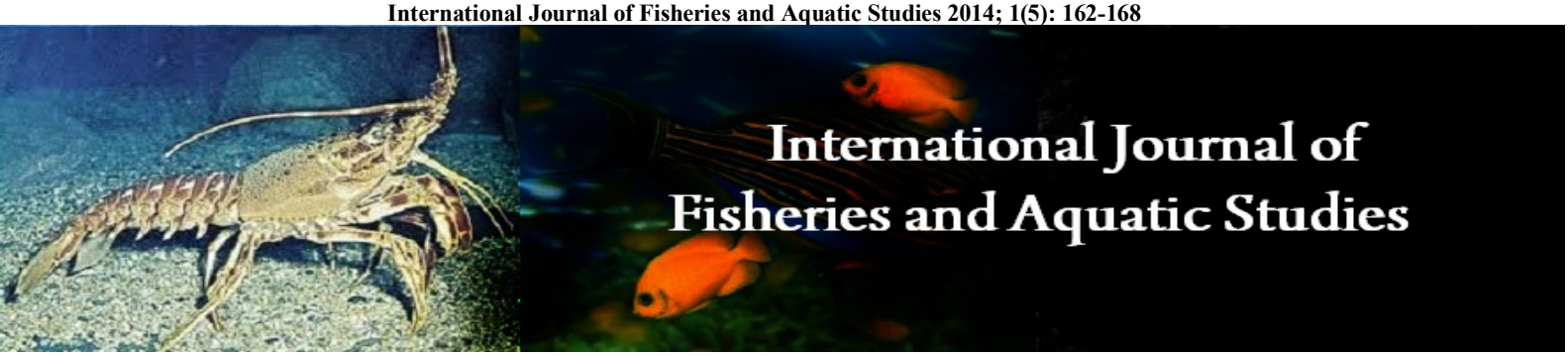

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Asian catfish fry (*Clarias batrachus*) rearing with wheatgrass powder mixed formulated feed in plastic half drum

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ABSTRACT
Wheatgrass is highly nutritive and a source of vitamins, minerals, protein, lipid, enzymes and antioxidant. Therefore, an experiment carried out with formulating diet using wheatgrass powder (*Triticum aestivum*) to compare the growth performances of Asian catfish magur fry (*Clarias batrachus*) with commercial pellet feed for a period of 113 days from 12th September 2012 to 19th January 2013 in the Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. In the experiment, there were two treatments T_1 and T_2 and each treatment carried out with two replicates. An average initial length and weight of magur fry was 6.03 (±0.64) and 5.68 (±0.48) cm and 2.09 (±0.56) and 1.75 (±0.41) g in T_1 and T_2 respectively. After 113 days of rearing the mean length gain of magur fry was 1.31 and 1.93 cm, mean weight gain 1.02 and 2.61 g, percent weight gain 48.68 and 149.31, SGR 0.298 and 0.808, FCE 0.01 and 0.04, survival rate 83.33 and 36.67% and fish production 382.11 and 222.08 kg/ha in T_1 and T_2 respectively. The production and survival rate was significantly higher in the treatment T_1. However, FCR was very high in the experiment. The present study suggests that along with the vitamins, minerals and protein the wheatgrass powder has some special properties which protected the fry from cold shock and death. Further in depth study need to be carried out to verify the result.

Keywords: Asian catfish, wheatgrass, growth performance and survival rate.

