THE EFFECTS of YEAST DERIVATIVES (BIO-MOS®) on GROWTH of GILTHEAD SEA BREAM (*Sparus aurata*)

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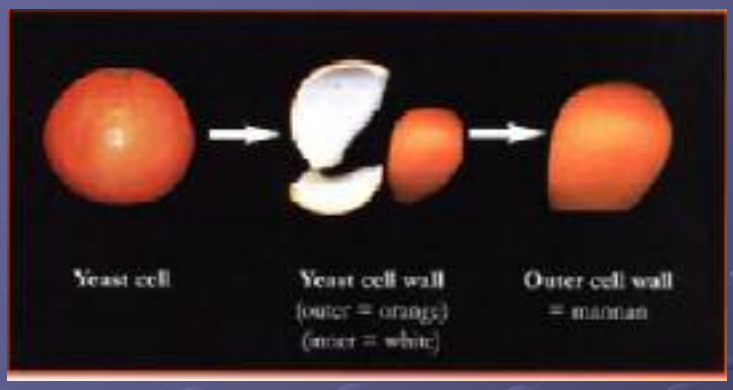
1. INTRODUCTION

- Aquaculture production is developing all around the world. In relation to this, good quality products and cost-effective production are gaining more importance every day. The shortage on feed raw materials is seen on a global basis and it's a factor that pushes the developing aquaculture industry to look for alternative raw material sources. It is necessary for these alternative raw materials to provide benefits on the production side.
- Research accumulated in recent years has shown that yeast is a versatile & alternative raw material with different applications. It is proven that the use of products derived from yeast (direct usage of active or inactive yeast or different products obtained by the application of novel technologies) has several positive effects on animal production, with the most significant effect on economical production.
- The objective of this study is to determine the effects of Bio-Mos® on the growth of gilthead sea bream (*Sparus aurata*) in commercial size production.

Bio-Mos® represent a new era in biological gut microfloral modifiers. These pure spray dried mannanoligosaccharides have been processed and prepared with the animal feed industry's requirements in mind.

Bio-Mos® is a mannanoligosaccharide derived from the cell wall of yeast *Saccharomyces cerevisiae*. This complex carbonhydrate product has been scientifically proven around the world to be beneficial to animals.

Bio-Mos® developed from Alltech's vision of feed industry, not as it is, but what it will become. The application of advanced biotecnology to the effectiveness of yeast in monogastrics led to the identification of mannanoligosaccharides as being the active ingredient in many of responses seen to yeast. This activity has been concentrated in form of Bio-Mos®



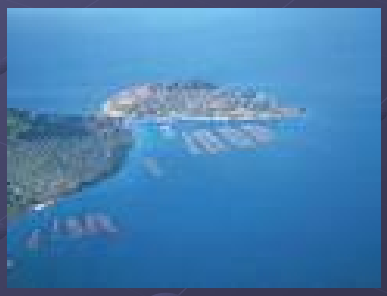
The diagram above illustrates the origin of Bio-Mos®. The fruit represent the yeast cell and the peel represent the yeast cell wall. This is separated into the inner (white rind) and outer cell wall (orange-colored skin). The outer cell wall consist of glucomannoproteins, of which mannanoligosaccharides constitute a major part. These are utilized to create the product Bio-Mos®

2. MATERIAL

This study is focused on to look for the effects of Bio-Mos® to growth in different levels which have been 2-4 kg Bio-Mos®/ton feed for Gilthead Sea Bream (*Sparus aurata*).

Experiment has been desinged triplicated in 9 octogonal cages at Kılıc Marine Products company which located at south-west part of Turkey (Bodrum-Milas). Fish were counted manually and placed in cages.





2.1. FEED. Press pelled feed has been produced at Kılıc fish feed Mill.





Figure1,2: Kılıc Fish Feed Mill.

Experimental feed were formulated by replacement of wheat meal by bio-mos® 2-4 ‰ as shown at the table 1.

