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Studies on the Effect of Pharmacological Agents on the Melanophores of Fresh Water Teleost Ophiocephalus Gachua (Ham)

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Abstract: **The Present study is an attempt to determine the nature of nervous control of the colour change mechanism in the fresh water teleost ophiocephalus gachua the effect of pharmacological agents on the melanophores of fresh water teleost ophiocephores gachua.**
A Pharmacological study has been made on the melanophores of the teleost fish ophioclphone gachua. The findings of study indicates that there is not to be a cholinergic pigment dispersing mechanism in this species it also indicates that the melanophore of this species are under adrenergic control and that alpha adrenorecepters are involved in pigment concentration.

Keywords: **Melanophore, Colour change, Adrenergic.**

1. INTRODUCTION

Many workers have used pharmacologically active substance to elucidate and intricate melanophorecontrol mechanism in fishes. (waten Abe & others,1962; Pye, 1964; Healey & Ross, 1966; Abbott, 1968; Ruffin and others 1969; Grove, 1969; Read and Finnin, 1972; Dudinsk; & others ,1975; Fujii miyashita, 1975, 1976; Dwivedi, 1972; 78; and Dixit (shukla) 1980, 1996, 2016.
The present Pharmacological study is an attempt to determine the nature of nervous control of the colour change mechanism in ophiocephalus gachua the drugs used include adernorecepter, agonist and antagonists and various unclassified substances.

2. MATERIAL AND METHOD

The fish ophiocephalus gachua of length 6-9 cm were collected locally from ladhedi gwalior. The fish were adapted to a standard background condition. Sites A (Bands above lateral line)c, (Intervanning area) above (l)were selected as previous study of colour pattern study; (Shukla (Dixit) A. 1980) for in vivo study both before and after intra peritoneal injection of the drugs during investigation.

For the in vitro studies isolated scales from the sites A & C of the fish were kept in young's ringer solution. The melanophore showed constant pigment dispersion in the solution , The dispersed condition reading provide the initial dispersed condition reading for the estudy of the effect of melanin aggregating drugs. Scales of same sites, pretreated with adrenaline the initial aggregated readingfor the study of the drugs effect, known to dispersed melanin in the melanophores.

Observation on drug treated scales were recorded at regular time intervals for a group of ten melanophores on the one scale. Melanophore responses were recorded by melenophore index (MI) method (Hogben&& slome 1931)

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3. OBSERVAATIONS AND RESULTS

White adapted fish site A and C

Average responses of melanophore in vivo

	Drug	Dose inject ed (µg)	Shade Before	After Drug
1.	Adrenaline tartrate	36	1.1/0.5	0.80/0.5
2	Nor adrenaline	30	1.2/0.7	0.80/0.5
3	Ephedrine hydrochloride	320	1.1/0.7	0.80/0.5
4	Reserpine hydrochtoride	100	1.1/5.6	0.5/4.8
5	Atropine sulphate	50	1.1/ 5.3	0.5/4.6
6	Merphine sulphate	750	1.1/3.0	0.5/2.2
7	Emetine hydrochloride	750	1.1/6.2	5.5/5.7
8	Posterior pituitary powder	1250	1.1/6.2	0.5/5.7
9	Tolazoline Hydrochloride	750	1.1/7.5	0.5/6.5

Average resonanses of melanophore in Vivo

Black adapted fish

	Drug	Dose Injected (µg)	Shade A	After	Before	After dose
1.	Adrenaline tartrate	36	7.5	1.0	6.5	0.5
2	Nor adrenaline	30	7.5	1.2	7.0	0.9
3	Ephedrine hydrochloride	320	7.5	0.9	7.0	0.9
4	Reserpine hydrochtoride	100	7.5	7.5	6.5	6.5
5	Atropine sulphate	50	7.5	7.5	6.5	6.5
6	Merphine sulphate	750	7.5	7.5	6.5	6.5
7	Emetine hydrochloride	750	7.5	7.5	6.5	6.5
8	Posterior pituitary powder	1000	7.5	7.5	6.5	3.3
9	Tolazoline Hydrochloride	1250	7.5	7.5	6.5	6.5

Average responses of melanophores in vitro to various drugs .(MI Method ,Hogben and Slome 1931)

	Drug	Site A		Site C	
		Before drug	After drug	Before drug	After drug
1.	Adrenaline tartrate	5	1	5	1
2	Nor adrenaline	5	1	5	1
3	Ephedrine hydrochloride	1	1.78	5	1.78
4	Reserpine hydrochtoride	1	2.4	1	2.4
5	Atropine sulphate	1	3.3	1	3.3
6	Merphine sulphate	1	5	1	5
7	Emetine hydrochloride	1	5	1	5
8	Posteriorpituitary powder	5	4.2	5	4.2
9	Tolazoline Hydrochloride	1	5	1	5

Average peak melanophore response obtained in vivo

(symphathonumetic drugs) adrenaline , noradrenalin and eldrine caused complete aggregation of melanin within melanophore both in vivo and in vitro .

1- White adapted fish were observed to pale until a maximum paling response was shown .

2- These three drugs also produced a rapid paling in black adapted fish . but the time required to reach the peack effect was different to each of three drugs .

3- The adrenoceptor reserpine cause moderate darkening of white adapted fish

4- Reserpine caused only slight dispersion of melanophore pigment (in vitro)

5- The parasympathomimetic drugs acetyl choline produced an uneven darkening in white adapted fish.

