

Original Research Article

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## Up-Scaling of Fish Feed and Feeding Practice for Carps Based on Locally Available Ingredients in Mid-Hilly Regions of Uttarakhand

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### ABSTRACT

The current experiment was designed for evaluation of formulated diet prepared by locally available feed ingredients rice bran, mustard oil cake, madua flour (Ragi), soybean cake and mineral and vitamin mixture as potential basal ingredients for Chinese carp culture in mid hills of Uttarakhand. Three experimental diets (D1, D2, and D3) of different composition and the similar protein level (27-30%) were formulated with locally available ingredients. Data on the proximate composition reflected that there was not any significant difference in nutritive value of elements in all diets. Protein level in the all diets was in the range of 27.4 - 30%. A feed trial was conducted for standardization of the feed composition by using locally available ingredients during the month of May-June. At the end of experiment treatment fed with diet D3, showed highest net weight gained 55.78 gm with 95% survival, SGR 3.46 % and 3.1 % minimum value for FCR as compared to treatments fed with D1 and D2 experimental diets. The findings of the current study indicate that locally available feed ingredients from mid hill region of Uttarakhand can serve as potential basal feed ingredients for hill carp culture.

#### Keywords

Feed ingredients,  
Carp culture,  
Proximate  
composition,  
Experimental diet

#### Article Info

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### Introduction

Aquaculture is feed based industry, over 60% of operational cost coming only from feed sources with shifting from extensive to semi-intensive or intensive farming, depending on farm. Replacement of fish meal with cheaper

ingredients of plant origin in fish feed is necessary because of rising cost (FAO, 2013). Fish feed is main factor for fish production and it should have various properties according to the target species. The artificial feed balanced with protein, lipid, carbohydrate, fatty acids, vitamins, minerals

and containing optimum protein/energy ration is the common practice for better yield. The fish farmers are not very well aware about the suitable feed ingredients and their proportion in the formulated feed diet. The general feed ingredients being used by fish farmer include rice bran, rice polish, oil cake and groundnut oil cakes and husk etc.

The nutritional value of food depends not only on the quantity of protein but also on the amino acids profile. Thirty per cent protein level is optimum for growth of carp fingerlings, also observed by Renukardhya and Varghese (1986); Gangadhar *et al.*, (1997); Rangacharyulu *et al.*, (2000); Paul and Mohanty (2002); Arya *et al.*, (2019). Carbohydrate remain in the fish feed in the range of 15-45%. Lipids are an important nutrient in the diet as a source of energy, carriers of vitamins, essentials fatty acids, sterol and phospholipids. Lipids also impart necessary flavor and thus may increase feed palatability.

Keeping in view, reduction of feed cost and ultimately production cost of fish for better return, there is an urgent need of some non-conventional feed ingredients in the diet of fish. The feed ingredients, generally provided in artificial feed are mainly the byproducts of various agricultural crops such as vegetables oil cake, rice and wheat bran & husk etc. Traditionally supplementary feed comprising oil cake and rice bran in 1:1 ratio @ 1-2 % of fish biomass is used as fish feed. Generally supplementary feed provided to the fish by fish farmers is very low in protein (13-16%) as majority of fish farmer provide only rice bran with husk, owing it to decrease fish yield mostly ranging between 1500-2000kg / ha / yr. (Singh and Sharma, 1998). Therefore, there is a need to develop nutrient balanced fish feed incorporating locally available ingredients to obtain maximum fish production and minimize the cost.

## Materials and Methods

The experiment was designed for evaluation of formulated diet prepared by locally available feed ingredients rice bran, Mustard oil cake, Madua flour (Ragi), Soybean cake and mineral and vitamin mixture as potential basal ingredients for Chinese carp culture in mid hills of Uttarakhand. Three experimental diets (D1, D2, and D3) of different composition and the similar protein level (27-30%) were formulated with locally available ingredients (Table 1). Data on the proximate composition reflected that there was not any significant difference in nutritive value of elements in all diets (Table 2 and Fig. 1). Protein level in the all diets was in the range of 27.4 - 30%. All the three exotic species viz. silver carp, grass carp and common carp were reared in 750 liter FRP tanks for two month duration. Fingerlings of uniform size were stocked @ 20 nos. in each tank. Feeding was given @ 3% of the total biomass of the fish in the tank with 2 feeding frequency in a day.

