The Effects of Feeding Rates On The Growth Performance And Feed Utilization Of Black Seabass, Dicentrarchus Labrax (Linnaeus,1758)

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Abstract:

A feeding experiment was conducted over 17 weeks between 15th November 2005 and 21th March 2006, to investigate the effects of feeding rates on the growth performance and feed utilization of Black seabass, *Dicentrarchus*. *labrax*. Four feeding rates were employed: 1.0; 1.5; 2.0 and 2.5%BW/day. The fish increased in body weight observed at all feeding regimes. At the end of the experiment, the feeding rate of 2.0%BW/day gave the best growth performance, specially specific growth rate (SGR%), but this growth was not high significant difference ($p < 0.05$) than that observed with other treatments. The feeding rate 2.0%BW/day gave the best performance and improved feed utilization over all with regard to

Food Conversion Ratio (FCR), and Feeding Efficiency (FE%). This should be seen both in the light of economical in the marine intensive fish farm as well as environmental implications.

Key words: Feeding rates. Growth performance. Feed utilization, *D. labrax*

1. Introduction:

The black seabass, *Dicentrarchus labrax* (L.), is a marine aquaculture species. It has a resistance to high variation in the environment and highly economic value in the Mediterranean fish market. Food quality and feeding management are the key parameters to the economic feasibilities for all intensive cultured species such as *D.labrax*, especially in the Mediterranean region. For economic reasons, the food management in fish farming has been vitally important for efficient aquaculture. Under feeding led to a loss of production. Over feeding will cause a wastage of expensive feed and is additionally a potential cause of water pollution. Thus, both over and under feeding have serious economic consequences which affect the viability of the farm (FAO,1987). At present feed costs can range from 40-60% of the total production costs in some intensive fish farm operation and obviously is one area where any improvement is very useful (Ross,1990). Feeding rates is the most influence biotic factor affecting growth performance of the fish (Brett,1979). The important of the feeding rates has been emphasized investigated by several researchers for different species (Bryant & Matty,1981 : Allen & Wotton, 1982). However feeding rates are inversely proportional to the age or size of the fish and vary widely between the fish species (Krishnan & Reddy, 1989). The feeding rates of the commercial species are often based on feeding tables with some modification resulting from the experiences on the particular

fish farm. *D. labrax*, appears to eat all the food offered to it, however this does not means that it is converting this food. This species tend to eat more food than they may utilize at high temperature. This issue in terms of feeding rates needs tobe investigated. There is no information about the optimum feeding rates of *D. labrax* growing under commercial production or experimental level. The principal objective of the present study involved a feeding experiments carried out to investigate the effects of feeding rates (%BW/day) on the growth performance and feed utilization of *D. labrax*.

2. Materials and Methods:

2.1.Growth experiment:

The experiment was conducted over 17 weeks, between 15th November 2005 and 21st March 2006, this corresponded to a total of (120) days, including acclimation period of 3 weeks.

2.2. Experimental tanks:

(12) square, white fiber glass of (1.5 m^3) tanks was used. The tanks were located indoor were received bore hole water of constant salinity (37%). The tanks were supplied with water at a rate between 15-20 L/min, for each tank to keep and adequate dissolved oxygen level of 8.0 mg/L and a constant temperature of 21 c^o.

2.3.Experimental fish:

D. labrax were supplied by private fish farm company (Shut El-zawia), and transported to the experimental tanks of the Marine Biology Research Center in Tajura with sufficient oxygenation. A total of (480) fishes of an average weight (130) grams was distributed randomly in the

tanks with (40 fish/T). At the start and the end of the experiment a random fish samples from each tank was weighed, seven days intervals from each tank were also sampled, and under an anesthetic (2-phenoxy ethanol) weighed and measured the growth performance and food utilization . The weight of the fishes was measured using an electronic balance of an accuracy of (0.01)g.

2.4.Experimental diets:

The experimental fish were fed on a pelleted commercial food of 2.5 mm (Provimi B.V.Holland) it was supplied by a private fish farm company (Rass Elhelal Fish Farm). The proximate chemical composition of the basal experimental diets is presented in Table (1). Four feeding rates were exploited (1.0, 1.5, 2.0 and 2.5%/BW/day). The daily ration of food was divided into two equal amounts and was offered two times a day (8.00 am and 16.00 pm). The duration of the typical feeding session was lasted to an about one hour.

Table.1. Proximate composition (%) of the experimental feed (Provimi B.V; Holland).

Proximate	Crude protein	Crude lipid	Crude fiber	Moisture	Ash
Composition (%)	48.96	12.25	3.30	7.54	9.20

PROVIMI, commercial marine fish feed (Holland)

2.5.Assessment of fish performance:

At the start and the intervals of the experiment, the fish body weight was recorded, then we calculate the mean of initial and final body weight for each treatment. The following formula were used to calculate by equations: SGR(%/day)=log(Final BW) – log (Initial BW) / days X 100;

FCR = Food intake (g) /Increase in weight gain (g); FE(%) = Increase in weight gain (g) / food consumed X 100.