6- Atropine - A parasymphathomimetic antagonist did not show any response in black adapted fish. Atropine did not cause complete pigment dispersion in white adapted fish both in vivo and vitro.

7- Morphine sulphate caused only slight darkening of white adapted fish. However melanophore of isolated scale showed pigment dispersion with morphine sulphate.

8- Posterior pituitary powder was found unique in its effect on melanophores white adapted fish showed a rapid pigment dispersion i.e. darkening of the fish white black adapted fish showed pigment aggregation i.e. paling of the fish.

But ppp showed weak pigment aggregation in isolated scale (in vitro experiment)

4. DISCUSSION

The results from a pharmacological study indicates that the nature of the nervous control i.e. the melanophores of the fish Ophiocephalus gachua are under adrenergic nervous control .and that alphadrenoceptors are involved in pigment aggregation this fish does not appear to have a cholinergic pigment dispersing nervous system. The strong pigment aggregation shown in response to the sympthimimetic agent adrenaline ,nor adrenaline and ephedrine indicates the presence of sympathetic nervs supply to the melanophore of the fish the action of alpha – adrenoceptor blocking agent totalazoline and regetine Which both caused pigment dispersion in white adapted fish ; supports there concept and indicates the involvement of alpha adrenoceptors in the adrenergic mechanism Reserpine has been shown to deplete transmitters from adrenergic nervous the pigment dispersing action of reserpine on fish melanophore has been reported previously by turner and carl (1955) scheline (1963) healey and ross (1966) Abbott (1968) ,Ruffin & others (1969) Grove (1969) and Finnin and reed (1973), Dwivedi (1978) .the findings of present of these results . atropine –a parasympathetic blocking agent produce a darkening in white adapted fish instead of palling .thus giving no evidence to blocking any cholinergic pigment dispersing mechanism of the fish seems independent of the cholinergic – dispersing mechanism. All the sympathomimetic drugs but ephedrine brought full aggregation of the pigment in melanophores.

Effect of adrenaline and reserpin on isolated scale melanophores –

For the study of process of aggregation (due to effect of adrenaline) and dispersion (due to effect of respine) , isolated scales were taken from vertical band of the fish , under normal background condition .One ml of adrenaline tart rate was added to 100ml of young's Ringer solution(composition [128mM Nacl 2.6Mm KCl 1.8mM $Cacl_2$) to make desired concentration suitable for the experiment Reserpine in a concentration of I Mg in 1Ml of stabilized aqueous solution was used .

Before each experiment a few drops of young's ringer were taken on the cavity slide .A scale from band region of the fish body was carefully taken out and kept in the cavity slide the removed of scale inhibits the autonomic nervous control (i.e. scale is devervated) and, this denevation result in their complete dispersion young's ringer helps in maintaining the fully dispersed condition of the melanophores. Now two drops of adrenaline solution were added and successive stages of melanosome aggregation were noted /observed until complete melanophore aggregation. (MI5- to MI 1)

The adrenaline treated scale with fully aggregated melanophores was then washed in youngs ringer for about one minute this scale was kept in another cavity slide containing youngs ringer . the aggregated state of the melanophores was observed .two drops of reserpine solution were adapted to study the successive stages of dispersion in the same way ;as described in untill maximum dispersion of the melnaphore was attained .Results –the fully dispersed state of melanophores in youngs ringer was observed the first reading was taken after 7 seconds; then successive stages of (aggregating effect of adrenaline on) . melanophores .were observed in regular time intervals of 10 seconds untill fully aggregated scale was attained the observations were noted following Hogben and slorne (1931) MI method .The action of reserpine resulted in the dispersion of melanophores .then the scale washed in youngs ringer solution ,adding of two drops of respine resulted in dispersion of melanophores .the first observation were taken after seven (7) minutes then successive

stages of melanophore were noted at regular time intervals (10seconds), until no further dispersion of the melanophores has taken place. In the present study, the melanophore aggregation, in the adrenaline, taken about 65 seconds to attain the maximum state. The dispersion of melanophores in reserpine concentration also take same time for maximum dispersion state of melanophores. Although in previous literature reserpine is concentration also take same time for maximum dispersion state of melanophores.

Although in previous literature reserpine is considerd as potent melanophore dispersing agent. But in ophiolephalus gachua reserpine showed that the dispession is not only incomplete but also not uniform as the bulk of pigment remains confined to the centre of melanophores.The action of there two drugs (Adrenline & Reserpine), known to effect the autonomic nervous wystem was studied aggregating, then dispersing effect confirmed previously in many teleost i.e. Phoxius phoxinus (Healey,1966) carassius (chavin w,1956; Iwata, 1959), oryzias latipus (Iga 1968) Fundalus heroclitius (Abbott, 1949), Nannstomus (Ruffin et al 1969), Rasbora daniconuis (Dwivedi 1972 ,78).The observation regarding dispersing effect of reserpine on the nelanophore has also been studied in teleost species (Turner , 1955) , lebistes ridiculous (opitz ,1963) phoxinus phoxinus (Healey ,1967) Fudulus Heleroclitius (Abbott ,1968) Nannostomus Backfordianomalus (Ruffin et al 1969) .The observation in Ophiocephalus gachua is of similarly observation of Dwivedi 1972, 1978. that melanophore not dispersed fully but melanin remains concentrated centrally .

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