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Effect of hypoxia on fresh water fishes of Madhepura

Anil Kumar & Arun Kumar*

University Department of Zoology, B.N.M. University, Madhepura, Bihar, India

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Abstract: Whenever an organism's body or part of the body is deprived of adequate amount of oxygen supply at tissue level, on condition generally called as hypoxia develops. Fishes generally depend on dissolved oxygen in water for their respiratory needs. And this dissolved oxygen usually depends on various factors such as surface area of water, temperature, etc. so for survival of fishes, a constant concentration of dissolved oxygen is a must. This paper deals with the causes and effects of fishes.

Key words: Gills, hypoxia, fishes, dissolved oxygen.

INTRODUCTION

Most fishes depend on surface dissolved oxygen for their respiratory requirements. They usually possess a pair of gills from which exchange of gases take place. Gills are composed of short thread like filaments, which contain capillary network increasing the surface area. Fishes take O₂ rich water & brush it over their gills & oxygen crosses the thin filament via diffusion. The oxygen is then transferred over the entire body via blood. Water then exits the fish body through operculum, a flap like structure found on the sides of throat of bony fishes.^{1,2}

Hypoxia, usually develops when the content of oxygen in the water body falls considerably. Hypoxia is subdivided into two categories.³

Local- when only a part of body is affected.

Generalized- when the entire body is affected.

Hypoxia is generally with two other terms

i. Hypoxemia- low arterial O₂ supply.

ii. Anoxemia- zero arterial O₂ supply.

The general cause for hypoxia seems to be decreased exposed surface area of water body. As oxygen is sparingly soluble in water, any form of vegetation on the water body surface, hampers the solubility rate adversely.⁴

For inland fisheries in Bihar, the growth of water hyacinth, on the surface of river water poses a great threat. The spread of this plant is usually uncontrollable sometimes even the entire pond is covered by it. In such a scenario, the fishes are deprived of both sunlight as well as dissolved oxygen.⁵ The submerged plants, (which are add on sources of oxygen) on not receiving sunlight, as unable to perform photosynthesis, which releases oxygen. This causes the O₂ level to further dwindle.⁶

At peak deprivation level, the fishes suffer hypoxia. Hypoxia affects not only the respiratory system but all the other important system such as reproduction development as well.

*Corresponding author :

Phone : 9006991000

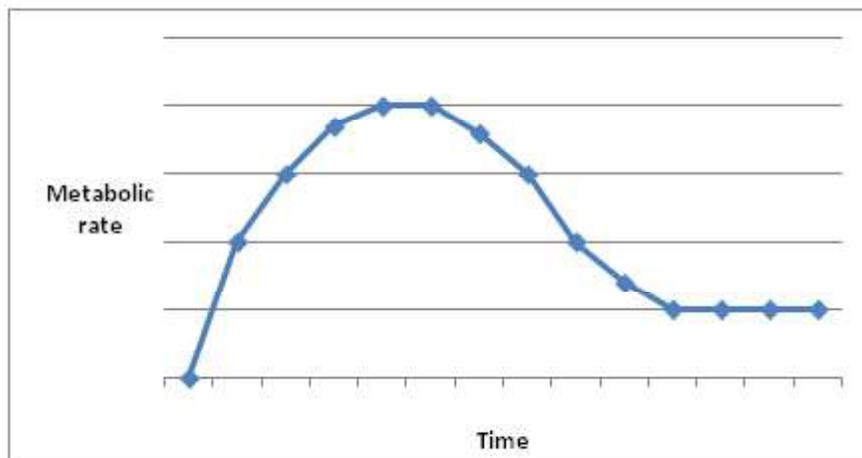
E-mail : prf.arunkumar@gmail.com

MATERIALS & METHODS

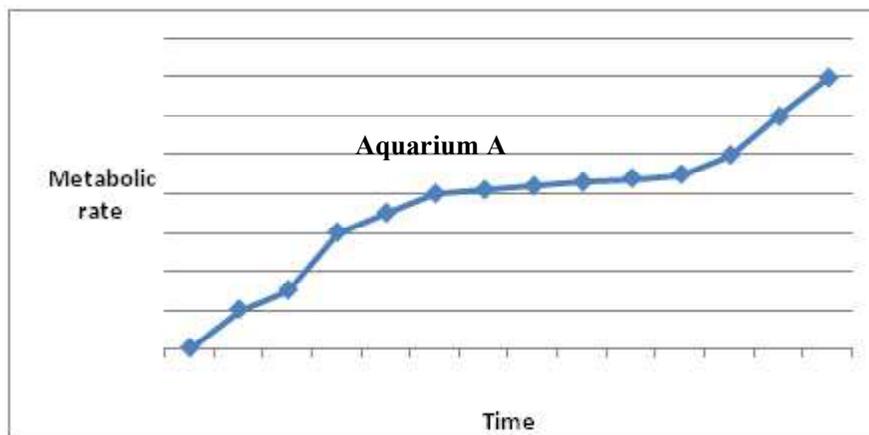
2 aquariums, 10 fishes (especially ones that are pregnant or producing eggs), Hydrilla, covers. An experiment was designed. The 2 aquariums were placed at 2 different spots. Water submerged plants such as hydrilla was introduced into the aquariums. Top of aquarium A was five fishes each were kept covered with air tight opaque material & negligible inlet of air (O_2) was allowed & it was kept in a room with no sunlight.

Aquarium B was kept in well lit room, with perforated lid, to allow inlet of O_2 . The metabolic rates were monitored from time to time.

The following results were observed. Fishes in aquarium A & B were very active at first, feeding & moving actively. After two- three days, the activity of fishes in aquarium A was negligible, while that of aquarium B was constant.



Aquarium A



Aquarium B

CONCLUSION

From the above experiment it can be said that lowering the amount of oxygen, lowered the activity of fishes, showing a sharp decrease in metabolic rates. Also it was seen that in fishes of aquarium A the reproduction

of eggs was lowered almost to zero while in the fishes of aquarium B, the eggs count was good.

Hypoxia can always differ in terms of severity. In cases where hypoxia is sudden, it can kill thousands of fishes at a time (oil spills).

If hypoxia is gradual the fish body can adapt/adjust itself to low O₂ levels, usually by lowering their metabolic rates, & survive for some time.

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