Table1. Feed formula of essay

	Cntr. Group (kg/ton)	Group I* (kg/ton)	Group II** (kg/ton)
Soybean Germ 48	220	220	220
Corn Gluten	80	80	80
Fish Meal (Peru65)	400	400	400
Wheat Brand	50	50	50
Wheat meal	160	158	156
BIO-MOS®	0	2	4
Fish Oil	79,75	79,75	79,75
D-L-Methi.98%	2	2	2
Antioxidant	0,25	0,25	0,25
Pelled binder	3	3	3
Rovimix	5	5	5

* Replacement of Bio-Mos® with wheat meal 2‰(2 kg/ton Bio-Mos®)
** Replacement of Bio-Mos ®with wheat meal 4‰ (4 kg/ton Bio-Mos ®)

2.1.1. Nutritional Value of Feed

Feed were analyzed in laboratory and nutritional value of experimental feed's given at the table 2.

Table 2. Nutritional Value of Feed

	Cntr. Group (%)	Group I (%)	Group II (%)
Dry Matter	**89,90**	**90,01**	**89,83**
Crude Protein	**44.30**	**44.24**	**44.21**
Crude Fat	**12.50**	**12.51**	**12.50**

Fish were fed ad libitum by fisheries engineers. Divers were checked if the fishes were eating feed or not.

2.2. FISH: Gilthead Sea Bream (*Sparus aurata*) is one of the important species in aquaculture at Mediterranean.

Phylum : *Chordata*
Subphylum : *Vertebrata*
Classis : *Osteichtyhes*
Superordo : *Teleostei*
Ordo : *Perciformes*
Subordo : *Percoidei*
Family : *Sparidae*
Genus : *Sparus*
Species : *Sparus aurata* (Linneaus, 1758).



Figure 3. Gilthead Sea Bream (*Sparus aurata*)

Fish were stocked in cages as 20 000±210 fish/net-cage with average 172.11±13.19 g initial weight in July 2004.

Fish were fed with basal diet during July and with experimental diets during August for to adaptation.Fish weight hasn't got in August. First sampling for this study is taken at the beginning of September.



Figure 4. General view of fishes in cage

2.3. NET-CAGE:

Fish were stocked in 9 Octagonal net-cages with 760 m^3 volume.





Figure 5,6 : General view of net-cages

2.4. CHEMICAL COMPOSITION OF MARINE WATER

Chemical composition of marine water is checked and avarage amounts are given at the table 3.

Table3. Avarage marine water parameters.

Parameters	Amount
Temperature	20-24 ^{0}C
pH	7-8
Salinity	‰36 ± 0,5
O_2	8 ± 0,5 mg/L

3. METHOD

Sampling is done as seen figures below and meristic mesuerments is taken. Sampling is done every month during the study. Results have been evaluated statistically (ANOVA)









Figure 7,8,9,10 : Sampling of fishes from cages.





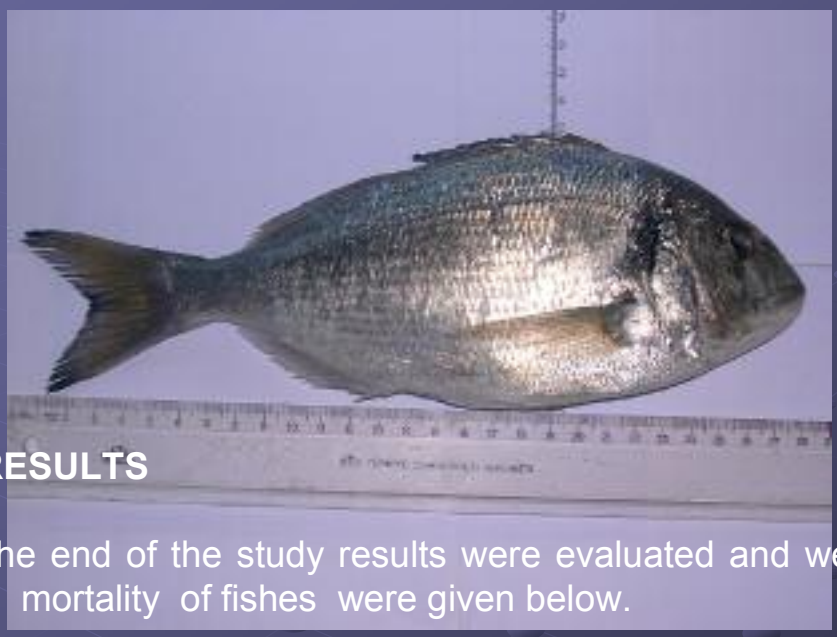


Figure 13,14,15: Measurement of fishes.





