

The Effect of Potassium Fortification of Culture Water on Survival of Pangasianodon Hypophthalmus Reared in Inland Ground Saline Water

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ABSTRACT

The present study was performed to evaluate the survival performance of Pangasianodon hypophthalmus in inland saline water. P. hypophthalmus (0.41±0.03g) for 60 days. The experimental design consisted of freshwater as the control and inland ground saline water fortified with KCl at 100% to that of equivalent salinity sea water (K - Equivalence) at salinities 5, 10, 15, 20, 25 as the treatments KT1, KT2, KT3, KT4 and KT5 respectively (with Potassium Fortification) and without Potassium fortification as treatment groups T1, T2, T3, T4 and T5 respectively. However, growth retardation has been encountered with the increasing salinity in the experimental treatments. The results indicate that P. hypophthalmus can tolerate the salinities up to 15 ppt in inland saline water where as 100% mortality was observed in treatments (20 ppt) and (25 ppt) after 48 hours and 18 hours, respectively in (with Potassium Fortification and without Potassium fortification) both the tanks. Though P. hypophthalmus survived up to 15 ppt but the optimum salinity for culture is 10 ppt in inland saline water. The results obtained from the experiment clearly indicate that potassium amendment do not have much influence on the survival of P. hypophthalmus, at any of the tested salinities in inland saline water.

Keywords: Inland saline water, Potassium Fortification, Survival

INTRODUCTION

The aquaculture sector is now accepted as the sunshine sector in Indian agriculture. It encourages growth of a number of subordinate industries and is the source of food and livelihood for a large section of fishermen of the country, especially economically backward population. These sectors support the two nutritional security of the country by adequate protein food supply and creating suitable employment opportunities. Increasing inland salinity due to human interference has major economic, environmental and social consequences to the numerous rural communities. Secondary salinization affects over 380 million hectares of land in worldwide over 20 countries [7]. Countries including Australia, India, China, Israel and USA have demonstrated to utilization their saline-affected resources for aquaculture. Although the ionic composition of saline groundwater is differ from the seawater, and the ionic composition varies according to different regions. The ionic composition of groundwater is varies

according to the interactions between soil surface, mineral composition of ground rocks etc. However, inland saline water is always deficient of potassium in worldwide, compared to equivalent salinity of seawater.

River catfish (*P. hypophthalmus*), belong to the family Siluridae (Pangasidae). According to [10], the origin of *P. hypophthalmus* was from the Mekong river of Vietnam; subsequently, it was spread over other countries such as Malaysia, Indonesia and China. According to [1] *Pangasius* sp. is highly tolerant to salinity, pH, dissolved oxygen, temperature, and even pollution. Owing to its cheaper market price, *P. hypophthalmus* is well accepted by a wide range of people and therefore, it has been a good source of protein for poor, medium and better-off people in rural as well as urban areas. It is now considered as the 3rd most important freshwater fish group within the aquaculture sector.

Pangasius is cultured in several countries like Thailand, Laos, Myanmar, Indonesia, Bangladesh and India. While it is not a native to the country, *Pangasius* is considered as low risk aquaculture species since it cannot reproduce naturally. *Pangasius* (*P. hypophthalmus*) is a good candidate species for inland aquaculture, owing to its rapid growth rate, the capacity to withstand high rates of stocking, disease resistance, salinity tolerance and ease in the acceptance of artificial feed, less spines, and its good demand in domestic and international markets.

MATERIALS AND METHODS

The experiment was conducted in the catfish research unit located at CIFE centre, Rohtak, Haryana, India. Fishes (0.40 ± 0.04 gm) were procured from a private fish hatchery located in Kolkata (West Bengal, India). The fish were transported in 20 L Polyethylene packing with sufficient oxygen (1000 fish in each pack) and fishes were acclimatized at wet laboratory for 15 days in a circular tank (1000L) after giving a mild salt treatment. The fishes were stocked into the experimental units (N=15) with one control and five treatments in triplicate. The experimental design consisted of freshwater as the control and inland ground saline water fortified with KCl at 100% to that of equivalent salinity sea water (K - Equivalence) at salinities 5ppt, 10ppt, 15ppt, 20ppt, 25ppt as the treatments KT1, KT2, KT3, KT4 and KT5 respectively (with Potassium Fortification) and without Potassium fortification as treatment groups T1, T2, T3, T4 and T5 respectively. Inland saline water used in the experiment, have been obtained from various bore wells located in the high saline and low saline zones of the CIFE Rohtak Centre. The saline water of salinities 20 and 25 ppt have been prepared by evaporating previously obtained 15 ppt water for 4 and 6 days respectively for the experiment. The experimental animals were acclimatized to different salinities for around 20 days. The salinity of each experimental unit was increased by 1 ppt every 18 hrs until each treatment has reached around 5ppt, after that salinity was increased by 1ppt at 24 hrs interval. Although the ionic composition of saline groundwater generally reflects that of seawater, the exact composition varies both locally and regionally. The survival was assessed as a percentage of number of fishes harvested upon the number of fishes stocked. The statistical analysis was conducted using the statistical package SPSS version 16.0A. Means were separated at a significance level of $P < 0.05$. Comparison of difference in means among treatments was carried out using Duncan's multiple range test.

