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Growth performance of Jayanti rohu with three species combination viz., *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala* at different stocking densities

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Abstract
The present study was conducted to compare the growth performance of 9th generation Jayanti rohu with non-Jayanti rohu cultured together with *Catla catla* and *Cirrhinus mrigala* at different stocking densities for 90 days The experiment was carried out in homogenous rectangular cement cisterns in the wet laboratory of College of Fisheries, Assam Agricultural University, Raha. Four treatments with three replicates *viz*. Treatment-I, Treatment-II, Treatment-III and Treatment Control (reference treatment) were taken. Ten numbers of fishes were stocked in each cistern. Jayanti rohu was stocked at the rate of 35%, 40%, 45% and 0% in the treatments respectively. Non-Jayanti rohu was stocked at the rate of 40% in Control treatment The study revealed the effect of different stocking densities with better growth of Jayanti rohu in Treatment-I (35% stocking density) where stocking density of catla and mrigal was 55% and 10% respectively. The percentage weight gain of 9th generation Jayanti rohu over non-Jayanti rohu showed 31.60% in Treatment-I followed by 17.13% in Treatment-II and lowest was recorded at 6.65% in Treatment-III treatment. The result indicates better performance of Jayanti rohu in terms of net weight gain, average daily growth rate, Food Conversion Ratio (FCR), Specific Growth Rate (SGR), survivability and production compared to non-Jayanti rohu.

Keywords: acclimatization, FCR, Jayanti rohu, non-jayanti riohu, SGR

Introduction
Aquaculture is considered as one of the fastest growing sector of the animal production industry. Fisheries and aquaculture are the important sources of food, nutrition, income and livelihoods for millions of people around the world. In Indian freshwater aquaculture scenario, carp culture is the major mainstay of fish production. The three Indian Major Carps (IMC), *viz*. Catla (*Catla catla*), Rohu (*Labeo rohita*) and Mrigal (*Cirrhinus mrigala*) contribute the bulk of production to the extent of 70 to 75 percent of the total fresh water fish production, followed by silver carp, grass carp, common carp, catfishes forming a second important group contributing the balance of 25 to 30 percent (FAO, 2014) [16]. In India, Indian major carps are the most important common commercial fishes, generating maximum market demand and acceptability as food by the consumers due to their taste and flesh. Among the Indian major carps, Rohu is one of the most preferred species in the country and fetches a higher price in the market.

India's first genetically improved rohu, Jayanti rohu with higher growth efficiency was released by Central Institute of Freshwater Aquaculture (CIFA), Bhubaneswar during 1997 on the occasion of 50 years of Indian independence (Swarna Jayanti). Morphologically it is similar to rohu but grows much faster than the normal rohu. The Jayanti rohu is recording 17% more growth per generation after five generations of selective breeding (Reddy, 2003; Das Mahapatra *et al*. 2007) [30, 12]. When tested extensively in different farms, the performance of Jayanti rohu was found better than the other strains used by farmers which resulted in superior performance in terms of body weight and survival rate. On an average farm, the improved carp strain showed 15% higher body weight at harvest in India and 36% higher in Bangladesh (Dey *et al*. 2010) [13].

The improved strains are found to be more profitable than the existing carp strains. This would increase the profitability of a hatchery which can afford to pay a higher price for genetically-improved brood stock (Kumar *et al*. 2008) [24]. The culture of Jayanti rohu is preferred over the normal rohu due to its higher growth performance and disease resistance (Das Mahapatra, *et al.* 2007) [12]. The growth performance of Jayanti rohu in monoculture system was 38.16% higher than that of normal rohu in monoculture system after the culture period of 11 months. The growth performance of Jayanti rohu in composite fish culture system was 17.72% higher than that of normal rohu in monoculture system (Sharma, 2015) [39].

Materials and methods

The experiment was conducted in homogenous cement cisterns (2.6m x 1.50m x 1.75m) with treatments T- I, T- II, T- III and TC located in the wet laboratory of the College of Fisheries, Assam Agricultural University, Raha for a period of 90 days. 9th generation Jayanti rohu was stocked @35%, 40% and 45% in T- I, T- II and T- III treatments along with *Catla catla* and *Cirrhinus mrigal* as shown in Table 1.