2.6.Statistical analysis:

Using the individual data for the three replicates of each treatment, statistical analysis was carried out to discover whether there was any significance differences between different treatments for each performance parameters. Data was statistically analyzed using Student-Newman-Keuls, Multiple Range Test (Zar,1996).It was employed at a level of significance of ($p < 0.05$). The analysis was performed on a personal computer using BMDP Statistical Software Package (Version PC 90).

3. Results:

3.1.The growth performance:

The results showed an increase of the body weight at all treatments. (Table.2). The best growth response was observed at feeding rate of 2.0%BW/day of the fish is 212.3 g, even thought there was no significant differences at ($p < 0.05$) among all feeding rates of 1.5%W/day and 2.5%W/day. Feeding fish at a rate of 1.0%BW/day showed significantly lower final body weight than *D. labrax* fed on other feeding rate. Similar results were obtained in the specific growth rate (%BW/day). The highest value of 0.6%, was found in feeding rate 2.0%BW/day, and the lowest value of 0.2% in feeding rate 1.0 %BW/day. No significant differences at ($p < 0.05$), were observed among the feeding rates of 1.5%, 2.0% and 2.5%BW/day.

3.2.The feed utilization:

Although there was no significant differences in food conversion ratio, the fish fed 1.0 and 1.5%BW/day gave the lowest FCR, of 2.2, followed by feeding rate of 2.0%BW/day of 2.5. Fish fed a feeding rate of 2.5%BW/day showed the higher FCR of 3.7. The FCR increased gradually with increase of feeding rate 1.0% to 2.5% BW/day. Feeding efficiency, showed a significant at ($p < 0.05$) decrease as the feeding rates increased. Feeding rate 1.0%BW/day, showed significantly ($p < 0.05$) the best feeding efficiency, followed by 1.5 then 2.0 %BW/day. The feeding rate of 1.0 %BW/day was significantly higher of ($p < 0.05$) when compared with the feeding rates of 2.0.% and 2.5 %BW/day respectively. The mean values of feeding efficiency ranged between 27.6 at fish fed 2.5%BW/day and 47.2 at 1.0%BW/day. (Table.2).

3.3.Mortality:

No fish mortalities was recorded during the experimental period except in feeding rate 1.0 %BW/day were 2 specimens (1.66%) was recorded.

Table 2. Growth performance and feed utiiization of *D*icentrarchus *labrax* fed on different feeding rates.

	Feeding rates (%BW/day)			
	1.0	1.5	2.0	2.5
Ini. BW (g)	136.3[a] ± 3.6	134.4[a.] ±4.3	134.4[a.] ±6.3	134.7[a] ± 6.0
Fin. BW (g)	166.6[nd] ±6.5	204.9[a] ±2.5	212.3[a] ±5.4	199.0[a] ±.6.8
SGR (%)	0.2[nd] ±0.0	0.4[a] ±0.0	0.6[a] ±0.0	0.4[a] ±0.1
FCR	2.2[a] ±0.7	2.3[a] ±0.2	2.4[a] ±0.1	3.7[nd] ±0.5
FE (%)	47.2[b] ±12.5	44.8[b] ±4.1	38.6[ab] ±1.8	27.6[a] ±3.8
M%	1.66	0.00	0.00	0.00

BW=Body weight, SGR=Specific growth rate, FCR=Food conversion ratio, FE=Feeding efficiency, M=Mortality; a, b, nd values in each row with the same superscript are not significantly different
($p > 0.05$) by using the Student-Newman-Keuls Multiple Range Test.

4. Discussion:

From the results obtained, there were differences in the growth performance among the feeding rates. The feeding rate 2.0 %BW/day gave a better overall growth performance compared to the other treatments, as regards, body weight and SGR. But there was an overall better performance in food conversion ratio (FCR), and feeding efficiency (FE), in the case of feeding rate 1.0 %BW/day, compared to the other feeding rates. At the other studies, growth performance improved or remained constant when fish fed a higher feeding rates than the control of carp, *Cyprinus carpio* (L.)

(Huisman, 1979), and milk fish, *Chanos chanos* (Forskal). Krishnan and Reddy (1989) observed a fall in growth rate at a higher level of feeding.

