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# Effect of different types of feed on growth pattern of farmed rohu and genetically improved rohu, (*Labeo rohita*)

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**Abstract**
The fish culture is to increase the survivability, growth and fish production mainly depends upon the low cost inputs. The low cost greatly depends on the supply of quality feed containing appropriate proportion of different energy of nutrients. An experiment was conducted at regional agriculture research station (RARS) Tarahara, Nepal for 90 days during December, 2017 to March, 2018. The research was conducted in earthen pond which was partition by nylon nets. The size of partition was 80 $m^2$ (10×8 $m^2$). The stocking densities of farmed rohu (FR) and genetically improved strain rohu (FIR) was 1 f/ $m^2$. The stocking size of both fish was 9.11±1.18 and 10.57±1.97g, respectively during the experimental period. There was three treatments viz: mash feeding, pellet feeding and control (only fertilization of pond) with three replications. The feeding frequencies were 2 times per day. The fish received feed as 5% of their body weight. The protein level of mash feed and pellet feed was 20 and 19.7% respectively. The harvested growth rate of genetically improved rohu was significantly ($P$<0.05) higher 47.32±10.01 g than farmed rohu was 36.03±11.50 g which was based on pellet feed. Similarly, harvested growth rate of both fish, feeding to pellet feed was significantly ($P$<0.05) higher 54.44±11.78 g than mash feeding was 40.80±4.09 g and control was 23.70±3.52 g. The interaction between fish species and feeding forms i.e FR: mash was 43.38±2.11 g, FR: pellet was 43.91±1.30 g, FR: control was 20.60±0.96 g, similarly, FIR: mash was 50.21±1.53 g, FIR: pellet was 64.21±1.64 g, FIR: control was 26.78±1.79 g. The result showed that the growth of genetically improved rohu of different feeding treatments were significantly ($P$<0.05) higher than farmed rohu. But growth of genetically improved rohu based on pellet feed showed better performance than others feed. The FCR recorded on mash feeding was 5.1:1 and pellet feeding was 2.2:1. In Nepal, feeding practices are not well developed that mostly farmers are used under feeding and over feeding practices. So that this study helps to farmers by adaptation of feeding practices and their impact of fish production.

**Keywords:** mash and pellet feed, growth, strain, *Labeo rohita*, protein, FCR

## 1. Introduction
Indigenous major carps including Rohu (*Labeo rohita*) are the major group of fish species in polyculture fish farming systems of Nepal [1]. Among the Indigenous major carps, rohu is the one of the most preferred species in the country and higher price in the market [2]. The contribution of carp aquaculture components to the national fish production (77000 tons) has increased significantly over the last two-decade period to reach 70 percent in 2016 [3].
A new strain of Rohu (GIR) developed from selective breeding program has been obtained at Regional Agricultural Research Station, Tarahara, Nepal with the assistance of Food and Agriculture Organisation (FAO) and Fisheries development Training centre (FDTC), Janakpur, Nepal in August 2013 [4]. The problem of slow growth and inbreeding depression with existing hatchery stocks or farmed Rohu (FR), a new strain of genetically improved rohu (FIR) was introduced and it had a superior performance on growth and yield over the farmed rohu [4].
The fish culture is to increase the survivability, growth and fish production mainly depends upon the low cost inputs. The low cost greatly depends on the supply of quality feed containing appropriate proportion of different energy of nutrients [5]. Most semi-intensive fish farms are used formulated, pelleted feeds. A variety plants and animal origin, ingredients has been used either singly or in combination [6].

In Nepal, farmers relying on single ingredient, and mash feed prepared from several ingredients to feed the farmed fish. But the feeding practices are not well developed that mostly farmers are used under feeding and over feeding practices. The problem, low productivity of fish (1.03 to 5.79 tons/ha) from carp polyculture has been reported [7]. So that this study helps to farmers by adaptation of feeding practices and their impact of fish production.