1. Introduction
Bangladesh is one of the fifteen leading aquaculture producing countries in the World, achieving the rank of 6th position [3]. Aquaculture contributed about 46.62% of the total fish production of the country during 2009-10 [3]. Fish is especially important in the developing world, often referred to as "rich food for poor people." Fish provides essential nourishment, especially quality proteins, fats, vitamins and minerals. For those involved in fisheries, aquaculture and fish trade, fish are a source of income [7].
Among the freshwater fishes, catfish is one of the important groups in our country and is getting increasingly popular showing a promising future for commercial culture [1]. *Clarias* fry required very shallow water (2 to 3 ft), because in deeper water they could not swim to surface for gulping air and hence died [10]. As compared to the larvae, the fry also requires more precise and careful nursing to ensure their survival and growth. It is believed that lack of appropriate diet is the main cause of fry mortality during nursing [5]. Magur fry preferred live feed during the early stage of life history [4,12]. Rearing of magur fry with *Tubifex sp* has been reported [6]. Now-a-days wheatgrass powder is used as animal food as well as a nutrient supplement for human throughout the world. It is generally rich in essential nutrients such as protein, lipids, vitamins and minerals. Hence, if wheatgrass powder is used as feed ingredients for rearing of magur fry, the results may give better growth and survival rate. For this reason, wheatgrass powder used as feed ingredients in this experiment to observe its effect on growth and survival rate of magur fry in confinement.

2. Materials and Methods
2.1 Site and duration of experiment
The experiment was carried out in the Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. The study conducted for a period of 4 months from 12th September 2012 to 19th January 2013.

2.2 Magur fry collection and acclimatization
The Asian catfish fry was collected from the Sharnolota Agro Fisheries, Fulbaria, Mymensingh with oxygenated poly bag and gunny bags. During the period of acclimatization, adequate oxygen supply was ensured and fish were fed finely ground compound pellet feed containing 35% protein twice daily at 9 am and 5 pm.

2.3 Experimental design
The experiment started on 29th September 2012. Four plastic half drum of 90 L capacity containing 70 L water was used as experimental tanks. In this experiment there were two treatments T_1, T_2 and each treatment conducted with two replications R_1, R_2. For convenience the tanks were numbered as T_1R_1, T_1R_2, T_2R_1, T_2, R_2, and allocated randomly. The fry of *C. batrachus* released at a rate of 15 fish per tank. The fish were fed with formulating diet using wheatgrass powder and commercial diet as control. The uneaten feed and faces removed twice daily through siphoning.

2.4 Preparation of wheatgrass powder
For production of wheatgrass, at first ½ kg wheat seed were taken. Then it was washed properly and soaked with water for overnight. One pinch of salt was added to the water to have better germination. Then it was kept in water for 12 hours. In the following morning the wheat was sieved and kept in a cotton bag for 24 hours. After that a layer of soil was taken into a perforated plastic tray and the wheat seed spread over it. Then watered over the tray and covered it for 3-4 days, during these the trays watered once to twice to maintain good moist condition in the tray. When the seedlings become one to two inches in 3-4 days the uncovered and keep spraying water over it for twice daily. After 8-9 days the wheatgrass become dark green and 6-8 inches long and cut the stem and make a powder with a blender after drying in micro oven and used in the fish feed. The fish feed composition and preparation is shown in the Table 1.

Table 1: Composition of feed ingredients used in the experimental fish's diet.

Name of ingredients	Amount in %	Total quantity (g)
Fish meal	15	105
Wheatgrass powder	10	70
Mustard oil cake	15	105
Rice bran	25	175
Maize powder	15	105
Wheat bran	10	70
Atta	5	35
Molasses	4	28
Vitamin premix	1	7
Total	**100**	**700**

2.5 Feed preparation
The ingredients were mixed well and water was added to make the mixture moisten. This resultant dough was then passed through a 1.0 mm mesh size hand pelleting machine. The resultant pellets were then sun dried. The feed then stored in airtight plastic bags in the fridge and used during feeding the fry. The proximate composition of the formulated feed shown in the Table 2.

Table 2: Proximate composition of prepared feed.

Moisture (%)	Lipid (%)	Protein (%)	Ash (%)	Crude fiber (%)	Nitrogen free extract (NFE) (%)
14.99	8.40	16.63*	11.59	6.65	41.74

*It was assumed that the protein content of fish meal is 56% but actually it was less than expected
NFE= Nitrogen free extract calculated as =100%- (Moisture + Protein + Lipid + Ash + Crude fiber)

2.6 Feeding rate and methods
Fish were fed experimental diets twice daily in the morning at 9 am and afternoon at 5 pm. Fishes in the tank were fed experimental diets at the rate of 10% of their body weight and checked regularly whether the feed was consumed or not.