Acclimatization was done for one week in the cement cisterns and fed with 1:1 mixture of rice polish and mustard oil cake. After seven days of fertilization, each tank was stocked with ten numbers of fishes. The length and weight of the fishes stocked were recorded. Cisterns were covered with nylon net to prevent escape of fishes. The reference treatment (TC) was stocked only with Non-Jayanti rohu. Each treatment was conducted in triplicate. The bottoms of the cisterns were provided with 6″ soil bed.

Cisterns were initially dried, cleaned and limed @ 500 kg ha^{-1} and filled up with tap water to a depth of 1.2 m ± 2 cm. After 7 days of lime application, 0.01 kg m^{-3} Raw Cow dung (RCD), 0.035 kg m^{-3} Mustard oil cake (MOC) and 0.0025 kg m^{-3} Single Super Phosphate (SSP) were applied as initial dose. Mustard oil cake was soaked overnight and on the next day before application RCD and SSP were mixed along with overnight soaked MOC and then broadcasted throughout the tanks.

During the experimental period the fish were fed with pelleted feed containing 25% crude protein twice daily @ 3% body weight. The feed was given on trays which were provided on each cistern. The initial length and weight of the fish was recorded on the day of stocking and at fortnightly interval thereafter. Netting was done every fortnightly for checking fish weight and feed ration was adjusted accordingly.

The water quality parameters were analyzed on the day of stocking and thereafter at 15 days interval; during the entire experimental period following standard methods described by APHA, 2005 [15].

Table 1: Species combination and percentage of different species stocked

Species	Treatments			
	T-I	**T-II**	**T-III**	**TC**
Jayanti rohu	35%	40%	45%	-
Non Jayanti rohu	-	-	-	40%
Catla	55%	50%	45%	50%
Mrigal	10%	10%	10%	10%

Results and Discussion

The body weight gain of Jayanti rohu, non-Jayanti rohu, *Catla catla* and *Cirrhinus mrigala* of different treatments during culture periods are given in Table 2. In terms of weight gain the highest growth was recorded in Jayanti rohu i.e. T-I treatment (35% stocking density) where the stocking density of catla and mrigala was 55% and 10% respectively. The data pertaining to growth of Jayanti rohu, non-Jayanti rohu, *Catla catla* and *Cirrhinus mrigala* are presented in Table 3. From the study, it was revealed that the average net weight gain of Jayanti rohu was highest (118.76±0.57 g) in T-I treatment where stocking density (SD) was 35%. The highest growth of Jayanti rohu in T-I treatment probably due to lower stocking density compared to T-II and T-III treatments. Similar results also reported by Sah *et al*. (2018) [34] while conducting on the growth performance of genetically improved rohu and farmed rohu in Nepal. The percentage weight gain of 9th generation Jayanti rohu over non-Jayanti rohu in the present finding showed 31.60% in T-I followed by 17.13% in T-II and lowest was recorded at 6.65% in T-III treatment. Das Mahapatra, *et al*. (2006) [10] reported after four generations of selection, an average of 17% higher growth per generation was observed in improved rohu. Das Mahapatra *et al*. (2016) [11] also acheived genetic gain of 18% per generation for growth trait after nine generations of selective breeding. It has also been reported that on an average, the improved carp strain gives 15% higher body weight at harvest in India and 36% higher in Bangladesh (Dey *et al*. 2010) [13]. In case of non Jayanti rohu, the average net weight gain showed 87.19±0.60 g in the reference treatment (TC) where stocking density was 40% which showed significant difference (p<0.05) from T-I, T-II and T-III treatment. The results are comparable with Verma and Mandal, (2018) [40] on evaluation of growth performance of common carp and mrigal with major carps in polyculture. Moreover in case of *Catla catla*, the average net weight gain was highest in T-III treatment (96.20±0.35 g) with 45% stocking density which coincide with the findings of Haque *et al*. (1993) [19] who carried out an experiment on the effect of stocking densities in six nursery ponds and achieved best growth at lower stocking densities in *Labeo rohita* and *Cirrhina mrigala***.** Average net weight gain of Catla showed no significant difference (P>0.05) in TC and T-II treatment but differ significantly from T-I and T-III. Further, for *Cirrhinus mrigala*, the average net weight gain was highest (70.38±0.67 g) in reference treatment (TC) with same stocking density of 10% in all the treatments. Mrigal did not show significant difference (P>0.05) in average net weight gain between T-I and T-II treatments and also between reference treatment (TC) and T-III but T-I and T-II showed significant different from reference treatment (TC) and T-III treatments. From the present study, it is evident that growth of mrigal is slow in comparison with rohu and catla. Similar results were also reported by Verma and Mandal, (2018) [40] while evaluating growth performance of amur carp and mrigal with major carps in polyculture system.