## 2. Material and Methods

An experiment was conducted at regional agriculture research station (RARS) Tarahara, Nepal for 90 days during December, 2017 to March, 2018. The research was conducted in earthen pond which was partition by nylon nets. The size of partition was 80 $m^2$ (10×8 $m^2$). The stocking densities of farmed rohu and genetically improved rohu was 1 f/m2.The stocking size of both fish were 9.11±1.18 and10.57±1.97g respectively during the experimental period. There was three treatments viz: mash feeding, pellet feeding and control (only pond fertilization) with three replications. The three types of fertilizers viz: urea, DAP and organic manure were used in control pond. The feeding frequencies was 2 times per day. The fish were feeding with 5% of body weight of fish. The protein level of mash feeding was 20% and pellet feeding was 19.7%. The mash feed included rice bran, mustard oil cake, wheat flour and fish meal etc. The research was conducted in RCBD with factorial design. There were 2 factor i.e species and feed.

Sample of fish biomass were netted fortnightly for growth check. Fortnightly growth check was carried out by sampling 20% of the standing biomass. Survival and yield data were obtained upon harvest by complete drying of each experimental ponds. Water quality parameters: temperature (daily), dissolved oxygen (DO) and pH were measured at weekly interval to correlate the growth of fish with their rearing environment. The nutrient composition of mash feed and pellet feed was analysed in animal nutrition division under NARC, Khumaltar.

## 3. Statistical Analysis

Data processing and illustrations were performed using Microsoft excel. The R system of statistical computing of version 3.5.0 was used for the data analysis.

## 4. Results and Discussion

The research showed the harvested growth rate of genetically improved rohu was significantly ($P$<0.05) higher (47.32±10.01 g than farmed rohu was 36.03±11.50 g based on pellet feed. The daily growth rate of genetically rohu was higher 0.41 g/d than farmed rohu was 0.29 g/d. The Gross yield of 2223.8 kg/ha for genetic improvement of rohu (GIR) was significantly ($P$<0.05) higher than the gross yield of 338.4 kg/ha for farmed rohu (FR) [4]. The growth rate superiority of GIR up to 75% to the growth rate of local Rohu [2]. The genetically improved rohu having 17% growth advantage over normal rohu which growing importance over normal [8].

**Table 1:** Mean weight gain of Farmed rohu (FR) and genetically improved rohu (FIR) at different time interval

| S. N | Growing days | Farmed rohu (FR) | Genetically improved rohu (GIR) |
|---|---|---|---|
| 1 | 0 | 9.10±1.18$^b$ | 10.57±1.97$^a$ |
| 2 | 15 | 11.26±2.29$^b$ | 14.26±1.66$^a$ |
| 3 | 30 | 14.01±3.09$^b$ | 20.06±4.53$^a$ |
| 4 | 45 | 17.01±4.22$^b$ | 25.06±7.04$^a$ |
| 5 | 60 | 21.42±4.42$^b$ | 29.43±8.25$^a$ |
| 6 | 75 | 26.53±5.82$^b$ | 37.73±11.53$^a$ |
| 7 | 90 | 36.03±11.50$^b$ | 47.32±16.81$^a$ |

Different superscripted letters within row are significantly different at α0.05.

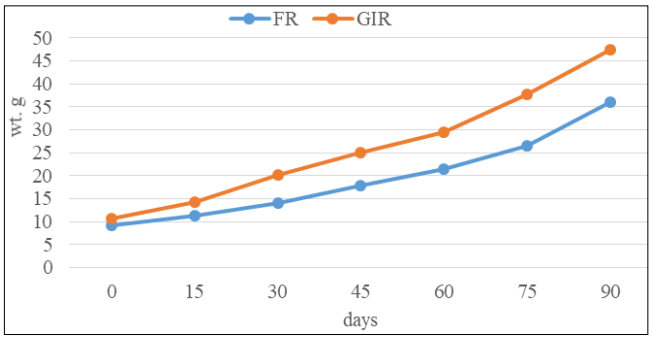


**Fig 1:** Growth of farmed rohu (FR) and genetically improved rohu (GIR) during the experimental period

The harvested weight gain of fish showed significantly ($P$<0.05) higher in pellet feeding was 54.44±11.78 than mash feeding was 46.80±4.09. In every growing days weight gain of pellet feed showed higher than mash feed (Table 2). In fish production system, phytoplankton and zooplankton and other natural food organisms significantly contribute to the nutrition of the fish [9]. It is evident from the survey that the use of pelleted feeds generally improves the FCR.