2.7 Fish and water quality sampling
Fish and water quality parameters were sampled every 15 days interval. The fish was caught by the hand held scoop net. Ten fishes were caught randomly from each tank and length and weight of the individual fish were measured carefully using a scale and electric balance.

2.8 Growth parameters
The following parameters were used to evaluate the growth performances of magur fry:

Length gain: Length gain (cm) = mean the final length (cm) – mean initial length (cm)

Weight gain: Weight gain (g) = mean final weight (g) - mean initial weight (g)

Percent weight gain: $= \frac{\text{Mean final weight} - \text{Mean initial weight}}{\text{Mean initial weight}} \times 100$

Specific growth rate (SGR) : $SGR(\%\text{per day}) = \frac{\text{Log}_e W_2 - \text{Log}_e W_1}{T_2 - T_1} \times 100$

Food conversion ratio (FCR): $FCR = \frac{\text{Amount of feed (kg)}}{\text{Live weight gain (kg)}}$

Food conversion efficiency (FCE): $FCE = \frac{\text{Live weight gain (kg)}}{\text{Amount of feed (kg)}}$

$\text{Survival rate}(\%) = \frac{\text{No. of fish harvested}}{\text{No. of fish stocked}} \times 100$

Fish production = No. of fish × mean increased weight

3 Results

3.1 Water quality parameter: Water quality parameters play an important role in the growth and development of aquatic organisms. All the water quality parameters were within the product range in the experiment. The following water quality parameters were observed during the study period in the present study (Table 3).

Table 3: Water quality parameters observed in treatment-1 and treatment-2.

Parameter	Treatment -1	Treatment -2	Range
Water temperature (^{0}C)	19.57(±7.89)	19.57(±7.89)	9-30
Dissolved oxygen (mg/L)	6.5(±0.35)	6.6(±0.33)	6.02-6.8
pH	7.8(±0.14)	7.8(±0.14)	7-8
NO_2 (mg/L)	0.2(±0.001)	0.2(±0.001)	0.2-0.21
NO_3 (mg/L)	0.0	0.0	0.0