In terms of feed conversion ratio (FCR), the highest value was found in case of Jayanti rohu (1.56±0.01) in T-III treatment, followed by catla (1.42±0.01) in reference treatment (TC), T-I and T-III treatments, mrigal (1.39±0.02) in T-II treatment and non-Jayanti rohu (1.34±0.03) in TC treatment. The FCR value of Jayanti rohu in T-III (1.56±0.01) treatment with 45% stocking density was positively higher than T-II treatment (1.35±0.00) with 40% stocking density and T-I treatment (1.28±0.01) with 35% stocking density. Higher FCR value with increasing stocking density resulted less efficient utilization of food fry due to somatic growth (Ronald *et al*. 2014) [31]. The FCR value of Jayanti rohu showed significant difference (P<0.05) among all the treatments. Sarkar, *et al*.

(2015) [38] reported more or less similar result that Jayanti rohu showed best FCR of 1.92 on diet containing 25% protein. Sahoo and Mukhopadhyay, (2008) [35] reported best FCR for Jayanti rohu when fed with vitamin C @ 60mg/kg diet. But was found comparatively lower for non-Jayanti rohu, Catla, Mrigal. The FCR value of non-Jayanti rohu was 1.34±0.03. Similar FCR value for non-Jayanti rohu was also reported by Manomaitis *et al*. (2004) [25]; Abid and Ahmed, (2009) [2]; Jahan, *et al*. (2013) [21] and Basak *et al*. (2017) [6]. The FCR value of Catla obtained coincided with the findings of Ganesan, *et al*. (2015) [17]; Sachan, *et al*. (2016) [33] and showed no significant difference (P>0.05) among treatments. While for mrigal the highest FCR was obtained in T-II (1.39±0.02) followed by T-I (1.36±0.04), T-III (1.29±0.01) and TC (1.26±0.01). Results obtained were found more or less similar with the reported value of Hussain, *et al.* (2014) [20] and Priya Darsini, *et al.* (2014) [28]. Basak, *et al.* (2017) [6] reported the FCR of mrigal ranged from 1.49 to 1.81 under carp polyculture with different stocking densities in Bangladesh. There showed no significant difference (P>0.05) between T-I and T-III but TC and T-II differ significantly from the other treatments.

Jayanti rohu showed highest SGR value in T-I (2.47±0.01%) followed by T-II (2.40±0.00%) and T-III (2.24±0.04) which was comparatively low than reported by Sarkar *et al*. (2015) [38] and Sah, *et al*. (2018) [34]. Low SGR value for genetically improved rohu was also reported by Sahoo and Mukhopadhyay (2008) [35] when fed with 46.25% crude protein. The SGR of Jayanti rohu did not differ significantly (P>0.05) between T-I and T-II treatment but differ significantly from T-III. Non-Jayanti rohu showed SGR value of 2.07±0.02% and is more or less comparable to the values obtained by Kohinoor *et al*. (2005) [23]; Basak *et al*. (2017) [6]; Sah *et al*. (2018) [34] and Verma and Mandal, (2018) [40]. SGR value of Catla was highest in T-III (2.13±0.01%) followed by T-II (2.11±0.03%), TC (2.08±0.02%) and T-I (2.05±0.01%). Samad *et al*. (2017) [36] reported highest SGR value in lowest SD and lowest SGR at highest SD. Verma and Mandal, (2018) [40] reported 1.39% SGR on polyculture system. The SGR of catla did not differ significantly (P>0.05) among different treatments. The SGR of mrigal was found to be highest in TC (1.98±0.02%) and lowest in T-I (1.81±0.05%). Basak, *et al*. (2017) [6] reported the SGR of mrigal ranged from 1.04 to 1.07 under carp polyculture with different stocking densities. Verma and Mandal, (2018) [40] found SGR of 1.45% on growth performance of amur common carp and mrigal with major carps in polyculture system. Mrigal from natural source revealed 2.0% SGR (Biswas *et al*., 2008) [7]. Vhanalakar & Muley, (2014) [41] found that mrigal showed SGR of 1.17 ± 0.03% in 40% plant protein. Mrigal did not show significant difference (P>0.05) between T-I and T-II treatments and also between TC and T-III but T-I and T-II showed significant different (p<0.05) from TC and T-III treatments.

