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ROLE OF BIOGENIC AMINES ON MIGRATION OF DISTAL RETINAL PIGMENTS OF THE FRESHWATER PRAWN, *MACROBRACHIUM KISTNENSIS*

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Effect of serotonin, dopamine, norepinephrine and acetylcholine on distal retinal pigment migration of *M kistnensis* has been determined. Serotonin and dopamine induced dark adaptation. Moreover, norepinephrine and acetylcholine produced light adaptation. Response observed was dose dependent.

INTRODUCTION

Crustacean compound eye is composed of large number of ommatidial units. Each commatidium is equipped with three sets of retinal pigments which undergo movements in response to light and dark stimuli (Kleinholz, 1936; Brown *et al* , 1952). The photosensitive rhabdome is screened in bright light and covered in darkness. Thus, these pigments help to control the amount of light impinging on the rhabdome. Movements of the distal pigment are regulated by light and dark adapting hormones (Fingerman *et al.*, 1959 & 1971; Fielder *et al* , 1971).

Various biogenic amines such as serotonin (5-HT) dopamine (DA) and norepinephrine (NE) are present in the nervous system of crustaceans (Barker *et al.*, 1979; Laxmyr, 1984). Studies on these biogenic amines on various chromatophores, by Fingerman and his colleagues revealed that these neuroregulators are responsible for release of various chromatophorotropins. Little attention

has been given to investigate the role of these biogenic amines on movement of distal retinal pigment. Hence, in the present investigation it has been thought proper to study the role of these neuroregulators in controlling release of retinal pigment hormones in the freshwater prawn, *Macrobrachium kistnensis*.

MATERIAL AND METHODS

Freshwater prawn, *M. kistnensis* were collected from Kham river, near Aurangabad. Prawns were maintained at 27 to 29°C in white enamel containers under 12 : 12 hrs light and dark conditions. After one week acclimatization experiments were conducted at day time using prawns of either sex having carapace length of 20 mm.

The position of distal pigment was determined by observing the sectioned eyestalks. In order to fix the retinal pigments in their original position, the method of Fingerman & Nagabhushanam (1963) was used. With the help of occular micrometer, the distances (a) from outer corneal surface to distal edge of distal pigment and (b) from outer corneal surface to basement membrane were measured. The ratio of a/b is distal pigment index (DPI). Use of ratios minimised the size differences among the specimens Each experiment was repeated once and mean of both experiments is reported.

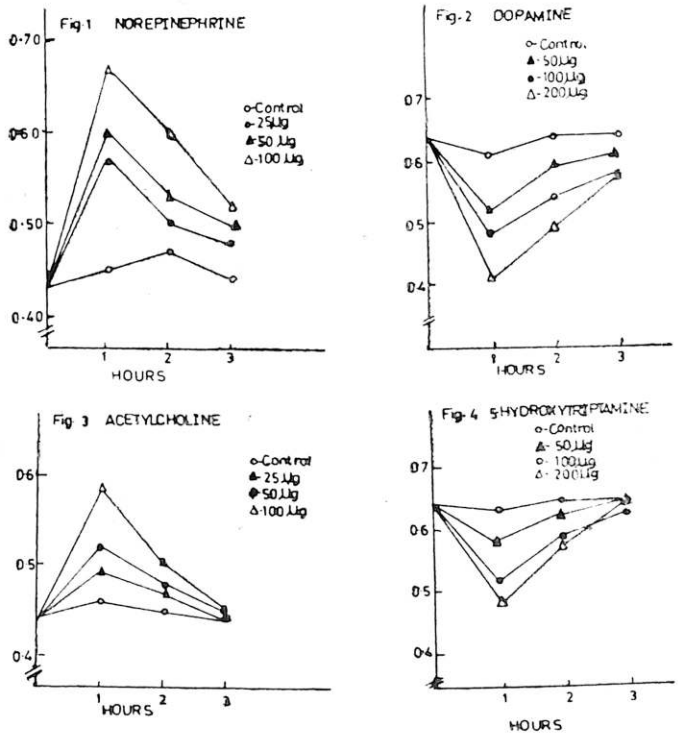
Biogenic amines, serotonin (5-HT), dopamine (DA), norepinephrine (NE) and acetylcholine (ACh) were dissolved in physiological saline (Van Harrveld, 1936). Concentrations were expressed in μg per dose *i. e.* 0.02 ml. In preliminary experiments NE and ACh induced light adaptation and DA dark adaptation. To see the light adapting response dark adapted prawns were used. For dark adapting response, light adapted (120 Ft. c.) prawns were used. In both the cases, control group of 15 prawns were injected with 0.02 ml saline. Similarly experimental group of 15 prawns received 0.02 ml of testing solution. Eyestalks of 5 prawns of each group were fixed 1 hr, 2 hr and 3 hrs after the injection and DPI were determined.

