosinase. Accordingly these pigment cells are designatedas melanophores. They exhibit three forms: reticulate or fully expanded; stellate or partially expanded and punctuate or fully aggregated forms.

V. SUMMARY & CONCLUSION

Studies on the impact of some environment changes and a few drugs on the pigment cells of an Indian air breathing fresh water teleost, *Colisa fasciatus* (Bloch & Sneider) (Perciformes: Anabantidae) have been made in the present study.

The pigment cells contain melanin, which is a complex compolymerizie of oxidation products of the amino acid, tyrosine. It is a bichrome of high molecular weight and can be produced in vitro by oxidation of tyrosine with the copper-protein enzyme, tyrosinase. The melanophores of the fish scale, loose connective tissue flap and fins, which are the components of the skin, were subjected to the action of a number of stimuli which comprised varying physical, chemical and physiological conditions.

(1) The physical factors included,
   - (i) Continuous illumination
   - (ii) Total darkness
   - (iii) Red coloured back background environment and
   - (iv) Ultra-violet irradiation

(2) The chemical factors were
   - (i) Water of different pH
   - (ii) Physiological saline
   - (iii) Potassium chloride
   - (iv) Adrenaline
   - (v) Atropine and
   - (vi) Adrenocorticotrophic hormone (ACTH)

(3) Physiological conditions like forced water-breathing and air –breathing conditions.

(4) Besides using the H-E method, a number of histological methods were exploited for staining melanin, neurofibrils, lipofuchsin, Argentaffin granules, basic protein, iron , copper, haemosiderin etc.

Thus to conclude the present study, the presence of iron molecules and copper-protein complex within the melanophores appears to be interesting and probably indicates their involvement in the vital process of respiration. But it will be too early to draw any final conclusion & needs further investigation.

REFERENCES :

[1] Ando, S. – "Note on the type of mechanism of the colour change of the medak", Oryzias latipes. annotations. Zool. Jap., 33(1960), 33-36.

[2] Breathnach, A. S. – "Melanin pigmentation of th skin Oxford Biology reader, (1974), 7-8.

[3] Anandaswarup,P. Rao, D.M, and Murty, A. S.- "Toxicity of endosulfan to the fresh water fish, Chrrninus mrigala". Bull Environ. Contamtoxicol, 27(1981), 85-881.

[4] Cope, O. B., - "Contamination of the fresh water ecosystem by Pesticides". J. Appl. Eco.3(Suppl.) (1996), 33-34.

[5] Verma, S. R., Rani, S. and Daleta, R. C. – Impact of tannevy effluent on bioenergetics of fishes". J. Ecotoxicol environ. Monti, 13(3)(2003) 161-173.

[6] Paulese, P.V., - "Effect of water pH of toxicity in a fish Gamburia at finis" Indian J.