Scholars Academic Journal of Biosciences (SAJB) **ISSN 2321-6883 (Online)**
Sch. Acad. J. Biosci., 2013; 1(7):374-376 **ISSN 2347-9515 (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com **DOI:** 10.36347/sajb.2013.v01i07.005

Research Article

Effect of pH on growth performance and survival rate of Grass Carp

[1]C.B.Tiwary, [2] V. S. Pandey, [2]Fajle Ali, [2]Satanjay Kumar
[1] Department of Zoology, SMD College, MN Jalalpur, Gopalganj-841503 (Bihar)
[2] Research Scholar, Dept. of Zoology, J. P. University, Chapra-841413(Bihar)

***Corresponding author**
C.B.Tiwary
Email: tiwary_cb@rediffmail.com

Abstract: Grass Carp fingerlings averaging 19.0 ±1.0 g in weight were stocked for 60 days at different PH levels. The experimented Carp were fed with diet containing 26.58% crude protein. The total water was changed twice daily. Growth and survival of common carp was recorded at 15 days interval. Results showed that growth performance was significantly decreased at PH 6 and 9, while the difference between PH 7 and 8 were not significant (P>= 0.05). No mortality occurred during the experiment. Feed conversion ratio (FCR) increased at PH 6 and 9, since at the PH 6 value was significantly higher than PH 9. It was concluded that water PH 7-8 could be more suitable to Grass carp culture for optimum growth performance and survival rate.
Keywords: Grass Carp, P^H, performance, survival rate

INTRODUCTION

The fish is principal source of animal protein and more than half of world's population depends on it. Grass carp is an important food fish in many tropical areas of Africa, America and Asia. Grass Carps are considered suitable for culture, because of their high tolerance to pollutants, their relatively fast growth and the ease of breeding, good utilization of artificial diets, resistance to disease, excellent quality of flesh and finely appetizing fish to consumer[1].

De croux *et al*. [2] showed the acute lethal effects of elevated P^H on *C. macropomum* juveniles. They revealed no mortality at P^H 6 (control) and 7 but it was 10-20% at P^H 8 and 100% at P^H 9. Therefore, the present study was planned to investigate the effect of different P^H levels on growth performance and survival of Grass Carp fingerlings.

MATERIALS AND METHODS

The study was carried out at Zoology lab of SMD College MN Jalalpur in order to evaluate the effect of P^H levels on growth performance and survival rate of Grass Carp.

The fish were stocked at four different p^H levels (6, 7, 8, 9) with three replicates for each treatment. The sodium hydroxide (NaOH) solution was added gradually into the water to obtain PH values of 8 and 9, while HCL was used for p^H 6 and 7. Grass Carp were stocked for 60 days with 14 fish per aquarium.

Grass Carp fingerlings with mean average weight of 19.0± 1.0 g and 10.0 ± 0.30 cm length were obtained from college campus pond. They were fed on the standard diet for 1 week, prior to adapt them for the experimental conditions. Twelve glass aquaria (40x70x60 cm) with 60 litre water capacity were used for rearing the fingerlings. Commercial diet containing 26.58% crude protein was stored in a refrigerator (4^0C) during the experimental period to avoid the nutrient deterioration.

The daily feeding rate was 3% of the total stocking biomass. The feed quantity was readjusted at the beginning of each next two weeks, according to the actual body weight of the fish in each aquarium. Grass Carp fish were fed the experimental diet three times daily. Feeding rates were assigned to a particular range of net height according to NRC [4].

The growth performance was evaluated as:

Body weight gain (BWG) = (W_1-W_0)

Average daily body weight gain (ADG) expressed as:

Weight gained fish/day = (W_1-W_0)/t

Specific growth rate (% day):

SGR= (ln W_1 – ln W_0) x 100/t

Feed conversion rate (FCR) =D. f. / (W_1-W_0) according to De-Silva *et al*. [5].