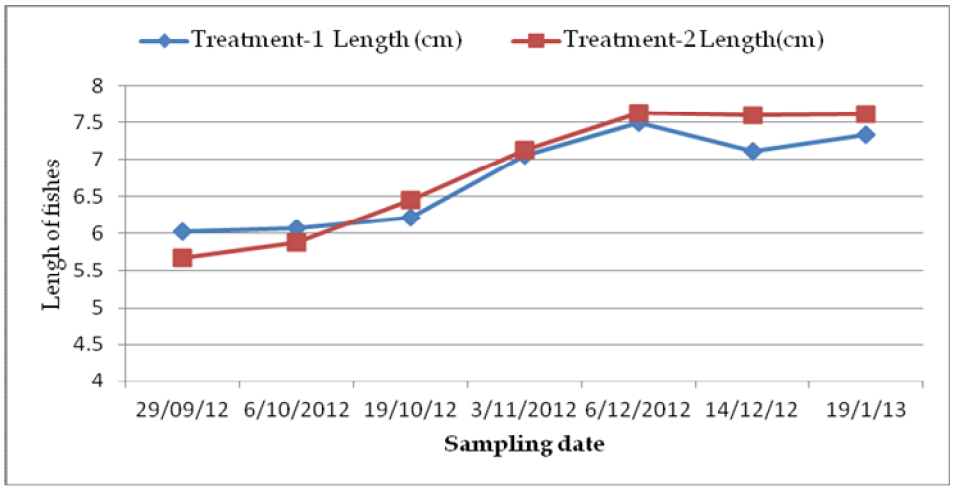

Fig 1: Increase of length of magur fry in treatment 1 and treatment 2

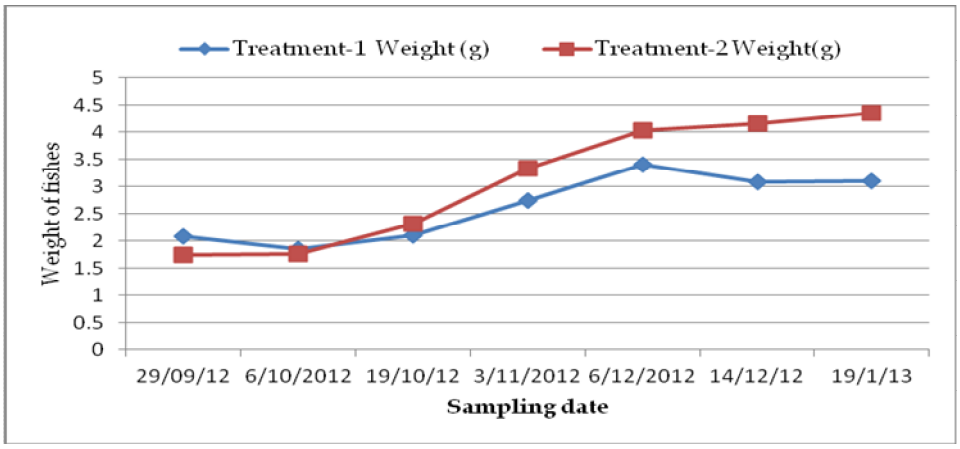

Fig 2: Increase of weight of magur fry in treatment 1 and treatment 2

3.2 Growth performances

After the end of the experiment all the fish were harvested and analyzed and the growth performances of magur fry were calculated and shows in graphically (Figure 1 and Figure 2). Initially the magur fry growth was parallel but later the fry fed commercial feed gave better growth as the protein percentage was much higher than in the experimental diet as the protein percentage was significantly higher in the commercial diet.

3.3 Length weight relationship

From the equation, we can see that for the increase of each cm of magur fry, the weight of magur increased to an average 0.944 g in treatment 1. Coefficient of Determination (R2)= 0.96 means 96% variation of the dependent variable (length) can be explained by the independent variable (weight) whereas, another 4% cannot be explained because of some experimental error. From the Figures 3 & 4, we can see that there exist a very high positive correlation (r=0.98) between the length and weight of magur fry in treatment 1.

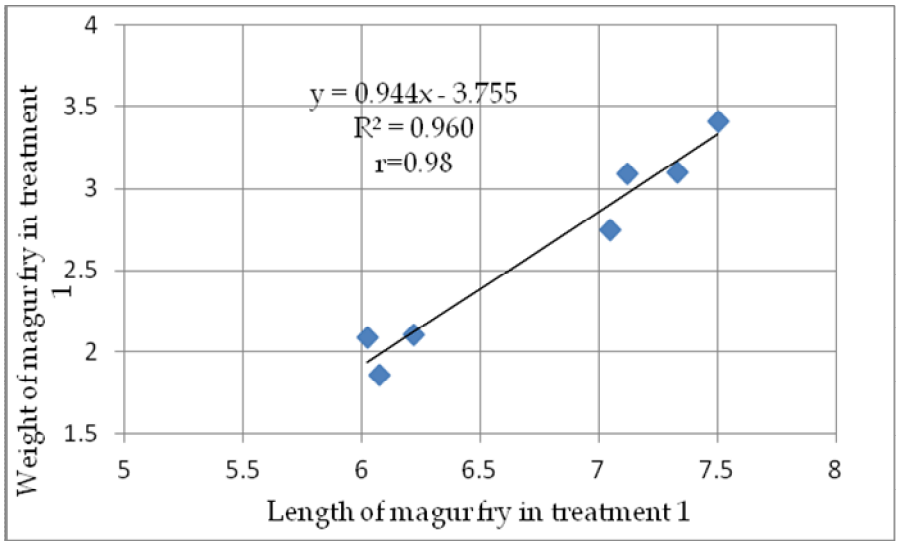

Fig 3: Length-weight relationship of magur fry feeding with wheatgrass powder mixed feed

From the length-weight relationship equation, we can see that for the increase of each cm of magur fry, the weight of magur fry increased to an average 1.331g in treatment 2. Coefficient of Determination (R^2= 0.973) means 97% variation of the dependent variable can be explained by the independent variable but another 3% cannot explain because of experimental error. From the Figure 4, we can see that there exist a very good positive correlation (r=0.99) between the length and weight of magur fry in treatment 2.