Initial and final data was recorded for the growth and feed intake in each tank. Fifty percent tank water was exchanged daily to maintain the water quality parameters in optimum range. Growth rate of fish was estimated by weighing all the fish from each tank at fortnight intervals. Each diet was analyzed for the proximate composition (AOAC, 2012). On the basis of recorded data from growing fish, the most suitable composition was finalized. At the end of the experiment growth performance was evaluated by the standard formulas for specific growth rate, feed conversion ratio, condition factor, protein efficiency ratio and assimilation efficiency. Various water quality parameters such as temperature, pH, Dissolved Oxygen (DO), free CO<sub>2</sub> and total alkalinity were analyzed weekly throughout the trial (APHA, 2012).

## Results and Discussion

As feeding is a very important step for the successful carp farming in uplands. In the current experiment formulated diet were prepared by locally available feed ingredients rice bran, mustard oil cake, madua flour (Ragi), soybean cake and mineral and vitamin mixture as potential basal ingredients for Chinese carp culture in mid hills of Uttarakhand. Experiment was conducted in three FRP tanks (size 1×1×0.7mt.) in outdoor condition at Krishi Vigyan Kendra, Lohaghat, during the month of May-June, 2008 (60 days). Three different test diets (Table 1) were formulated with locally available feed ingredients like rice bran, mustered oil cake, madua flour and soybean cake with their proximate composition (Table 2). Data on the proximate composition reflected that there was no significant difference in the level of nutritive elements of all diets. Protein level in the all diets was found in the range of 27.4-30% with almost similar level of other elements. The data on growth performance (Table 3, Fig. 2) revealed that feed D3 having 30% protein and 7.9% lipid is best among the all 3 tested diets having the feed ingredients- rice bran, mustard oil cake, madua flour (Ragi), soybean cake and mineral and vitamin mixture. In the feeding trial of 2 months with

the diet D3, net weight was gained 55.78 gm with 95% survival and 3.1 FCR. The value of Specific Growth Rate is used to compare growth on a daily basis. Higher growth and specific growth rate (3.46) indicates that the D3 is superior over the other tested diets. Several scientists have also applied SGR as growth index in different nutritional studies Dinesh (2004) and Pandey (2005). The value of condition factors for different treatments was 1.6 (D1), 2.2(D2) and 2.1 for D3, which shows similarity with other research on ponderal index or condition factor of different fishes i.e. 0.73 to 0.95 in *Tor putitora* (Pathani and Das, 1980), 1.03-1.31 in *Salmo trutta fario* (Kumar *et al.*, 1979) and 1.20-1.34) in *Salvelinus namayeuish* (Oosten and Eshneryer, 1956). Kumar *et al.*, (1979) concluded that the value of condition factor as about one is considered to be of its average weight. The values of K in present study were recorded in the range of 1.6 to 2.2 showed that the fishes of experimental unit are more robust condition. The value of the Assimilation efficiency (AE) for different 3 diets were in the range of 76.34-78.24, highest for the diet D3, and the value of the PER for different 3 diets were in the range of 24-29 with highest for the diet D3 (Table 3, Fig. 2).

**Table.1** Composition of different experimental diets

Diets	Ingredients	Ratio	Qty.in 1kg
<b>D1</b>	Rice bran	49	490 gm
	Mustard oil cake	49	490 gm
	Mineral mixture	2	20 gm
<b>D2</b>	Rice bran	30	300 gm
	Mustard oil cake	48	480 gm
	Madua flour	20	200 gm
	Mineral mixture	2	20 gm
<b>D3</b>	Rice bran	33	330 gm
	Mustard oil cake	35	350 gm
	Madua flour	20	200 gm
	Soyabean cake	10	100 gm
	Mineral mixture	2	20 gm