Survival rate (%): SR = N_i x 100/N_0 according to RM Harrell *et al*. [12]

Where W_1 = Final wet weight (g); W_0= Initial wet weight (g); t = time interval (days); N_i = Number of fishes at the end; N_0 = Number of initial stocked fishes; D. f. = Dry feed intake (g).

The obtained data were analysed by one-way ANOVA procedure of statistical Analysis system, means were compared by Duncan's new multiple range test. [6].

RESULTS AND DISCUSSION

Mean Individual Body weights:

The initial average weight of fingerlings at the start of experiment was 19± 1.0 g for all p^H levels. The final average body weight after 60 days of stocking showed great difference for pH levels. The level of p^H 7 showed the highest body weight (36.1 g) followed by p^H 8 (35.1 g), then p^H 9 (30.8 g) and finally p^H 6 (23.3 g). This is in agreement with the study of Saber *et al*. [7], Alte *et al*.[8] and Xu *et al*. [3]. Also, Saha *et al*. [9] found that ammonia excretion increased with increasing pH (alkalinity), while growth decreased. It was due to a decrease in feed consumption is also consistent with present finding. The difference among the mean weight of Grass Carp obtained from 6,8 and 9 p^H levels were significant (p=0.05), but it was not significant (p=0.05) between p^H 7 and 8.

Mean Body weight Gain:

The average of body weight gains were 0.5, 3.0, 2.8 and 2.0 g $fish^{-1}$ in the first 15 days and then gradually reaching 1.8, 5.8, 5.4 and 4.1 g $fish^{-1}$ at the 60 days for 6, 7, 8 and 9 p^H levels respectively. The data also indicated that the mean weight gain decreased with increasing p^H; whereas, it decreased also at p^H 6. These results supported Saber *et al*. [7] and Scott *et al*. [10]. The decrease in growth at p^H 6 was attributed to a decrease in feed consumption. There were significant differences (p=0.05) among 6, 8 and 9 p^H levels, but no significant difference (p=0.05) was found between p^H 7 and 8.

Average daily body weight gain (ADG):

The averages of body weight gain carp/day were 0.03, 0.2, 0.19 and 0.13 g for groups exposed to 6, 7, 8 and 9 p^H levels respectively during the first 15 days. The average daily body weight gain of Grass carp gradually reached its maximum of 0.12, 0.39, 0.36 and 0.27 g at the end of experimental period at different p^H levels respectively. The gain of body weight in fish / day decreased as the p^H value increased and the best body weight gains were achieved at p^H 7 and 8, respectively. Similar results were obtained by Scott *et al*. [10] and Xu *et al*. [3]. But, this finding is in contrast with study of Robert and William [11] as increased ammonia excretion at p^H 6, whereas decreased with increased pH for channel cat fish. There were significant difference ($p \leq 0.05$) among the average daily body weight gains of Grass carp at the different P^H values; while the difference was not significant ($p \geq 0.05$) between p^H 7 and 8.

Average feed consumption:

Average feed consumption at p^H 6, 7, 8 and 9 were 8.7, 9.9, 9.8 and 9.4 g, respectively during the first 15 days of the rearing. Thereafter, average feed consumption gradually reached 10.4, 16.2, 15.7 and 13.8 g for the exposed groups to p^H 6, 7, 8 and p^H 9 respectively. It can be stated that the average feed consumption reached its maximum value at p^H 7 and p^H 8. This result is consistent with Saber *et al*. [7], who obtained best feed consumption at pH 7.2-7.9. It could be concluded that the average feed intake of Grass Carp varied by varying p^H levels. The result also indicated that the average feed consumption decreased as the p^H level increased. Moreover, low feed consumption at p^H 6 may be attributed to the fish ability to less feed intake. The difference among p^H levels 6, 8 and 9 were significant (p=0.05), but the difference between p^H 7 and 8 was not significant (p=0.05). This was in agreement with Saber *et al*. [7].