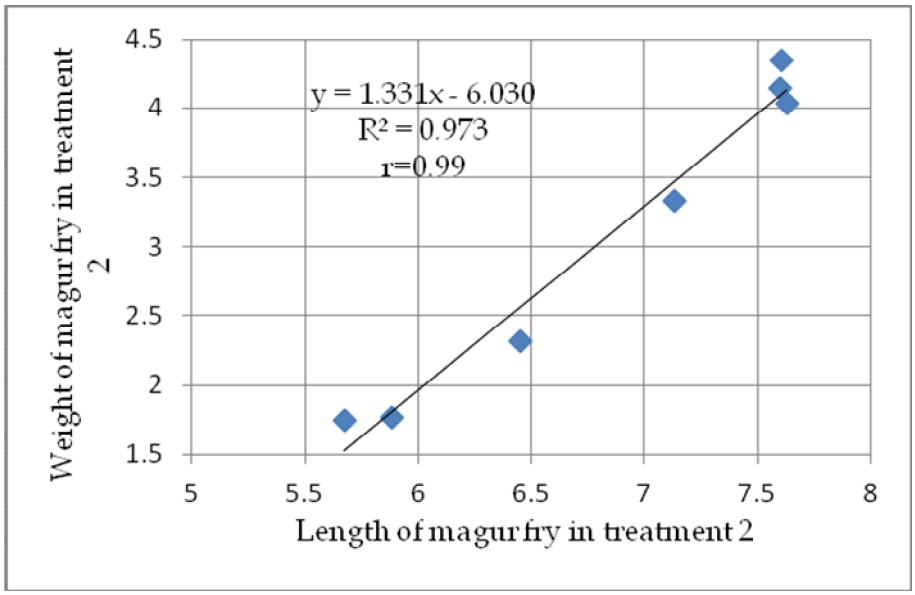

Fig 4: Length-weight relationships of magur fry feeding with commercial feed

3.4 Percent weight gain

The percent weight gain of magur fry in the present experiment was 48.68 and 149.31 in T_1 and T_2 respectively. The significantly highest percent weight gain was recorded in T_2 than the T_1 (Figure 5).