The research showed the fish received both feed as 5% of their body weight. The daily feeding rate of 15-20% for larvae, 8-10% for advanced fry, 5-7% for fingerling and 2-4% of the standing biomass of grow out carps would be sufficient [10].

During the research period frequency of feeding was done 2times per day. The feed utilization can be optimized by increasing feeding frequencies, and that the growth response to differential feeding frequencies is both species-specific and specific to the life history stage of the fish. In a diet evaluation experiment [11]. The dietary protein level 25% is optimum for the growth of GIR [8].

**Table 2:** Mean weight gain of fish on different feed at different time interval

| S.N | Growing days | Mash feed | Pellet feed | Control |
|---|---|---|---|---|
| 1 | 0 | 9.16±1.50$^{b}$ | 9.42±0.99$^{b}$ | 10.92±2.23$^{a}$ |
| 2 | 15 | 11.05±1.43$^{b}$ | 14.50±1.91$^{a}$ | 12.73±2.84$^{b}$ |
| 3 | 30 | 15.63±2.69$^{a}$ | 21.82±4.66$^{a}$ | 13.65±2.91$^{c}$ |
| 4 | 45 | 20.21±3.61$^{b}$ | 28.41±6.06$^{a}$ | 15.83±2.53$^{c}$ |
| 5 | 60 | 24.72±4.35$^{b}$ | 32.92±7.1$^{a}$ | 18.64±2.15$^{c}$ |
| 6 | 75 | 32.89±6.73$^{b}$ | 41.63±9.65$^{a}$ | 21.87±2.47$^{c}$ |
| 7 | 90 | 46.80±4.09$^{b}$ | 54.44±11.78$^{a}$ | 23.79±3.52$^{c}$ |

Different superscripted letters within row are significantly different at α0.05.

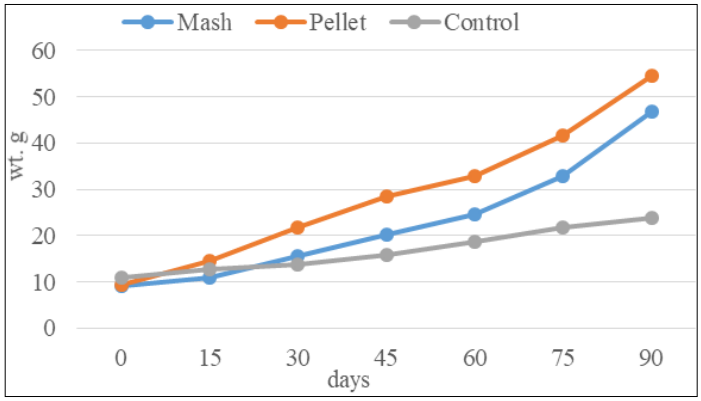


**Fig 2:** Growth of fish feeding with different feed during the experimental period

The interaction between fish species and feeding forms i.e. FR: mash was 43.38±2.11 g, FR: pellet was 43.91±1.30 g, FR: control was 20.60±0.96 g, similarly, FIR: mash was 50.21±1.53 g, FIR: pellet was 64.21±1.64 g, FIR: control was 26.78±1.79 g (Table 3). The result showed that the growth of genetically improved rohu of different feeding treatments were significantly ($P$<0.05) higher than farmed rohu. But growth of genetically improved rohu based on pellet feed showed better performance than others feed.

The high average FCR (2.5–3.5:1) obtained in carp culture system in Andra Pradesh, India represents low levels of nutritional efficiency, and reported that an FCR of 1.0:1 is attainable in experimental fertilized ponds in which the fish are fed commercial pelleted feeds [12].