Figure 11,12 : Records of meristic numbers.



4. RESULTS

At the end of the study results were evaluated and weight gain FCR and mortality of fishes were given below.

4.1. WEIGHT GAIN RESULTS

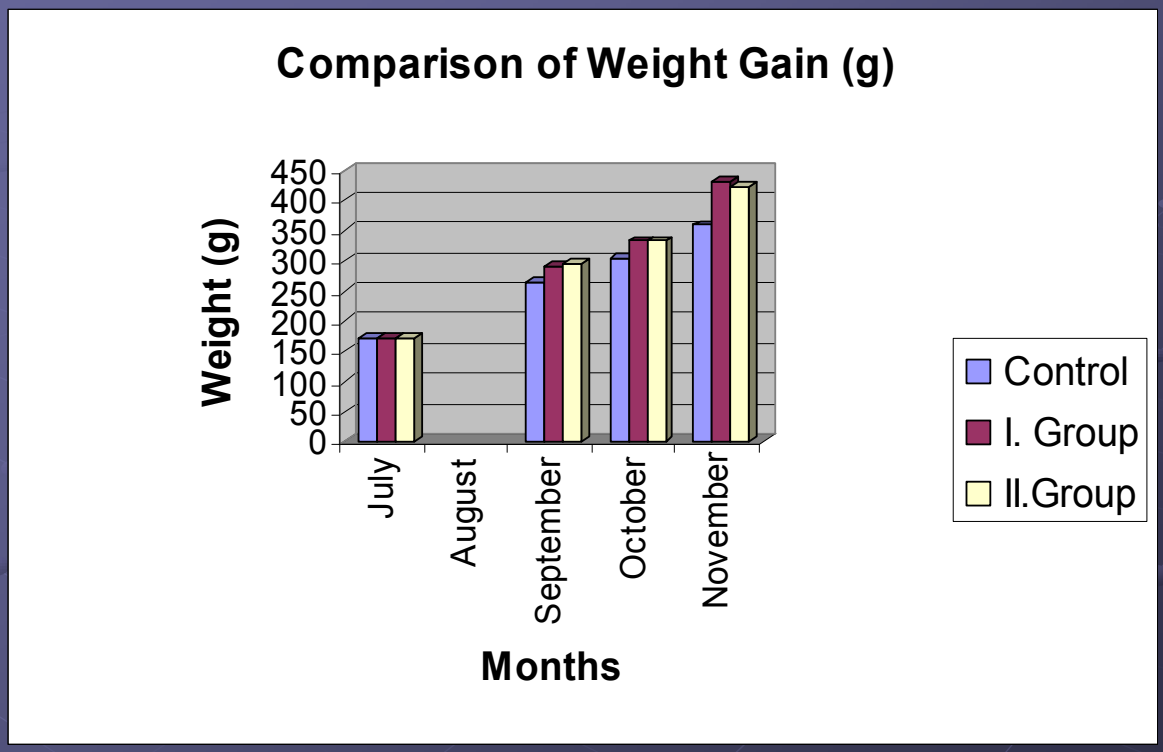
Weight gain results were comparated between control group and group I ,II in row.

Table 4 . Avarage weight of fish (g).