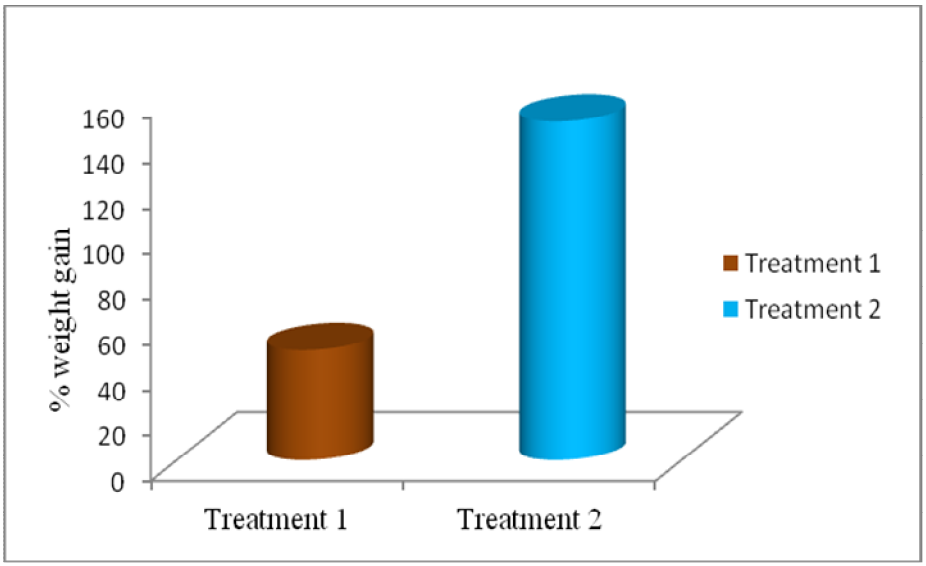

Fig 5: Percent weight gain of fishes in the treatment 1 and 2

3.5 Specific Growth Rate (SGR)

The mean specific growth rates of magur fry obtained 0.298 and 0.808 % in T_1 and T_2 respectively (Figure 6). The significantly ($P<0.05$) highest SGR value was recorded in T_2 than the T_1 treatment.

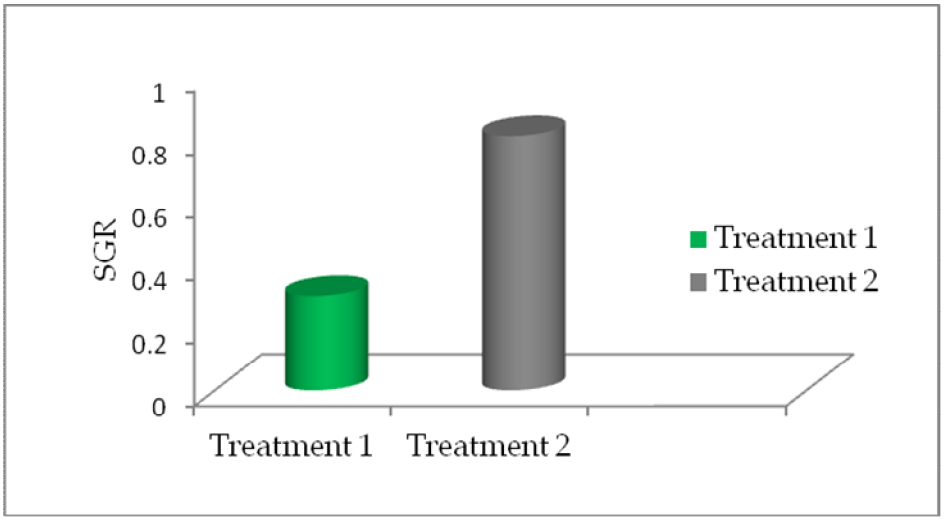

Fig 6: SGR of fishes in the treatment 1 and 2

3.6 Food Conversion Ratio (FCR)

The significantly ($P<0.05$) highest FCR values were recorded in T_1 than T_2. However, FCR was very high in both the experiment.

3.7 Food Conversion Efficiency (FCE)

The mean food conversion efficiency of magur fry in both treatments was 0.013 and 0.041 in T_1 and T_2 respectively (Figure 8). The significantly ($P<0.05$) highest FCE value was recorded in T_2 than in T_1.

3.8 Survival rate

The survival rate was 83.33 and 36.67% in T_1 and T_2 respectively (Figure 9). The highest survival rate was obtained in T_1. The lowest cold temperature in the month of December affected the magur fry in T_2 treatment than in T_1 because with vitamins, minerals and protein the wheatgrass powder has some special medicinal properties which protected the fry from the cold shock and death in the coldest month in December in 2012. On the other hand, commercial feed has lack of these vitamins, minerals and protein and other compounds that's it could not prevented of tilapia.

3.9 Fish production

The production of magur fry was 383.11 and 222.08 kg/ha/113 days in T_1 and T_2 treatmen Respectively (Figure 10). The production was significantly ($P<0.05$) higher in T_1 treatment compared to T_2.