The average daily growth rate of Jayanti rohu was highest in T-I treatment (1.32±0.01 g/day). Similar results for daily growth rate was also reported by Das Mahapatra, (2012) [9] while conducting farm field trial with 3rd generation Jayanti rohu in West Bengal. Sarangi *et al*. (2004) [37] also reported the daily growth rate of Jayanti rohu varied from 3.5 to 10.3 g/d in different farms under organic culture. The average daily growth rate of Jayanti rohu shows significant difference among different treatments. The average daily growth rate of non-Jayanti rohu showed 0.97±0.01 g/day. Rai *et al*. (2010) [29] reported average daily growth rate 1.41 g/day of rohu while comparing growth and production of carp in polyculture ponds. Sah *et al*. (2018) [34] found average daily growth rate 0.24 g/day of farmed rohu on comparative studied with genetically improved rohu. Das Mahapatra, (2012) [9] reported average daily growth rate of local rohu (1.66 g/day) on farm field trial experiment with Jayanti rohu, catla and mrigal. The average daily growth rate of catla in different treatments reflected the results obtained for SGR. The present study showed that SGR and daily growth rate declined due to highest stocking density (Ronald *et al*., 2014) [31]. DoF (2010) [14] observed the daily average weight gain of catla 0.391 g/day with mixture of rice bran and mustard oil cake (1:1) as supplemental feed fed at the rate 5% of total fish body weight daily. Rai *et al.* (2010) [29] reported average daily growth rate 0.96 g/day of catla while comparing growth and production of carp in polyculture ponds. The average daily growth rate of catla not varied significantly (P>0.05) in TC and T-II treatment while varied significantly with T-I and T-III treatment. For mrigal, the average daily growth rate was highest in TC (0.78±0.01 g/day) and T-III treatment (0.78±0.01 g/day) and lowest in T-I (0.70±0.01 g/day) and T-II (0.70±0.00 g/day) with same SD of 10%. Das Mahapatra, (2012) [9] reported average daily growth rate of 0.64-1.74 g/day on 10% SD. Rai *et al*. (2010) [29] reported average daily growth rate 1.22 g/day of mrigal while comparing growth and production of carp in polyculture ponds. Mrigal did not show significant difference (P>0.05) between T-I and T-II treatments and also between TC and T-III but T-I and T-II showed significant different (p<0.05) from TC and T-III treatments.

When we looked in to the survivability rate of the experimented species, it was found that Jayanti rohu and mrigal showed 100% survivability rate in all the treatments, where such survivability rate on Jayanti rohu was also reported by Sarkar *et al*. (2015) [38]. Survival rate of non-Jayanti in the present study was found to be 93.33±6.67 %. More or less similar results also obtained by Ahsan *et al*. (2012) [4]; Najero *et al*. (2010) [26]; Sah *et al*. (2018) [34]; Ahmed, *et al*. (2012) [3]; Khan, *et al*. (2017) [6] and Hafeez-ur-rehman, *et al*. (2006) [18]. The highest survival rate (93.33±6.67%) of catla in the present study was observed to be in T-III and T-II treatment and survival was lowest with (86.67±6.67%) was observed in T-I and TC treatment. The result of the survival rate was more or less similar to the reported values 86.01% to 94.4% (Ahsan *et al*. 2013) [5] and 79.75% to 89.63% (Samad *et al*. 2017) [36] and Biswas *et al*. (2008) [7]. Lower stocking density resulted in the highest survival rate when compared to higher densities (Costa *et al*. 2017) [8]. While Narejo *et al*. (2010) [26] reported that survival was found to be negatively influenced by stocking densities. No significant difference (P>0.05) was observed among different treatments on the survival rate. No mortality rate was observed in Mrigal and showed no significant difference (P>0.05) in all the treatment. Similar result was reported by Hafeez-ur-rehman *et al*. (2006) [18] and Rai *et al*. (2010) [29] in polyculture.

