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Changes in Erythrocyte Count (RBCs) Under Three Photoperiodic Conditions in Indian Cat Dish *Clarias batrachus* in different Phases

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ABSTRACT

In fishes the number of erythrocyte (RBCs) acts as an indicator for stress and health. The present study is designed to investigate different photoperiodic effect in RBCs under natural day night (14L:12D), continuous illumination (24L:00D) and continuous dark (00L:24D) conditions in four different phases viz., Resting Phase, Pre-Monsoon Phase, Monsoon Phase and Post Monsoon Phase. The experiment was conducted for 60 days, during this period counting of RBCs assessed at the interval n of 15 days after commencement of the experiment. Result reviled significant ($p<0.001$) changes in total erythrocyte counting in all three chosen photoperiod. Highest counting of erythrocyte recorded in continuous darkness (00L:24D) while lowest value has been recorded in natural day night (14L:12D) condition intermediate value recorded in continuous illumination (24L:00D). Elevated counting of total erythrocyte is due to stress which is caused due to photoperiod. Our results also documented that in continuous darkness count of erythrocyte (RBCs) were elevated during Pre Monsoon Phase and Monsoon Phase in comparison of Resting Phase, while the lowest count of RBCs observed during the Post Monsoon phase in comparison to two other photoperiod.

***Key words**: Clarias batracus, Photoperiod, Erythrocyte / (RBCs).*

Introduction

Hematological parameters have been recognized as valuable tools for monitoring the fish health and effect of environment changes on fish biology (Wells, 1999) it is also used for health status and stress indicator in fish (Valenzuela *et al.,* 2006). In fish as in mammals, Hematological frequently use health disease indicator and its consistent rules of nomenclature and procedures are compared to mammalian hematology. Ballarin *et al.,* (2004) Sheila *et al.,* (2005), worked on red paradise fish, *Macopodus opercularis* and reported that a comparative study showed that the size and number of erythrocyte present in teleost blood reflect its habitat, activity and degree of evolution. Collaza *et al.,* (1998) worked on male and females *Tinca tinca* hematological parameters in four seasons spring, summer, autumn and winter they noticed that significant changes in number of red blood cells. They also concluded that variation may play an important protective role for the survival of the animals. Information on the effects of artificial photoperiod on these parameters are scarce and ambiguous. Laboratory control studies of the effects of artificial photoperiod on hematological aspects show different result presumably due to differences in illumination protocols utilized, species and duration of exposure to light (Melignen *et al.,* 2002, Leonadi and Klempau 2003, Biswas *et al.,* 2004).

Materials and Methodology

Experiment was conducted under three light condi-

tions viz. LD, LL and DD. For experiment fishes were divided into three groups (group I, II and III). Each group with N=35 fishes. Fishes of group I was treated as control under LD12:12 while fishes of group II and group III treated as experimental group under LL and DD condition respectively. Before commencement of the experiment 105 acclimatized fishes (*C. batrachus)* about 70 ± 02 g were randomly selected from stock aquaria for proper acclimatization under 12LL:12DD for 24 hour. During the experiment fishes were fed with pieces of dried fishes and boiled egg on alternate days. The water of the aquaria was changed on the same day when food was provided.

Method: RBCs counting was done by standard haemocytric method.

Results and Discussion

Duncan's showed significantly lower value in post monsoon phase and it was higher in monsoon phase. Result of treatment significantly lower in LD condition and higher in DD condition. Duncan's s h owed significantly lower value in 15 days interval and were higher in 60 days.

