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EFFECT OF PHOTOPERIODS ON GROWTH AND MATURATION OF SWORDTAIL (*Xiphophorus helleri)*

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Abstract: *The present study was conducted to find out growth and maturation of newly born youngones of swordtail using different photoperiods (13hrs.,16hrs.,19hrs.,22hrs.,24hrs.-Dark) for a period of 60days, one 15watts , CFL Bulb were used as source of artificial light in each Setup-I-IV, whereas in Setup-V(24 hrs. dark) were maintained. 20 youngones were kept in each Setup-I to V. During study period, the average mean length, the average mean weight, survival rate percent and sex* identification *were observed. Water quality management were done throughout study period and physico-chemical parameters such as temperature, pH, dissolved oxygen, nitrite, nitrate, ammonia, total alkalinity and total hardness were measured and maintained using standard water analysis kits. Siphoning done weekly. Feed management were done using dried pelleted feed(Tokyu) and (Optimum)and freeze dried live feed(Blood worm) and (Tubifex) four times in a day with timimgs7 a.m.(Tokyu),11a.m.(Blood worm),3 p.m(Optimum), and 7 p.m.(Tubifex.). During study period growth and maturation were found to be maximum and fast in Setup-IV (22 hrs., CFL) and minimum and slow in Setup-III (19hrs.,CFL),while during second months found to be maximum in Set up-IV (22 hrs,.CFL) and minimum in Setup-V (24 hrs., Dark).The aim of present study was to find out which photoperiods were best suited for growth , maturation and survival of youngones, inorder to get healthy crops ,which not only going to make our country self sufficient in ornamental fish rearing and culture but also help in making a big platform to compete with world market .It also boost our national income and prestige. In today's global scenario ornamental fish rearing and culture, act as strong weapon in eradicating unemployment problem. So present study was an attempt to let several research scholars, entrepreneurs and women self help groups with basic knowledge in using different photoperiods to have a successful and fast growth of swordtails.*

Keywords: *Feed management, Growth, Maturation, Photoperiods, Swordtail, Water quality management*

I. INTRODUCTION

The live bearers were primarily presented in Europe at the end of 18 th century, and became the most popular species in Europe and USA in terms of production and trade.[1] Belong to the Poecilidae family and most popular ornamental fish for breeding.[2] Guppies. mollies. platies and swordtail are member of this family.[3] Easy to raise and feed, recommended for beginners who are interested in ornamental fish breeding.[4] The vast majority of ornamental fishes in the aquarium trade are of freshwater origin where aquaculture provides 90% contribution.[5] World trade of ornamental fish is estimated to about Rs. 2000 crores, but India's share is only Rs. 15 crores, which is insignificant.Also major shares of country's ornamental fish export are captive collection from North Eastern states comprising about 85% of total aquarium fish trade of India.[6] Nearly about 100 species are reared as aquarium fish where exotic species have great demand due to its shape, colour and appearance.[7] Animals develop photoreceptors and clock mechanism during early ontogeny according to a sequential set of events.[8] In teleost fish, light influences the entire life cycle from embryo development to sexual maturation in adults.[9] Photoperiods acts as an artificial zeitgeber which regulates endogenous rhythm and affect fish growth, metabolic rates, body pigmentation, sexual maturation and reproduction.[10] Ornamental fish culture needs a clear understanding of habitats and biology of fishes, requires less space ,less time and less expenditure.[11] Overall the present study provides a basic guidance how to use different photoperiods properly to raise growth and maturation of swordtail, hence playing significant role in the development and progress of ornamental fish rearing and which finally add to Country's income and progress.

II. MATERIALS AND METHODS

The materials and methods applied during study period were as:

A. Experimental Area:- A 60 days experiment were carried out in Fish and Fisheries Research Lab at Baba Saheb Bhim Rao Ambedkar , Bihar University, Muzaffarpur, Bihar.

B. Experimental Aquaria:- A total five glass aquaria were taken with measurement 8"x6"x10" with 10L water holding capacity. .

C. Light Source:- The photoperiod (15 W,CFL BULB) were used as source of light.

D. Light Measuring Tool:- A digital lux meter , Model LX-101A of HTC Company was used for measuring light.

E. Candidate Species:- The live bearer ornamental fish swordtail (*X .helleri*) were procured from CIFE Centre, Kolkat and brought to M.Sc. Fish & Fisheries Research Lab .