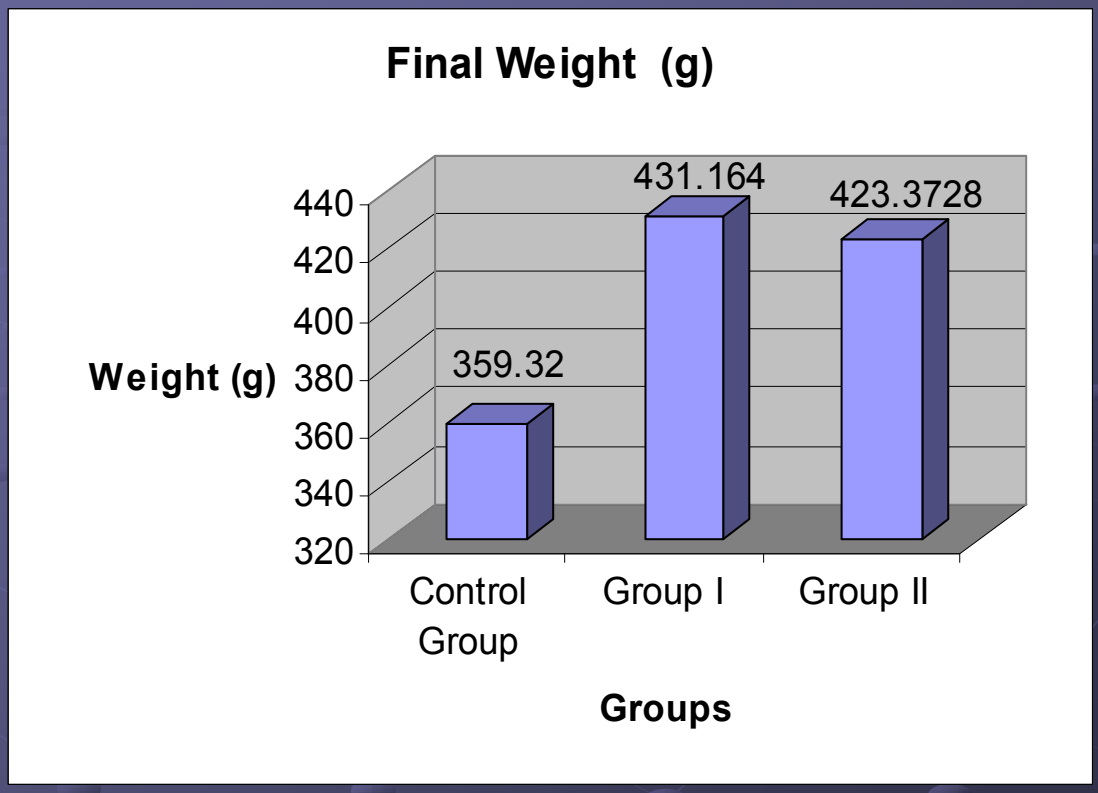
	Control Group	Group I	Group II
Initial	172,11±13.19	172,11±13.19	172,11±13.19
September	266,07±0.86	292,07±0.86	294,97±0.76
October	303,75±1.18	332,75±1.08	332,57±0.61
November	359,32±1.16	431,16±1.25	423,57±1.08

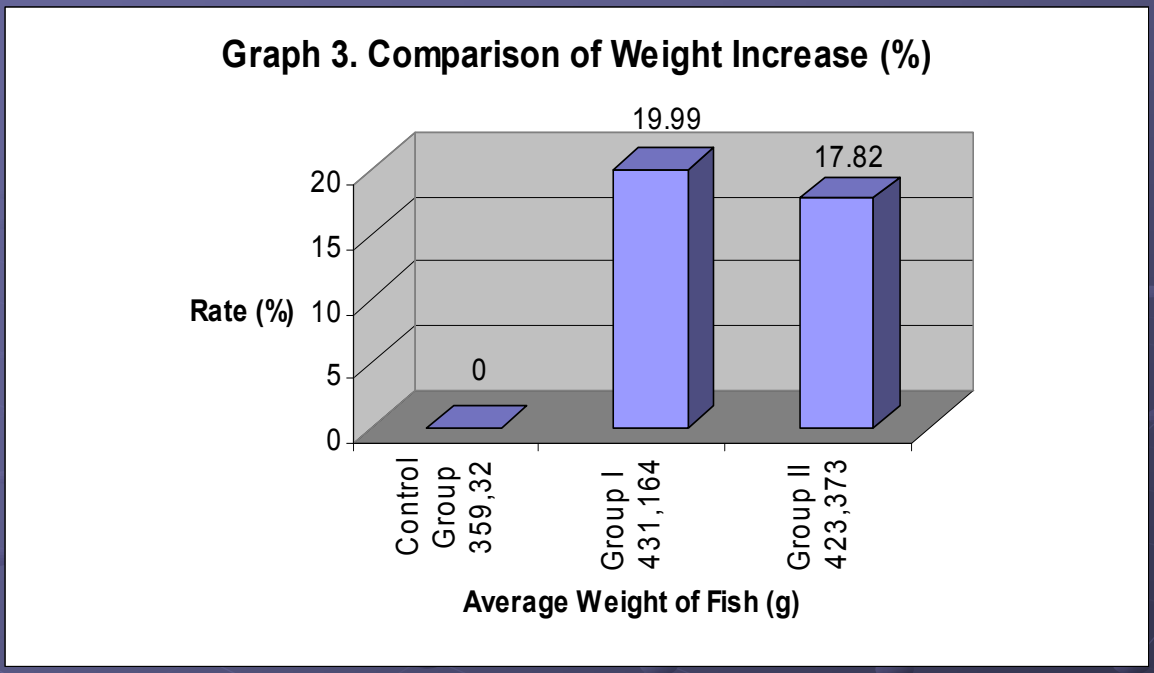
Initial weight of fish has taken in July, while the fish were locating in cages. First sampling for the study is done at the beginning of September. Avarage weight has been 266,07g, 292.07g, 294,97g in September at control group, group I and Group II in row, 303,75g, 332,75g and 332,57 in October, 359,32g, 431,16g and 423,57 g in November (Table 4, graph1,2).