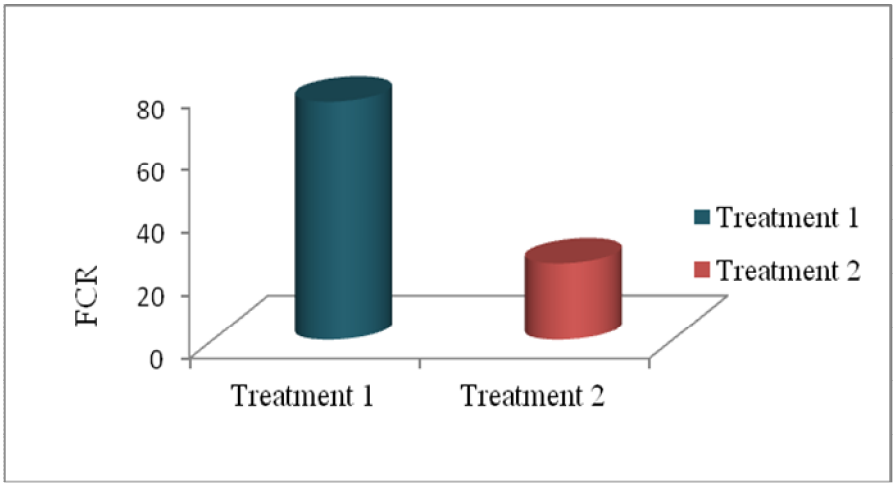

Fig 7: FCR of fishes in the treatment 1 and 2

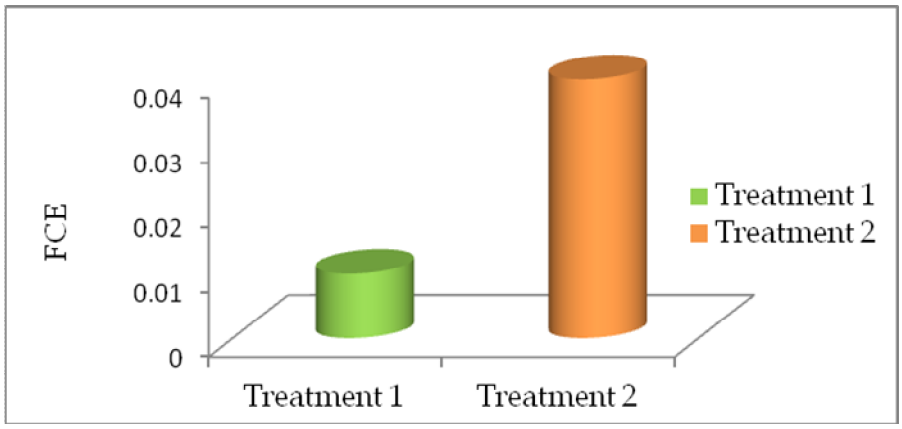

Fig 8: FCE of fishes in the treatment 1 and 2

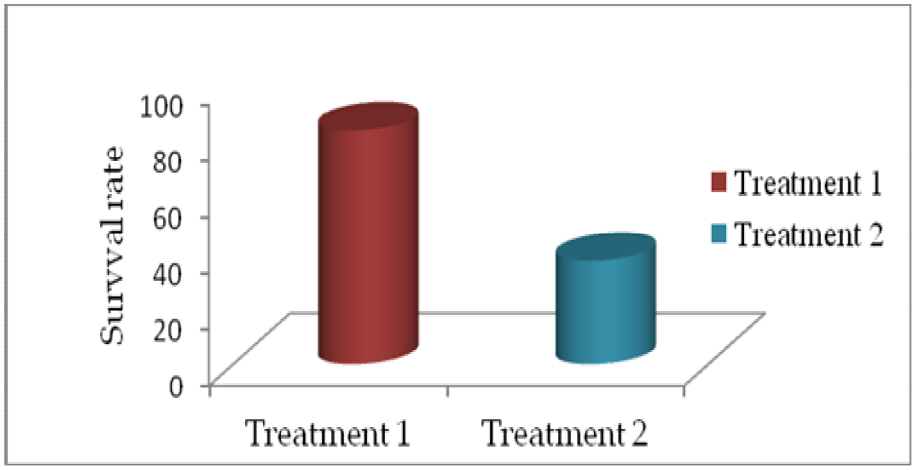

Fig 9: Survival rates of fishes in the treatment 1 and 2

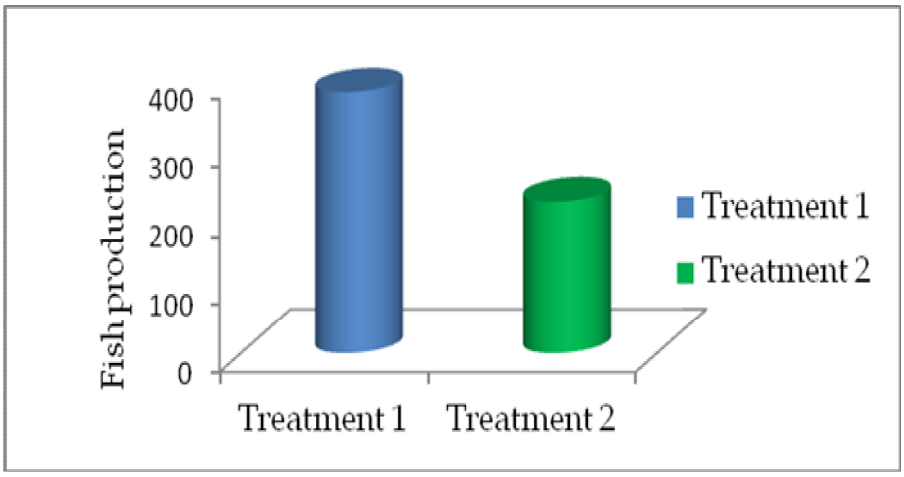

Fig 10: Production of fishes in the treatment 1 and 2

4. Discussion

4.1 Water quality parameters

The study was conducted to know the effects of wheatgrass powder mixed feed on growth and survival rate of magur fry in laboratory condition. The range of temperature recorded in T_1 and T_2 was varied from 30 to 7 ^{0}C. The mean temperature was 19.57 ^{0}C. The dissolve O_2 content was 6.5 and 6.6 ppm in T_1 and T_2 respectively. pH value of the treatment T_1 and T_2 was 7.8.The present experiment was conducted in the winter season from September to January, when the temperature was as low as 7 ^{0}C which reduces the growth of fish. O_2 content and pH value was more or less similar to the other experiments.

For this study 15 magur fry were stocked per plastic half drum and four drums were used. In the present experiment fingerlings were stocked at densities of 51fry/m^3. Catfish fingerlings were stocked at densities of 60, 70, 80, 90, 100, 110, 120, 130, 140 and 150 fish/m^3 in cage culture, which is higher than the stock of the present experiment because the experiment was in the open water in cages where water quality parameters were better than the present study. The survival rate was 83.33 and 36.67% in T_1 and T_2 treatments respectively. The highest survival rate was obtained in T_1 [9]. The Survival rate ranging from 79.53% to 91.06% in *C. batrachus* [11]. Juvenile *C. gariepinus* stocked in the earthen ponds and reported a survival rate of 88.5% which is more or less similar to the present experiment. In the month of December when the temperature was as low as 7 ^{0}C, mortality occur during replication-1 in treatment T_2.The production of fishes was 382.11 and 222.07 kg/ha/113 days. The protein percentage was higher in T_2, so the fish growth of T_2 was higher, but in the month of December when the temperature was as low as 7 ^{0}C, all fishes were dead in replication-1 in treatment T_2 [8]. The production of *C. batrachus* was 7906 kg/ha over a period of 150 days. In T_1 protein percentage was low compared the treatment T_2, so the growth was low, but in formulating feed had some special substances which increase the survival rate of fishes [2]. It helps the fish to survive in adverse environmental condition. So, wheatgrass powder can be used as a fish feed ingredient during the nursery stage for better growth and high survival rate of the fish in the future along with the higher protein percentage.

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