F. Acclimatization:- The swordtail youngones were acclimatized in tap water for one week.

G. Experimental Design:- Each glass aquaria were kept on wooden table with 24 hrs. electric supply and aeration facility provided for 8hrs daily to each setup. In each setup 20 youngones were kept for observation of photoperiods effect.Photoperiods were maintained in each setup such as in Setup-I(13 hrs.,CFL, 1100-3300 lux), Setup-II(16 hrs., CFL,1600-2500 lux), Setup- III (19 hrs.,CFL, 2500-3400 lux),Setup-IV(22 hrs.,CFL, 4100-4900 lux) and Setup-V(24 hrs., Dark). Switching of electric supply done manually.

H. Feed Management:- Youngones were fed with dried pelleted and freeze dried live feeds which were given four times in a day with timing 7 a.m.(Tokyu), 11 a.m.(Tubifex), 3 p.m. (Optimum) and 7 p.m.(Blood worm) .

I. Water Quality Management:- Water quality parameters were observed weekly and recorded using standard water analysis kits as mentioned in Table-1

Table-1 Water Quality Measurements

SETUPS	***PARAMETERS***						
	D.O	***Temperature***	***pH***	***Nitrite***	***Nitrate***	***Ammonia***	***Total hardness***
I	***5-9 ppm***	***26-29º c***	***7.5-8***	***0-1 ppm***	***0-5 ppm***	***0-5 ppm***	***150-230 ppm***
II	***5-8 ppm***	***26-29º c***	***7.5-8***	***0-1 ppm***	***0-5ppm***	***0-5 ppm***	***150-240 ppm***
III	***5-7 ppm***	***26-29º c***	***7.5-8***	***0-1ppm***	***0-5 ppm***	***0-5 ppm***	***160-250 ppm***
IV	***5-9 ppm***	***26-29º c***	***7.5-8***	***0-1 ppm***	***0-5 ppm***	***0-5 ppm***	***150-240 ppm***
V	***6-10 ppm***	***23-26º c***	***7.5-8***	***0-1 ppm***	***0-5 ppm***	***0-5 ppm***	***140-230 ppm***

J. Growth Performance:- The lengths and weights of each youngone were measured and noted before starting of the experiment and then onwards these were recorded weekly. The lengths were measured from tip of snout to the end of caudal fin using divider and graduated scale and weights were measured using standard electronic balance. At end of the experiment the average mean length, the average mean weight, standard deviation, survival rate percent, undifferentiated sex and number of males and females were identified in each setup and recorded as mentioned in Table-2. Statistical formulas which were used to calculate above mentioned growth performance were as:

Statistical Formulas :

$$\text{Average mean length} = \frac{\text{Sum of the lengths}}{\text{No. of lengths}}$$

$$\text{Average mean weight} = \frac{\text{Sum of the weights}}{\text{No. of Weights}}$$

$$\text{Standard deviation } (\sigma) = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2}$$

Where σ= Standard deviation
x_i = Each value in data set
μ = Mean of value in data set
$\frac{1}{N}$ = No. of observation in data set

$$\text{Survival rate (\%)} = \frac{\text{Final no. of fishes}}{\text{Initial no. of fishes}} \times 100$$

$$\text{Specific growth rate (\%)} = \frac{\text{Mean final wt.- Mean Initial wt.}}{\text{experimental period } (T_2 - T_1)} \times 100$$

$$\text{Percent weight gain (\%)} = \frac{\text{Mean fish final wt.- Mean fish Initial wt.}}{\text{Rearing periods (Total period)}} \times 100$$

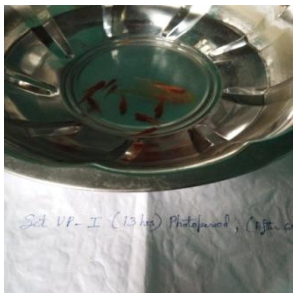
III. RESULT

Table-2 Growth Performance of Swordtail (youngones) during first month

Setups	*Avg. mean length ± S.D*	*Avg.mean wt. ± S.D*	*Survival Rate%*	*Sex Ratio (F: M)*	*Undifferentiated Sex*
I	1.63 ± 0.26	0.04 ± 0.089	100	18:2	Zero
II	1.59 ± 0.35	0.047 ± 0.039	90	17:3	Zero
III	1.4 ± 0.28	0.03 ± 0.02	90	15:5	Zero
IV	1.7 ± 0.17	0.054 ± 0.024	90	16:4	Zero
V	1.66 ± 0.17	0.05 ± 0.014	90	18:2	Zero