Graph 1. Monthly Weight Gain



Graph 2. Final weight of fish





Differents between all groups according to the weight gain have been important ($p<0.05$). If we accept control group as zero weight gain of group I has been 19% and group II 17.82% higher than the control group.

4.2. FEED CONVERTION RATE (FCR)

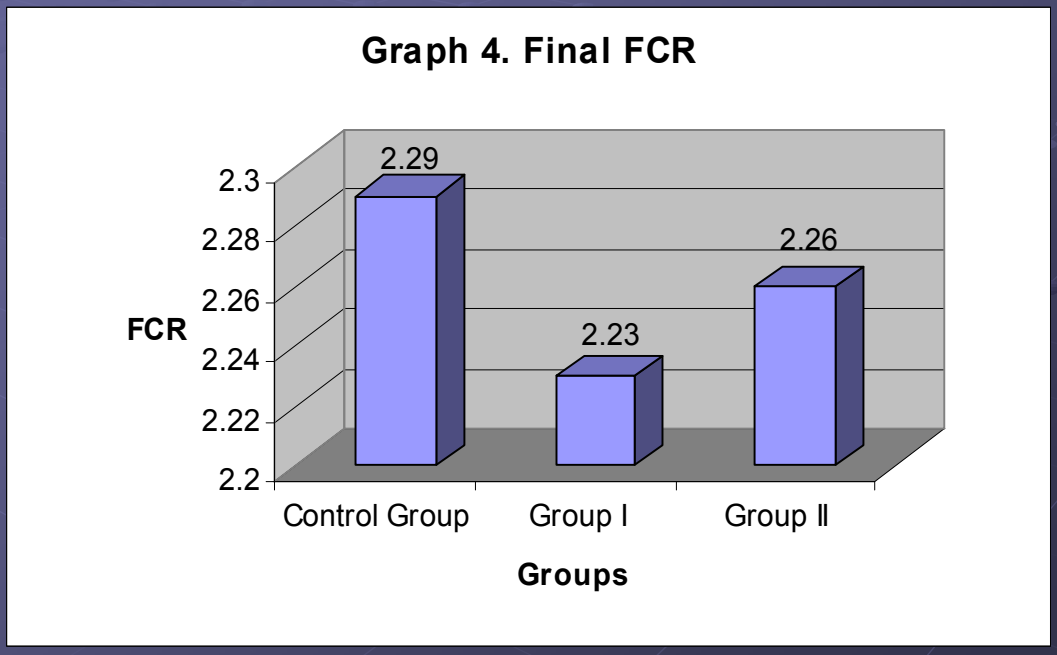
Results of FCR is given at table 5. According to this table FCR has been 2,32 at control group, 2,36 for group I and 2,34 for group II until the beginning of September. FCR results at the beginning of October has been 2,47- 2,30 and 2,30 respectively. In November FCR has been 2,10-2,02 and 2,13 in row. Final FCR according to these results have been 2.29 in control group, 2.23 in group I and 2.26 in group II. Yeast and yeast derivates have possitive effect on immune-system and stress. FCR of control group have been the highest while the water temparature decreasing in October. This could be related with exist of yeast derivate (Bio-Mos ®) in the feed.