The net production of Jayanti rohu was highest in T-I 2030.87±3.25 kg/ha followed by T-III (1984.48±3.25 kg/ha) and lowest in T-II (1798.05±1.47 kg/ha) which showed significant difference (P<0.05) among the treatments. Less net production of Jayanti rohu in T-II than T-III treatment was due to fact that stocking density may not have any influence on biomass (Costa *et al*. 2017) [8]. Similar results was obtained by Sah *et al*. (2018) [34] who reported that the yield of (2223±82 kg/ha) for genetically improved rohu on comparative growth studies. The net production of non-Jayanti rohu showed 1391.06±32.15 kg/ha in the control treatment which revealed that non-Jayanti rohu had no better growth performance over Jayanti rohu. In contrast to the above findings, Sah *et al*. (2018) [34] reported that genetically improved rohu had a superior performance on growth and yield over the farmed rohu. Sharma (2015) [39] reported that the growth of Jayanti rohu in both the culture conditions such as monoculture and polyculture with carps outperformed the local rohu. Roy *et al*. (2013) [32] reported that Jayanti rohu show superior performance in terms of body weight on both average and efficient farms. The net production of catla showed highest in T-II (1781.37±40.30 kg/ha) with 50% SD and lowest in T-III (1534.63±34.88 kg/ha) with 45% SD and showed similar with the results of Abbas *et al*. (2010) [1]; Prabaharan and Murugan, (2012) [27] and Ganesan *et al*. (2015) [17]. There showed no significant different ($p>0.05$) among different treatments. The net production of mrigal showed highest in TC (295.58±0.93 kg/ha) and lowest in T-II (263.49±0.54 kg/ha. There showed no significant difference ($P>0.05$) between T-I and T-II treatments and also between TC and T-III but T-I and T-II showed significant different ($p<0.05$) from TC and T-III treatments.

From the above discussion it may be assumed that Jayanti rohu had a better growth performance even at different stocking densities compared to the non-Jayanti rohu. Furthermore, future studies must be carried out using newly produced generation of Jayanti rohu for evaluation of growth rate superiority over non-Jayanti rohu as rohu is one of the important species included in a commercial aquaculture system.

Table 2: Average growth (g) of Catla, non-Jayanti rohu, Jayanti rohu and Mrigal fingerlings in different treatments during the experimental period

Sampling Days	Treatment											
	TC			T- I			T- II			T- III		
	Catla	NJR	Mrigal	Catla	JR	Mrigal	Catla	JR	Mrigal	Catla	JR	Mrigal
0	9.79 ±0.15	9.52 ±0.19	8.62 ±0.13	9.82 ±0.15	8.52 ±0.13	9.23 ±0.37	9.44 ±0.18	8.14 ±0.04	8.53 ±0.09	9.73 ±0.14	8.66 ±0.29	8.70 ±0.15
15	25.20 ±0.25	20.25 ±0.42	14.35 ±0.23	24.65 ±0.38	22.59 ±0.12	14.83 ±0.61	24.89 ±1.28	22.38 ±0.28	14.75 ±0.60	26.33 ±0.24	21.28 ±0.07	13.84 ±0.64
30	40.3 1±0.15	38.41 ±0.31	26.6 0±0.79	39.41 ±0.63	49.23 ±0.58	20.78 ±0.51	41.11 ±1.25	47.54 ±0.42	25.73 ±0.09	41.33 ±1.49	45.47 ±0.53	25.15 ±0.38
45	55.37 ±1.29	50.71 ±1.81	34.50 ±0.56	53.78 ±0.58	72.87 ±0.35	31.52 ±0.32	54.38 ±0.76	70.55 ±0.39	35.67 ±0.23	60.96 ±0.83	69.25 ±0.09	35.10 ±2.55
60	70.56 ±0.17	65.23 ±1.46	47.12 ±0.28	68.42 ±0.27	84.55 ±0.43	50.70 ±3.07	69.71 ±0.50	83.57 ±0.56	45.97 ±0.96	75.64 ±0.24	80.26 ±0.47	52.94 ±1.32
75	86.53 ±0.38	76.38 ±2.87	65.40 ±0.32	83.16 ±0.91	101.68 ±0.08	63.28 ±1.24	85.30 ±0.31	95.50 ±3.41	62.50 ±1.65	90.23 ±0.16	92.10 ±1.32	65.32 ±0.21
90	101.10 ±0.64	96.72 ±0.60	79.00 ±0.67	98.31 ±0.30	127.29 ±0.69	72.26 ±0.64	100.3 ±0.50	113.26 ±0.30	71.27 ±0.37	105.93 ±0.46	103.16 ±0.44	78.92 ±0.58