**Table 3:** Interaction between fish species and feeding forms

| S. N | Days | FR: mash | FR: pellet | FR: control | GIR: mash | GIR: pellet | GIR: control |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 8.43±1.25$^{b}$ | 9.86±1.38$^{b}$ | 9.01±0.75$^{b}$ | 9.90±1.57$^{b}$ | 8.98±0.05$^{b}$ | 12.83±0.96$^{a}$ |
| 2 | 15 | 9.86±0.29$^{c}$ | 13.76±2.58$^{ab}$ | 10.16±0.42$^{c}$ | 12.25±0.88$^{bc}$ | 15.23±0.93$^{a}$ | 15.30±0.51$^{a}$ |
| 3 | 30 | 13.35±1.32$^{c}$ | 17.66±1.41$^{b}$ | 11.01±0.67$^{d}$ | 17.91±0.86$^{b}$ | 25.98±0.71$^{a}$ | 16.28±0.07$^{b}$ |
| 4 | 45 | 17.11±1.34$^{c}$ | 22.98±1.06$^{b}$ | 13.63±1.01$^{c}$ | 23.31±1.18$^{b}$ | 33.85±1.45$^{a}$ | 18.03±0.71$^{c}$ |
| 5 | 60 | 21.03±1.99$^{c}$ | 26.48±1.60$^{b}$ | 16.73±0.48$^{c}$ | 28.40±1.70$^{b}$ | 39.36±1.07$^{a}$ | 20.55±0.66$^{c}$ |
| 6 | 75 | 20.81±1.18$^{c}$ | 32.98±1.48$^{c}$ | 19.80±1.15c | 38.96±1.14$^{b}$ | 50.28±2.48$^{a}$ | 23.95±1.04$^{c}$ |
| 7 | 90 | 43.38±2.11$^{c}$ | 43.91±1.30$^{c}$ | 20.80±0.96$^{c}$ | 50.21±1.53$^{b}$ | 64.96±1.64$^{a}$ | 26.78±1.79$^{c}$ |

Different superscripted letters within row are significantly different at α0.05.

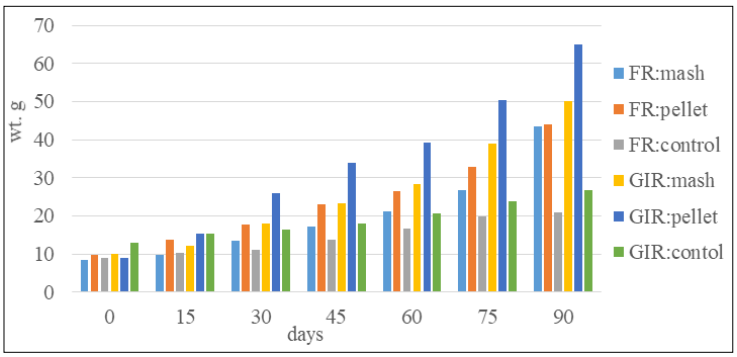


**Fig 3:** Interaction between fish species and feeding forms

**Table 4:** Proximate analysis of pellet and mash feed

| Feed type | Moisture % | Protein % | Crude fiber % | Dry matter% | Ash% |
|---|---|---|---|---|---|
| Mash | 89.9 | 20.0 | 7.6 | 92.4 | 11.5 |
| Pellet | 90.9 | 19.7 | 11.1 | 88.9 | 9.3 |

Proximate composition analysis of mash feed and pellet feed of mean crude protein was 20.0% and 19.7 %, respectively (Table 4). The dietary protein level of carps depends upon stage of development. In the absence of natural feeds in pond, stunted carp yearlings require a dietary formulation

comprising 25% protein and 37% carbohydrate but in the presence of natural feeds, the protein component of the dietary formulation can be reduced to 20% [13].

The water quality parameters during the experiment temperature showed 18.4-25 ºC, dissolved oxygen 2.0-3.1 mg/l, pH 7.3-8.5, ammonium 0.1-2.9 and secchi disc visibility 25-45 cm. The rate of oxygen consumption was positively correlated with protein content in the diet and showed that level of protein content in the diet was significantly affected the oxygen consumption [14]. Single feeding practice with mash feed and sinking pellet may lead to the release of ammonia from unconsumed feed, thereby polluting the water since the primary nitrogenous waste produced by fish from protein digestion is ammonia [15].

The FCR recorded of mash feeding was 5.1:1 and pellet feeding was 2.2:1. The FCR of the present survey are comparable with the reported FCR of 1.8–3.4:1 and 2.3–4.1:1 using commercially manufactured pellets and farm-made feeds in India [9].

## 5. Conclusion

The Pellet feed prevent dispersal loss in pond water and showed better performance of carp production. The feed management practices in optimizing production and giving training to farmers. Further experiments are recommended to Genetic improvement of rohu with carp polyculture feeding with mash and pellet feed.

## 6. Acknowledgement

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