Table 5. FCR of groups.

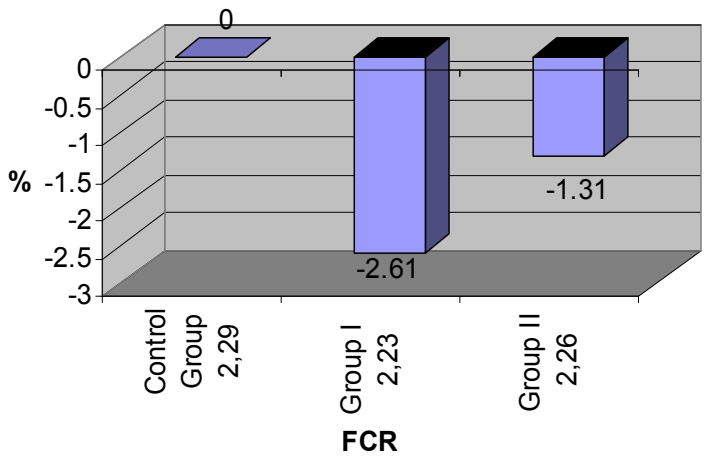
Months	Cntr. Group	Group I	GroupII
September	2.32	2.36	2.34
October	2.47	2.31	2.30
November	2.10	2.02	2.13
Final FCR	2.29	2.23	2.26

4.2.1. Comparison of final FCR

Final FCR has been compared statiscally (ANOVA).
Differences between groups for FCR has been important ($p<0.05$).



Graph 5.Comparison of FCR Decrease (%)

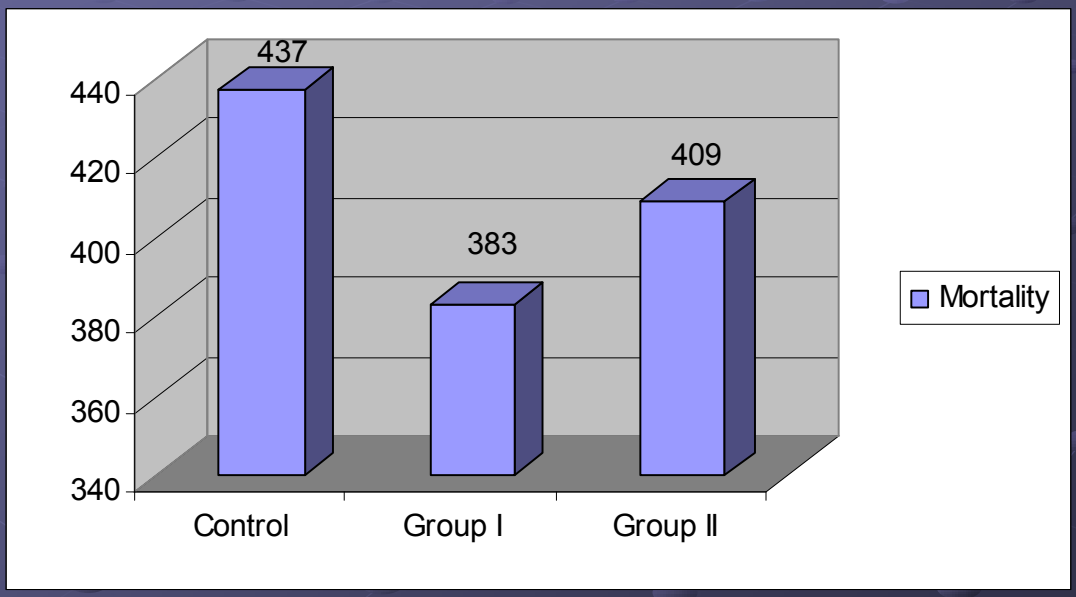


If we accept control group as zero, group I has shown 2.23% and group II 1.31% less value in this study.