Table 3: Details of fish growth (g) in different treatments (pooled data)

Parameters	Treatment											
	TC			T- I			T- II			T- III		
	Catla	NJR	Mrigal	Catla	JR	Mrigal	Catla	JR	Mrigal	Catla	JR	Mrigal
Mean initial weight (g)	9.79 ±0.15^{a}	9.52 ±0.19^{b}	8.62 ±0.13^{a}	9.82 ±0.15^{a}	8.52 ±0.13^{a}	9.23 ±0.37^{a}	9.44 ±0.18^{a}	8.14 ±0.04^{a}	8.53 ±0.09^{a}	9.73 ±0.14^{a}	8.66 ±0.29^{a}	8.70 ±0.15^{a}
Mean final weight (g)	101.10 ±0.64^{b}	96.72 ±0.60^{a}	79.00 ±0.67^{b}	98.31 ±0.30^{a}	127.29 ±0.69^{d}	72.26 ±0.64^{a}	100.38 ±0.50^{ab}	113.29 ±0.30^{c}	71.27 ±0.37^{a}	105.93 ±0.46^{c}	103.16 ±0.44^{b}	78.92 ±0.58^{b}
Mean weight gain (g)	91.31 ±0.75^{b}	87.19 ±0.60^{a}	70.38 ±0.67^{b}	88.49 ±0.18^{a}	118.76 ±0.57^{d}	63.02 ±0.79^{a}	90.94 ±0.64^{b}	105.15 ±0.26^{c}	62.74 ±0.38^{a}	96.20 ±0.35^{c}	94.50 ±0.46^{b}	70.22 ±0.56^{b}
FCR	1.42± 0.01^{a}	1.34± 0.03^{b}	1.26± 0.01^{a}	1.42± 0.01^{a}	1.28± 0.01^{a}	1.36± 0.04^{ab}	1.41± 0.01^{a}	1.35± 0.00^{b}	1.39± 0.02^{b}	1.42± 0.01^{a}	1.56± 0.01^{c}	1.29± 0.01^{ab}
SGR (%)	2.08± 0.02^{a}	2.07± 0.02^{a}	1.98± 0.02^{b}	2.05± 0.01^{a}	2.47± 0.01^{c}	1.81± 0.05^{a}	2.11± 0.03^{a}	2.40± 0.00^{c}	1.88± 0.01^{a}	2.13± 0.01^{a}	2.24± 0.04^{b}	1.97± 0.02^{b}
Avg. daily growth (g/d)	1.01 ±0.01^{b}	0.97 ±0.01^{a}	0.78 ±0.01^{b}	0.98 ±0.00^{a}	1.32 ±0.01^{d}	0.70 ±0.01^{a}	1.01 ±0.01^{b}	1.17 ±0.00^{c}	0.70 ±0.00^{a}	1.07 ±0.00^{c}	1.05 ±0.01^{b}	0.78 ±0.01^{b}
Survival rate (%)	86.67 ±6.67^{a}	93.33 ±6.67^{a}	100.00 ±0.00^{a}	86.67 ±6.67^{a}	100.00 ±0.00^{a}	100.00 ±0.00^{a}	93.33 ±6.67^{a}	100.00 ±0.00^{a}	100.00 ±0.00^{a}	93.33 ±6.67^{a}	100.00 ±0.00^{a}	100.00 ±0.00^{a}
Gross Yield (kg/ha)	1841.02 ±49.46^{a}	1542.70± 39.94^{a}	331.80 ±0.93^{b}	1788.53 ±44.09^{a}	2176.58± 3.95^{b}	303.48 ±0.90^{a}	1966.49± 44.64^{a}	1937.26± 1.68^{b}	299.33 ±0.52^{a}	1689.78± 38.25^{a}	2166.29 ±3.09^{b}	331.48 ±0.81^{b}
Net Yield (kg/ha)	1662.72 ±44.72^{a}	1391.06± 32.15^{a}	295.58 ±0.93^{b}	1610.20 ±40.46^{a}	2030.87± 3.25^{c}	264.70 ±1.11^{a}	1781.37± 40.30^{a}	1798.05± 1.47^{b}	263.49 ±0.54^{a}	1534.63± 34.88^{a}	1984.48 ±3.25^{bc}	294.94 ±0.78^{b}