Table-3 Growth Performance of Swordtail (youngones) during second month

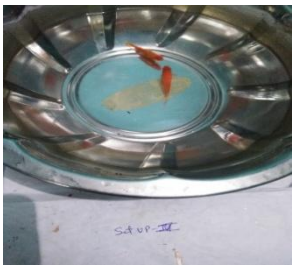
Setups	*Avg. mean length ± S.D*	*Avg.mean wt. ± S.D*	*Colour Change*	*Specific Growth Rate%*	*Percent Weight Gain%*
I	1.87 ± 0.197	0.081 ± 0.024	Not found	0.13666	0.06833
II	2.05 ± 0.526	0.13 ± 0.176	A little bit on body surface	0.27667	0.13833
III	2.23 ± 0.148	0.117 ± 0.02	More on body surface	0.32333	0.161667
IV	2.78 ± 0.340	0.416 ± 0.459	More on body surface	1.20667	0.60333
V	1.75 ± 0.130	0.065 ± 0.0145	Not found	0.05	0.025



Setup-I (13L:11D)

Setup-II (16L:08D)

Setup-III (19L:05D)



Setup-IV (22L:02D)

Setup-V (24L:00D)

Figure-1 Growth Performance of Swordtail in different setups during study period.

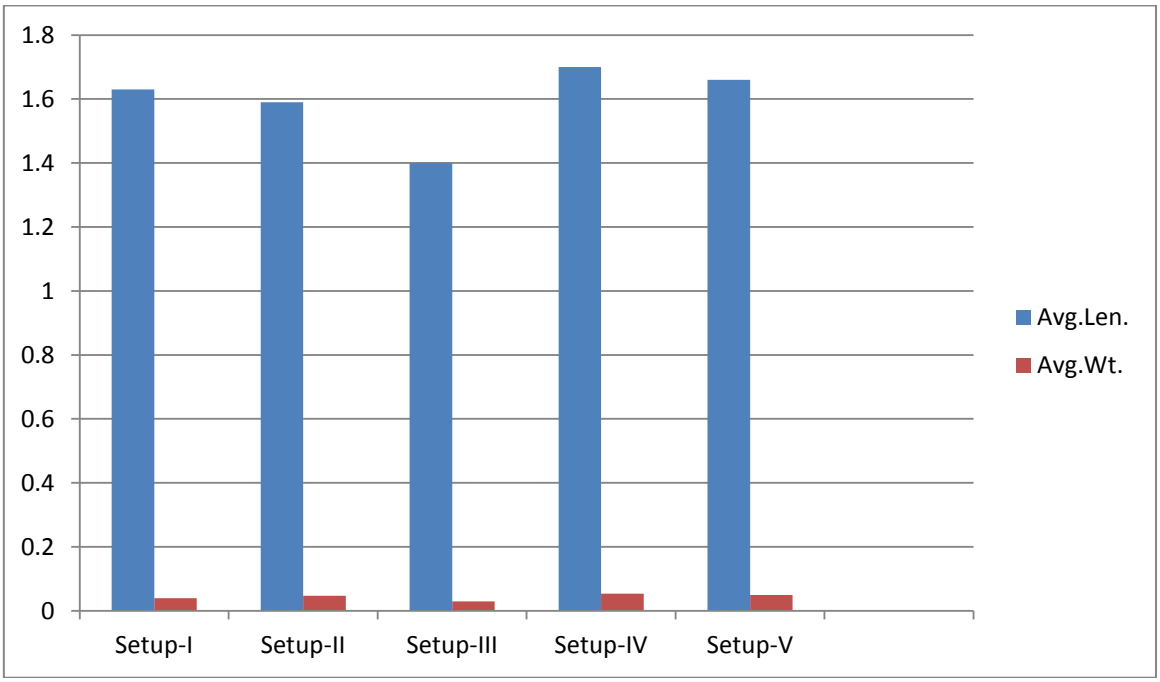


Figure-2 Growth Performance of Swordtail(youngones) in different setups during first month