In the present investigation, increasing feeding rates from 1.5% to 2.5%BW/day, resulting an increase in food conversion ratio (FCR). This results conform with Hasan and Macintosh (1993), *C. carpio* (*L.*). Feeding at a rate of 2.0%%BW/day gave an FCR of 2.5 and feeding efficiency (FE) of 38.6 compared to a FCR of 2.2 BW/day given by fish fed 1.0% and a FE of 47.2 and an FCR of 2.3 by fish fed 1.5%BW/day with a feeding efficiency of 44.8%. Al-Ahmad *et al*, (1988) grow 70 g. *Oreochromis spilarus* (*Gunther*), in sea water found that increasing feeding rates from 1.0% to 3.0%BW/day increased food conversion ratio from 1.2 to 2.4. In another experiment with 80 grams fish increasing from 1.0% to 2.0% increased FCR from 1.8 to 1.9. With 130 g. *O.spilarus* (G.), grown in sea water cages and tanks. Cruz *et al*. (1990), observed that the maximum SGR (0.90%/day), by fish fed 2.0%BW/day and the best FCR was 1.67. Increased feed efficiency at a lower feeding rate of 1.0 %BW/day was observed for *I. punctatus* (Andrews and Stickney, 1972) and *C. carpio (L.).* (Huisman , 1979). The FCR of feeding rate 1.0, 1.5, and 2.0%BW/day, as observed in this study, is an agree with the results found by kissil and Koven, (1987), working on the same species, *D.labrax*. The values obtained were : 2.0 and 2.11 respectively.

This result would also support the result of low value of food conversion ratio (FCR) obtained by feeding the fish at a rate of 1.0 – 2.0 %BW/day (Table 2). A similar decrease in SGR, was found with an increase of the feeding rate above 2.0% as reported by Cho (1992) and Robert *et al* (1993).

The values obtained in this study with *D. labrax* for SGR, FCR, and FE compare well with the results obtained by other workers on *D. labrax*. Marais and Kissil (1979), working with 45g *D.labrax* at a temperature from 22c^{o} to 26 c^{o} obtained a maximum specific growth rate of 8.1%BW/day. The maximum feeding efficiency and food conversion ratio obtained by these authors were 49.02%/day and 2.10 respectively. With temperature varying from 20c^{o} to 23 c^{o}, using 48 g of *D. labrax* fed to satiation. Kissil (1982) observed a maximum SGR of 0.7%BW/day and the best FCR was 2.09. Vergara (1992) grew 60g *D.labrax* at 22 c^{o} at a rate of 2.0 %BW/day. Maximum values of SGR and FE were 0.64%BW/day and 1.14% respectively.

In this study the fish were grown at a temperature from 21 c^{o} to 24c^{o}, and fed at rate between 0.1% and 2.5%BW/day. It appears clear from the analysis of the feed (Provimi P.V. Holand) used during the experimental period of the study that the protein content 48.96%% and lipid 12.25% of diet, there are sufficient energy requirements of *D.labrax*. and *S. aurata*. This is supported by various authors, such as Kissil (1982) and Vergara (1992), found that reported values of 40% and 42% to 46% respectively as being sufficient.

Overall these findings suggest that the feeding rate of 1.0%BW/day improved the feed utilization by *D. labrax*. Although not significantly different, faster growth was observed when fed 2.0%BW/day. This should be seen in the light of economical considerations weather faster growth is desired or weather a better food conversion ratio is sought for, or a compromise between the two factors SG and FCR. According to the commercial feeding tables of feed factory, the feeding rates used for growing *D.labrax* at a temperature of 20 c^{o} should have been 1.5 - 2.0 %BW/day (Ewos S . A, Spain), 1.5-1.7%BW/day (Provimi B . V. Holand).

The results of the investigation indicate that 1.0%BW/day at an average temperature 21 c^{o}, obtained the best FCR of all treatments and slightly lower SGR, though not significant difference at ($p > 0.05$), with 2.0%BW/day. It is clear that the feeding rate of 2.0%BW/day , obtained in this experiment, is not in agreement with that used by the commercial feeding tables, even that of (Provimi B.V. Holland), the commercial feed used in the experiments.

The 2.0%BW/day feeding rate may be considered the optimum feeding rate for on-growing *D.labrax* and more economical than the feeding regimes used by the commercial feeding tables. Also the results indicated that a feeding rate 2.0%BW/day was excess for on-growing. *D . labrax* .Food conversion ratio is the reduction of waste production and impact on the environment. Wastes from fish farming arise mainly from the faeces, the excreta of the farmed fish and the wastage of uneaten food which pass through the cage into the environment .Both food and faeces sink, with the actual settling rate being dependent on several factors such as size, shape, density and stability of the diets.

5. Conclusion:

All fish showed an increase of body weight at all feeding rates, even at the lowest feeding rate of 1.0%BW/day. The feeding rate of 2.0%BW/day gave the highest value of growth performance in *D . labrax* compared with the other feeding rates, but this growth was not significant difference at ($p< 0.05$) from that observed with fish fed at 1.0, 1.5 and 2.5%BW/day. In general the growth performance and feed utilization obtained in this experiment compared well with those of other experiment on *D.labrax*. There is obviously still a great deal of work that needs to be done in order to improve on the food conversion ratios of *D. labrax*. While

the results obtained in this experiment have given some clear indications. Further studies are needed. In the addition , any results must be extrapolated with caution to an industrial fish farming scale. Generally the best feeding rate was 2.0%BW/day, may be excessive for on-growing *D.labrax*. This work showed that increased growth by increasing feeding rate above 2,0%BW/day, but not significant difference. Indeed it may cause pollution of the water due to food wastage.

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