RESULTS AND DISCUSSIONS

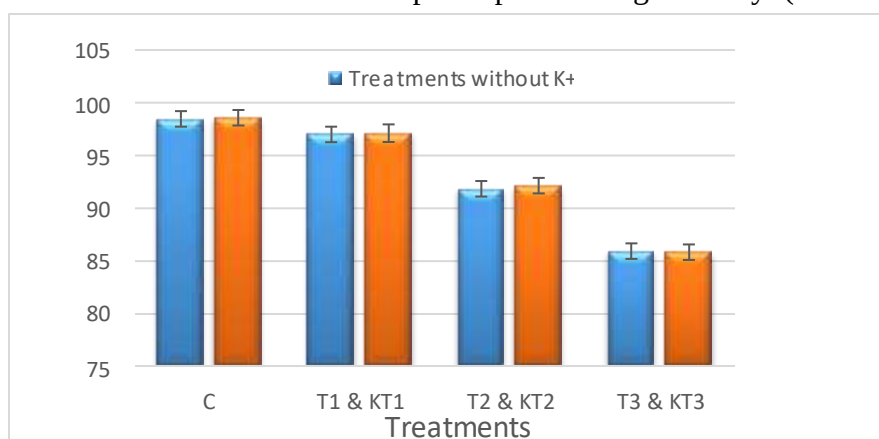
The survival (%) recorded at the end of the experiment is highest in the control group (98.52 ± 0.74) and lowest in T3 (85.92 ± 0.74) at 15 ppt. A variety of aquatic crustaceans and finfish have been reared in

inland saline water around the world [3,6,11] with potassium fortification. Since inland saline water is deficient in potassium relative to equivalent salinity seawater invariably so throughout the world. Hence in the present study a separate set of experiments have been conducted to find out the effect of potassium fortification on the survival and growth of *P. hypophthalmus* reared in inland saline water. The results obtained from this experiment clearly indicate that potassium amendment do not have any effect on the survival of *P. hypophthalmus*. Even though, 100% mortality was recorded at T4 (100% K⁺) and T5(100% K⁺) with potassium amendment and T4 and T5 without potassium amendment. Thus it indicates that there was no effect of K⁺ on survival of fish in inland saline water (Table.1, Fig.1).

These outcomes strongly favored previous studies those were suggested that K⁺ does not appear to be the only limiting mineral in inland low salinity groundwater that affects fish osmoregulation [9] This was reported in few freshwater teleost species such as silver perch and rainbow trout demonstrated good survival and growth in unmitigated inland saline water. The results obtained from the present study clearly indicate that *P. hypophthalmus* can tolerate the salinities up to 15 ppt in inland saline water, where as 100% mortality have been observed at T4 (20 ppt) and T5 (25 ppt) in 48 hours and 18 hours, respectively. There was no significant difference in the survival rate of the control and T1 groups. Even though there is significant difference in the survival rate, between Control (C), T1, T2 and T3 groups, the animals can show a reasonably good survival upto T3 (15ppt) (Table.1, Fig.1). This is an indication that the fish were perfectly able to regulate their body physiology up to 15 ppt. 100% mortality recorded at T4(20 ppt) and T5 (25ppt) in both the groups, indicates that the fish could not survive due to osmoregulatory failure. According to [2] the mortality observed in the fish when exposed to the higher salinities, could be consequence of the progressive deterioration in the osmotic and ionic regulatory mechanisms including the fish inability to control the excessive water loss, leading to osmoregulatory exhaustion, collapse and finally led to death.

Treatments	Survival % (Mean ± SE)	Treatments	Survival % (Mean ± SE)
Control (C)	98.52 ^a ± 0.74	Control (C)	98.63 ^a ± 0.74
T ₁	97.04 ^a ± 0.74	KT ₁ (100% K ⁺)	97.16 ^a ± 0.84
T ₂	91.86 ^a ± 0.74	KT ₂ (100% K ⁺)	92.16 ^a ± 0.74
T ₃	85.92 ^b ± 0.74	KT ₃ (100% K ⁺)	85.82 ^b ± 0.74

Mean values in the same column with different superscript differ significantly (P<0.05)



CONCLUSION

The result obtained in the present study reveals that the *P. hypophthalmus* can tolerate salinities up to 15 ppt in inland saline water where as 100% mortality in (20 ppt) and (25 ppt) after 48 hours and 18 hours, respectively in (with Potassium Fortification and without Potassium fortification) shows that *P. hypophthalmus* survived up to 15 ppt but the optimum salinity for culture is 10 ppt in inland saline water. The results obtained from the experiment clearly indicate that potassium amendment do not have much influence on the survival of *P. hypophthalmus*, at any of the tested salinities in inland saline water.

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