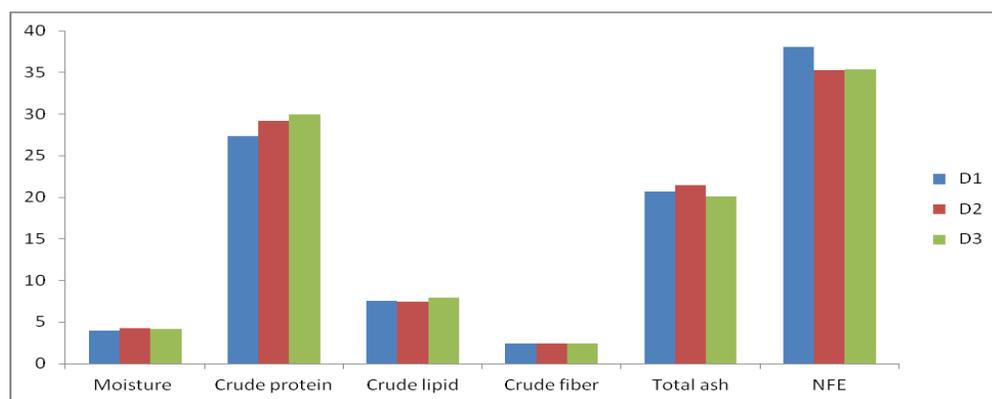
**Table.2** Proximate composition of tested carp diets

<b>CARP FEED</b>	<b>D1</b>	<b>D2</b>	<b>D3</b>
<b>Moisture</b>	3.97	4.24	4.12
<b>Crude protein</b>	27.4	29.2	30.0
<b>Crude lipid</b>	7.5	7.4	7.9
<b>Crude fiber</b>	2.41	2.40	2.42
<b>Total ash</b>	20.66	21.44	20.14
<b>NFE</b>	38.06	35.32	35.42

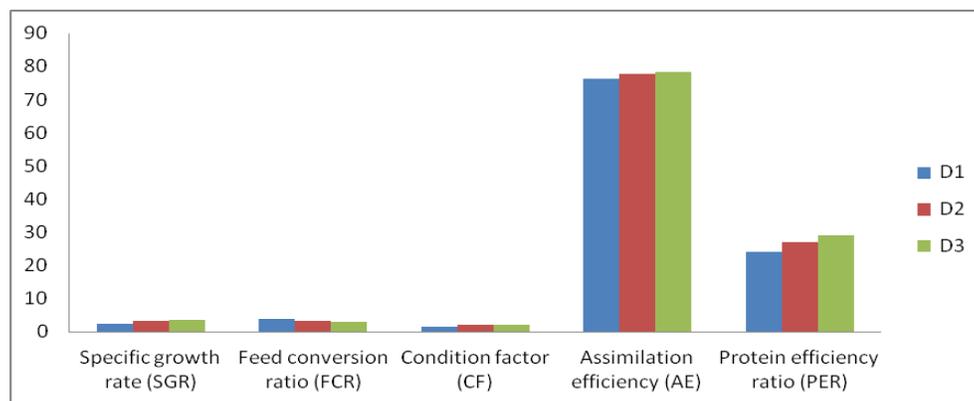
**Table.3** Evaluation of different growth parameters from experimental diets

<b>TEST DIETS</b>	<b>Specific growth rate (SGR)</b>	<b>Feed conversion ratio (FCR)</b>	<b>Condition factor (CF)</b>	<b>Assimilation efficiency (AE)</b>	<b>Protein efficiency ratio (PER)</b>
<b>D1</b>	2.53	3.8	1.6	76.34	24
<b>D2</b>	3.14	3.2	2.2	77.82	27
<b>D3</b>	3.46	3.1	2.1	78.24	29

**Fig.1** Proximate composition of experimental diets



**Fig.2** Evaluation of different growth parameters from experimental diets



The results of the experimental study concluded that best growth performance was obtained by experimental diet D3. Therefore cost effective fish feed with 30% protein and 7.9% lipid content formulated by locally available ingredients- rice bran, Mustard oil cake, Madua flour (Ragi), Soybean cake and mineral and vitamin mixture is should be used for enhanced production in the mid hilly regions of Uttarakhand.

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