Specific Growth Rate (SGR):

The SGR values of Grass Carp in all treatments were initially low and then gradually increase throughout the experiment period of 60 days. The SGR of Grass Carp was also influenced by varying treatments and the size of fish. The results showed that the SGR values of Grass Crap at the end of experimental period were increased by 0.53, 1.16, 1.11 and 0.95% for the groups under pH 6, 7, 8 and 9 respectively. The difference among p^H levels (6, 7, 8 and 9) for the SGR of Grass Carp were significant ($p \leq 0.05$); whereas, it was not significant ($p \geq 0.05$) between p^H 7 and 8. These results supported Saber *et al*. [7] who reported that the best SGR were at p^H 7 and 8 with no significant difference ($p \geq 0.05$) between them.

Feed Conversion Ratio (FCR):

The feed conversion ratios recorded at the end of experiment were 5.7, 2.7, 2.9 and 3.3 at p^H levels 6, 7, 8 and 9 respectively. The mean feed conversion ratio of Grass Carp increased as p^H levels differ than the p^H 7. This may be due to decrease in feed consumption at low p^H, since the FCR achieved at p^H 9 was significantly higher ($p \leq 0.05$) than that achieved in p^H 7 and 8 being 3.3, 2.7 and 2.9 respectively as reported by Scott *et al*. 10].

CONCLUSION

It could be concluded that Grass Carp fingerlings with average initial weight of 19.0±1.0 g, were more suitable to culture at water pH level 7-8 for optimum growth performance and survival rate than other conditions. Therefore, it can be recommended to be carried out under similar experimental conditions.

REFERENCES

1. Corpei A.; Product profile common carp, Expansion of Ecuador's Export Commodities, CBI Project, 2001.
2. De Croux P., Julieta M and A. Loteste A; Lethal effects of elevated pH and ammonia on juveniles of neotropical fish *Colosoma macropomum* (Pisces: Caracidae). J. Environ.

Biol, 2004; 25: 7-10.

3. Xu J.Y., Miao XW, Lu Y and Cui S; Behavioural response of Common Carp (*Cyprinus carpio*) to acute ammonia stress monitored by Computer vision. J. Zhejiang University Biol. Sci., 2005; 6: 812-816.
4. National Research council; Nutrient Requirements of Fish, National Academy Press, D. C. Washington, 1993.
5. De-Silva, SS and Anderson TV; Fish Nutrition in Aquaculture, St. Edmundsbuzy Press, Subfolk, UK, 1995.
6. Zar JH; Biostatistical Analysis. Prentice Hall, New Jersey, 1996.
7. Saber A., Shafai EL, Fatma A, Gohary EL, Fayza AN, Peter Van Der Steen N and. Huub JG; Chronic Ammonia toxicity to duckweed fed common carp (*Cyprinus carpio*). Aquaculture, 2004; 232: 117-127.
8. Atle, F, Kavuopio SI, Sacther BS and Evensen TH; Effect of chronic ammonia exposure on growth in juvenile Atlantic cod. Aquaculture, 2004; 237: 179-189.
9. Saha N, Kharbuli ZY, Bhattacharjee A, Goswami C and Haussinger D; Effect of alkalinity (pH=10) on urecogenesis in the air-breathing walking catfish, *Clarias batrachus*. Comp. Bioche. Physiol., 2002; 132:353-364.
10. Scott DM, M. Clucas M and Wilson RW; The effect of high pH on hydrogen ion balance, nitrogen excretion and behaviour in freshwater fish from a eutrophic lake: a laboratory and field study. Aquaculture Toxicology, 2005; 73: 31-43.
11. Robert VT, Rosemarie CR, Robert JL, Charlie ES, Elizabeth LM, Charles C, Kenneth CW and Brown CJD; Chronic Toxicity of Ammonia to Rainbow Trout. American fish Soc., 1984; 113: 56-73.
12. Harrell RM, Kerby JH, Minton RV (editors). . Culture and Propagation of Striped Bass and its Hybrids. Striped Bass Committee, Southern Division, American Fisheries Society, Bethesda, MD. 1990.