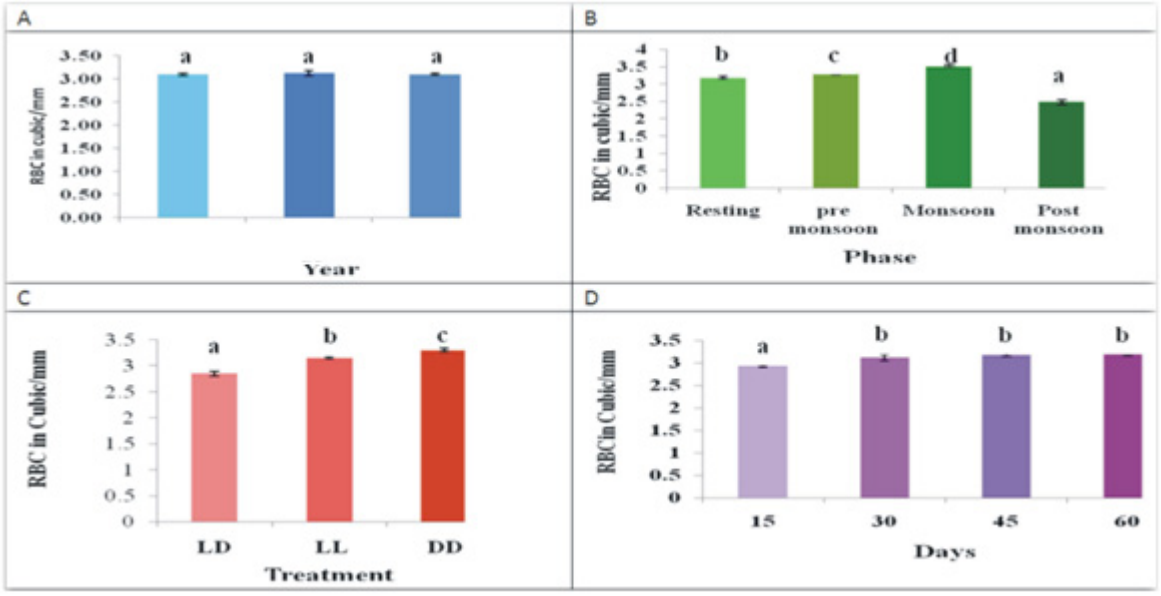
Proved by four ways ANOVA. It was employed to examine the interaction of factors. Statistical analysis showed that RBCs count increased season vise or phase vise. Similarly, RBCs found higher in those fishes which maintained under constant darkness. Erythrocyte also varies from Ist interval to IVth interval it show gradual increases throughout the experiment increased RBCs number also depend upon higher body weight. The greater number of erythrocyte count might be because of greater activity of fish. *C. batrachas* is a night active fish (Adity Niyogi 1983; Pati *et al.,* 1998; Srivastava and Choudhari, 2010) so it becomes more active at dark condition in comparison of day light condition which significantly supports the present findings. Erythropoietic activity, as reflected by changes in hematological parameter such as erythrocyte counts is modulated in fish by several factors like hypoxia (Valenzuela *et al.,* 2002), exercise (Kita and Itazawa, 1989), management induced stress (Pages *et al.,* 1995), reproductive state (Cech and Wohlschlag, 1982) and seasonal variations closely related to thermic cycles (Thomas *et al.,* 1999). These factors induce changes in metabolic demands that affect respiratory, ventilatory and hematological patterns, e.g., an increase in temperature increases oxygen demand, which in turn stimulates erythropoiesis (Houston and Murrad, 1992). Yamamato *et al.,* (1983) worked on yellow tail *Seriola quinqueradiata* and opined that release of RBCs in circulating blood from spleen is in response of hyperactivity. Srivastava (2003) concluded that prolonged light is to known as decreased locomotory activity in *Clarias batrachas*, the present work is in consonance with the above work.

Abnormal condition caused stress in fishes, Beouf and Bail (1999), Valenzuela *et al.* (2006) noticed that photoperiodic factors worked as stress factor for fishes, they concluded that elevated erythrocyte number is significantly higher (p>0.001) in rainbow trout *Onchorhynkis mykiss* in various photoperiod which is similar with the present study in which RBCs number also alter with photoperiodic condition and significantly higher (p>0.001) in treated group.

Leonardi and Klempau (2003) and Leonardi *et al.,* (2003) also noticed that stress caused elevated erythrocyte count in rainbow trout. Valenzuela et al., (2006 and 2008) worked on rainbow trout and resulted that fishes group that kept under photoperiod 14LL:08DD showed higher erythrocyte count. Pradhan (1961) and Das (1965) have concluded that RBCs count is proportionally related with length and age of fishes, this statement supports the present study. Dark reared fishes showed better growth and body weight on comparison of other group and elevated RBCs count. Biswas *et al.,* (2004) and (2006) supported the result that altered photoperiod causes higher growth rate in Nile tilapia *Oreochromis nilotichus* and Red sea bream with elevated physiological properties. Joshi and Tandon (1977) worked on *C. batrachas* and reported higher RBCs number in spawning period that in monsoon phase Jul- Aug, similar result has been noticed by Tugarina and Rayzhova (1970) in *Thymallus articus baicalensis.* Khan (1977) in *C. batrachus* and Josi, (1982) in *Rita rita* has been noticed that rapid fall occurs in hematological parameters in post spawning period due to ambient temperature.

Collazos *et al.* (1998) worked on *Tinca tinca* to see the seasonal variation on hematological parameters and their result supports present study that significant changes (p<0.001) has been found in erythrocyte count according to four phase/ season throughout the year. Sheila *et al.,* (2005) resulted that total number of erythrocyt es is related with their habitat. Environmental disturbances are regarded as a potential source of stress said by Biswas *et al.,* (2006).

Graphical presentation for different four factor's on erythrocyte counting in C batrachus



A. RBCs in *C.batrachus* at different year.
B. RBCs in *C.batrachus* at different phases.
C. RBCs in *C.batrachus* at different treatment condition.
D. RBCs in *C.batrachus* at different time interval

Continuous light causes acute stress (Leonardi and Klempau, 2003; Leonardi *et al.,* 2003) the sudden 24 h illumination, reflected in the heightened increase of total erythrocyte numbers in rainbow trout (*Oncorhynchus mykiss*) noticed by Valenzuela *et al.,* (2006). Effect of artificial photoperiod on the hematology of fishes is very limited as stated by Valenzuela *et al.,* (2007).

Conclusion

Photoperiod may be Effected by clarification of algal booms and aquatic weed causes stress to fishes.

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