RESULTS AND DISCUSSION

Effect of NE on distal pigment of *M. kistnensis* is represented in Figure 1 and it is clear that, NE evoked light adaptation of distal pigment. This

light adapting response increased with increase in dose concentration from 25 μg to 100 μg.

Effect of dopamine (DA) on distal pigment migration of *M. kistnensis* indicated in Fig. 2 showed that DA produces dark adapting response. Increase in dose concentration from 50 μg to 200 μg increased dark adapting response.



Effect of various biogenic amines on distal retinal pigment of *Macrobrachium kistnens's*. Figs. 1-4. **1**. Norepinephrine (NE) 0 0 : Saline control : 25 μg 0 0 : 50 μg : 100 μg **2** Dopamine (A) 0 0 : Saline control : 50 μg 0 0 : 100 μg : 200 μg **3** Acetylcholine (ACh) 0 0 : Saline control : 25 μg 0 0 : 50 μg : 100 μg **4**. 5-Hydroxy tryptanmine (5-HT) 0 0 : Saline control : 25 μg 0 0 : 50 μg : 100 μg.

Effect of acetylcholine on distal pigment migration of *M. kistnensis* in Fig. 3 suggest that, acetylcholine evoked light adapting response in distal pigment. This response was dose dependent from 20 μg to 100 μg.

Effect of serotonin on distal pigment migration of *M. kistnensis* is presented in Fig. 4 and it is seen that 5–HT induces dark adapting response. This response increased with increase in concentration of dose from 25 to 100 μg.

In crustacea, migration of the distal pigment in compound is regulated by antagonistic light adapting hormone (LAH) (Kleinholz, 1936) and dark adapting hormone (DAH) (Brown *et al.*, 1952; Fingerman *et al* , 1959; Fingerman & Mobberly, 1960). Characterization of these hormone is done by Fingerman & Mobberly (1960), Kleinholz *et al.* (1962) and Fingerman *et al.* (1971). According to them these hormones are polypeptides.

In the present investigation, NE and ACh stimulated light adaptive response of distal pigment whereas, DA and 5–HT produced dark adapting response to all biogenic amines was dose dependent. These results are consistent with those of Kulkarni & Fingerman (1986) on the fiddler crab, *Uca pugilator*. Fingerman and his colleagues (1974 & 1981a, b) studied effect of these biogenic amines on erythrophores and melanophores of the crab, *U pugilator*. Their results indicated that these biogenic amines induce response *in vivo* but are ineffective in *in vitro* studies. According to them these neurotransmittors are probably responsible for the release of chromatophorotropins. Recently, Fingerman (1987) reported that neurotransmitters like 5-HT, DA, histamine, GABA regulate release of various hormones from their storage/release site. Similarly, in the present study response induced by 5–HT, DA, NE and ACh is most probably indirect. NE and ACh probably induced release of LAH however, DA and 5–HT induce release of DAH resulting in light and dark adaptation of distal retinal pigment respectively.

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