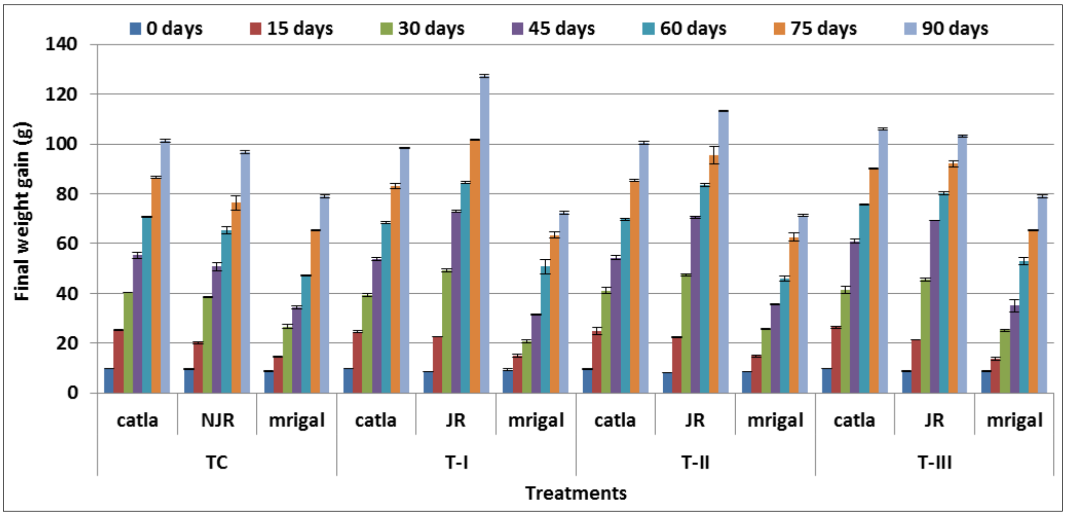

Fig 1: Final weight gain (g) of different fish species in different treatments (mean±SE)

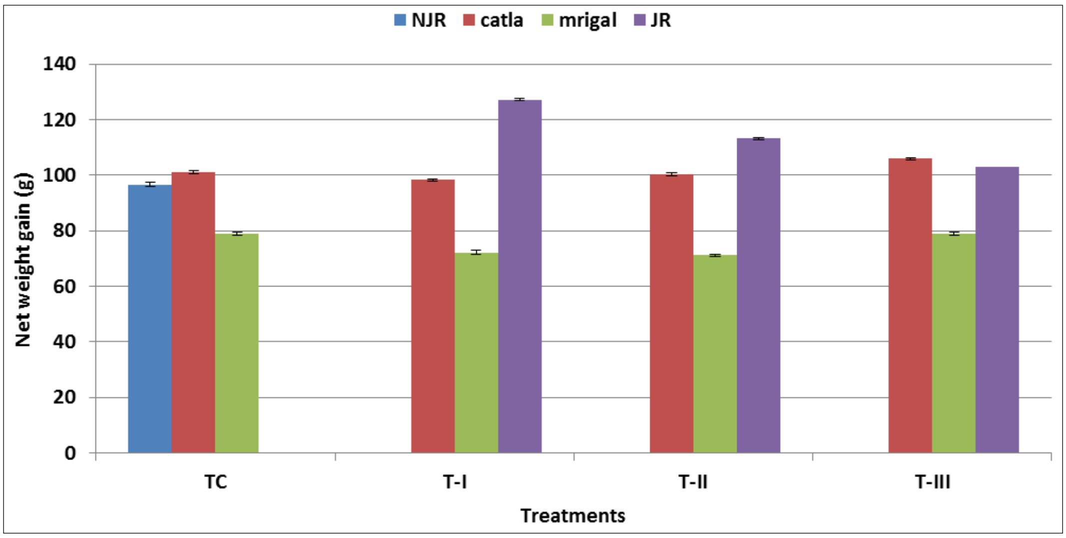

Fig 2: Net weight gain (g) of different fish species in different treatments (mean ± SE)

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