A Comparision on FCR in fish ponds of Rainbow Trout (*Oncorhynchus mykiss*) fed by extruder food and pellete food

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Food costs in rainbow trout farms are about 50% of production costs (Barrows *et al*., 2007). Because of inattention of most aquaculturists in exact calculation of FCR and not using qualified food, sometimes food costs will rise a lot and won't be economical.

The newest method for fish food production is production during the process of extrusion. Extrusion process is processing materials with high temperature in a short time (HTST) and is done by combined operation of Humidity, heat, mechanical energy and pressure (Watanabe and Pongmaneerat,1993).

Basically the longer food is under heat the more its quality will decrease. Because some amino-acids like lysine, tryptophan, cysteine, histidine,… are very sensitive to heat especially dry heat. Loss of these amino-acids reduce food quality (Barrows *et al*., 2007). Extruder food has these benefits in addition to pellet food benefits:

Starch of food is completely gelatinized in extrusion process. So its digestion will be accelerated and 90% improved. In pellete food starch digestion capability is almost 20%. Extruder food has soft spongy tissue and floats sustainably in the water. So it decreases food waste. Other benefits of extruder food are better food sterilization and deleting of harmful microorganisms (Pourjafar, 2007).Some studies were done about extruder food in recent years (Hilton et al., 1981; Pfeffer et al., 1991; Watababe and Pongmaneerat, 1993; Sørensen et al., 2002; Cheng and Hardy, 2003;Barrows et al., 2008).But there are a few studies about effects of extruder food on FCR (Boccignore*et al*., 1989; Al- Ruqaie, 2007;Degaura andSan Lucjan, 1997).

In this study, it was tried to compare between extruder and pellete food in addition to introduce a correct method for FCR calculation to determine economical food that

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give more profit to culturists.This study was done in rainbow trout fish farm in Chaharmahal-va-Bakhtiari province (Iran) in 30 days from 23th of August to 22thof October 2010.10000 fish specimens of one pond with average weight of 100 grand total weight of 1000 kgand total weight of1000 kg were collected. These fish were divided into 4 groups each contains 2500 specimens (Table 1). Then fish were introduced into 4 ponds each had a volume of 120 m^3. Input water to each pond was 60 lit/sec. Ponds were named as A, B, C and Dtreatments. Theponds A and B were fed by extruder food with amount of 2% of body weight and ponds C and D were fed by pellete food with the same amount in 60 days. Experiment was done with 4 replicates. Fish were sampled every 15 days. In each randomized sampling there were 5 replicatesand average weight and average legth of 200 fish were randomlymeasured. Finally,the FCR were calculated as follow:

Food conversion rate (FCR) = Food eaten/Weight gain.

For weighing fish digital scale with accuracy of two decimal places and for length determination biometric board were used. Weight and total length (TL) calculation were done in farm and then 200 harvested fish were released to pond again.

Differenc between FCR in two different kinds of diets was determine by one way ANOVA by SPSS version 19 (Table 2).

Table 1-Rainbow trout biological characteristicsand the fish ponds features

Pond	No.of fish	Average weight (gr)	Total weight (gr)	Average TL(cm)	Water volume (m3)
A	2500	100± 10.3	250	20±5.5	120
B	2500	100±7.5	250	20±4.3	120
C	2500	100±9.2	250	20±6.2	120
D	2500	100±9.8	250	20±6.9	120

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Table 2-Average FCR in ponds fed by extruder food compared with ponds fed by pellete food in study period

Pond	Total fish	Average weight (gr)	Average TL(cm)	Mortalities (%)	Total weight	New average weight (gr)	New average length (cm)	Total weight (kg)	Type of comsumed food	Amount of food (kg)	Weight gain (kg)	FCR
A and B	500	100±8.6	20±5.1	46	500	282±30.3	35±7.2	1397	Ex	876	897	0.9±0.1
C and D	500	100±9.5	20±6.4	103	500	211..5±33.2	35±5.8	1035	Pl	767	535	1.43±0.5

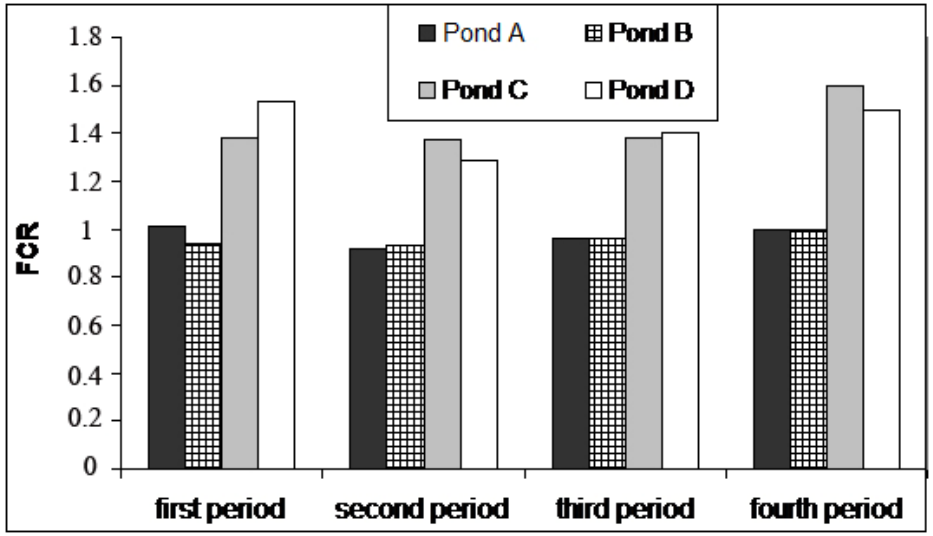

Figure1-A comparison on FCR in ponds fed by extruder food and pellete food

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Attention to tables,diagram 1 and specified factors show that using extruder food has positive effects from all aspects. FCR in fish fed by extruder food was significantly higher than fish fed by pellete food ($P<0.05$).Factors like food quality, environmental factors, feeding management and fish health are effective on FCR. Using extruded food has a lot of benefits like fast growing in trout fed extruded food (Watababeand Pongmaneerat, 1993; Watabe and pongmaneerat,1993;Barrows *et al*., 2008)degree of extrusion, not only starch degradability by amyloglucosidase but also performance of troutwas improved (Pfeffer *et al*., 1991).Extrusion significantly improves ADCs of dry matter (Cheng and Hardy, 2003), food digestibility (Sørensen *et al*., 2002) and causes lower weight but higher feed efficiency(Hilton *et al*., 1981).According to tables 8 and 9, it is clear that FCR obtained with consumed food had significant difference with each other (FCR of extruder food was 0.98 and FCR of pellete food was 1.43). Growth rate, food digestion and keeping nutritive materials in rainbow trout was studied in different temperatures. The more the temperature of extrusion, the more growth will be for fish (Sørensen *et al*., 2005). If temperature is 127^0C, FCR will be more than the time temperature is 93^0C (Barrows *et al*., 2007). Extrusion process will rise the value of protein materials and causes better digestion of proteins (Sørensen, 2007).In the present study, ponds fed by extruder food, had less mortality. But it is very important to consider this point in rainbow trout farms that these results are obtained in this farm condition and with food made in mentioned date. So culturists shoud choose the most qualified and economical food with exact calculation of FCR in 15 day periods (Experience has shown that this period is suitable) to obtain the best econocic efficiency.

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