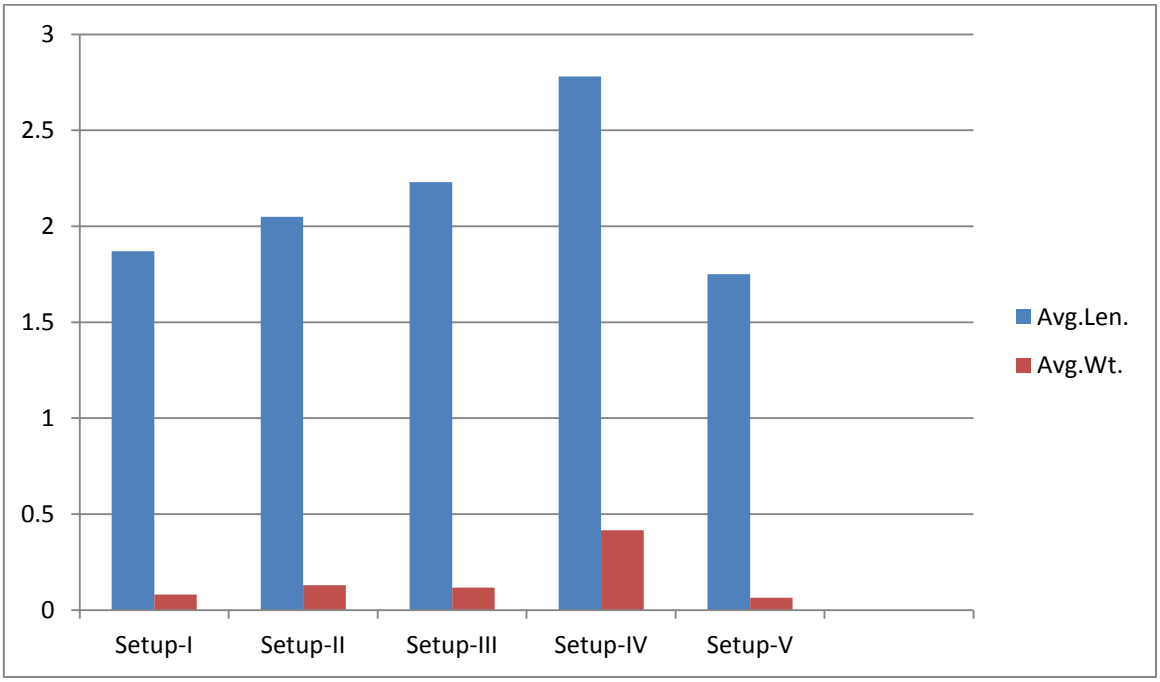


Figure-3 Growth Performance of Swordtail (youngones) in different setups during second months

IV. DISCUSSION

Nowadays, aquarium fish has become a popular hobby and aquarium fish selling a popular trade. Major shares of country's ornamental fish export are captive collection from N-E states, which contributes about 85% of total aquarium fish trade of India. Livebearer Ornamental fishes such as guppy, molly, platy and swordtail are exotic one, which dominate Indian market. The present study is going to help research scholar, unemployed youth and women self help group in making an idea about average mean length and average mean weight of swordtails during 60 days of rearing using dried pelleted and freeze dried live feed.

During first month, effect of photoperiods observed on growth performance of swordtail and maximum average mean length was found to be 1.7±0.17 (Setup-IV) and minimum to be 1.4±0.28(Setup-III) ,where as maximum average mean weight was found to be 0.054± 0.024 (Setup-IV) and minimum to be 0.03 ±0.02 (Setup-III). Maximum survival rate found to be (100%) in setup-I and then to be (90%) in all setups-II to V. Colour change not observed much during this

period. At end of first month , sex identification were done and it was observed that the number of undifferentiated sex were zero as mentioned in Table-2 and Figure-2.

During second month, maximum average length was found to be 2.7±8 0.34 (Setup-IV) and minimum to be 1.75±0.13 (Setup-V) where as maximum average weight was found to be 0.416 ± 0.459 (Setup-IV) and minimum to be 0.065±0.0145 (Setup –V) . Colour change were observed maximum in Setups III and IV and minimum in Setups- I and V. Maximum specific growth rate % was found in set up-IV (1.20667) and minimum in set up-V (0.05), while on other hand, maximum percent weight gain % was found in Set up-III (0.161667) and minimum in Set up-V (0.025) as mentioned in Table-3 and Figure-3.

The above findings justified to some extent by work of Galileu Crovatto Veras et al. (2013) ,they did work to evaluate the effect of photoperiod on locomotor activity, growth and gonadal development in Nile tilapia (*Oreochromis niloticus)* fingerlings and found that highest level of growth performance showed by fishes those subjected to photoperiods (12L:12 D, 18L:06 D and 24L:00D) and lowest to (06 L:18 D and 00L:24D).

As during second month ,we had observed maximum growth performance in Setup-IV, where photoperiod (22L:02D) and lowest to (00L:24 D).While during first month, result variations found in lowest level which should be in Setups-I and V, where photoperiods(13L:11D and 00L:24D) but instead of this result, it was observed in Setup-III, where photoperiod (19L:05D).

Hence , the present study is going to boost up knowledge of any beginner's ,entrepreneurs and women self help groups to use photoperiods (22L:02D) for best growth performance of live bearer swordtail(youngones) and to avoid photoperiods(00L:24D and 19L:05D) as in it least performance were found, and which further helped them in rearing and culturing of live bearer ornamental fishes. Thus, they can impart their significant role in country's National income, progress and development as well can uplift their social status.

V. CONCLUSION

Through present study, it is concluded that photoperiods showed an immense impact on growth, weight, survival and on body colour change of Swordtail (youngones).Photoperiod (22L:02D) is best for growth performance ,while on other hand photoperiods (00L:24D and 19L:05D) showed lowest performance.

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