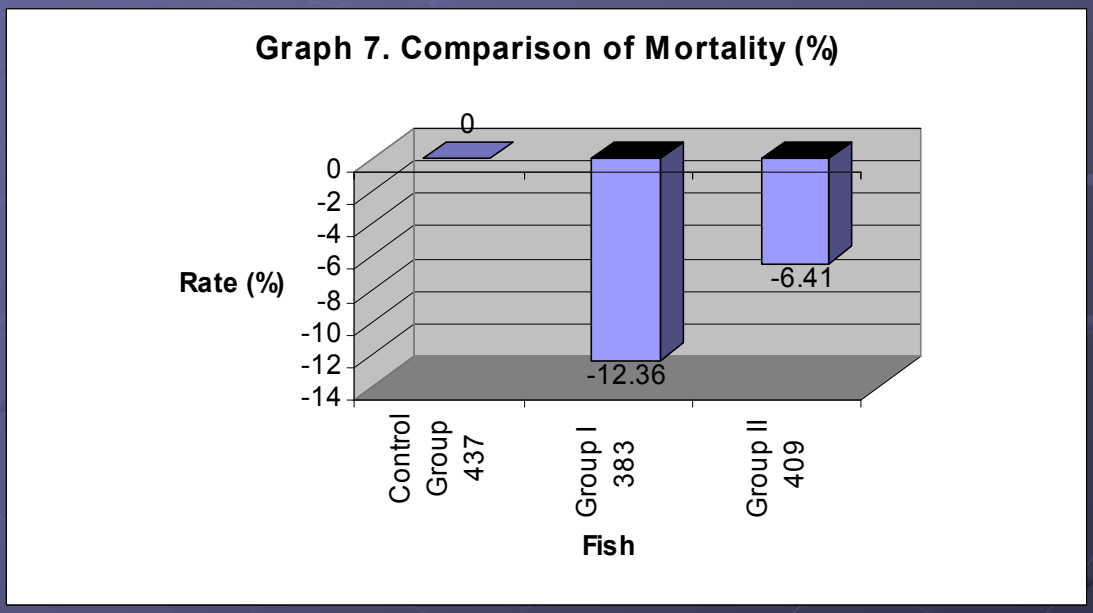
4.3.MORTALITY

Number of death fish has been recorded during the experiment. At the end of the harvest there have been 437 death fish at control group, 383 at group I and 409 death fish at group II.

Graphic 6 .Final mortality at groups.



Mortality has been evaluated by t-test and differences between groups has been important ($p<0.01$).



If we accept the amount of death fish at control group as zero, mortality rate at group I has been 12.36%, group II 6.41% less than control group.

5. CONCLUSION

Present study has been designed in commercial size at Kılıc Marine Products Company. Total fish amount has been around 180 000 fish with 20 000±210 fish/cage. So 9 octagonal cages that each one has around 760 m3 volume has been used. Fish were divided in to three groups as named control group, group I and II. Each group has been designed triplicated which means around 60 000 fish/group in three cages.

Feed compositions were changed by replacement of wheat meal by Bio-Mos® as 2‰ in group I and 4‰ in group II diets.

Weight gain, FCR and mortality of fishes were investigated. Group I is shown the best results with 431,16g weight gain, 2,23 FCR and 323 death fish. Differences between groups were important so we could say that 2‰ of Bio-Mos ® has shown the best results in this study.

Feeding of fish by carbonhydrates which's produced from yeast cell wall decreases mortality by improving the fish's non-specific immune mechanism(Robertson *et al*.,1990; Raa *et al*.,1992; Engstad and Robertson, 1993).

Studies has shown that commercial mannanoligosaccharides sources prevents rainbow trout against to cold water patogens (Howes, 1994).

Salmon has been fed by different types of yeast derivates at normal growth and disease periods. There have been significant decreases at mortality in 60 days. In 8 different diet compossitions mortality haven't been upper than 10% (M.Dehasque *et al*.,1995). Yeast has been replaced from 10% to 50% at diets of juvenile Sea Bass. Feed in take has been higher than the control group. It has been determinated that 30% and higher (50%) rates of yeast in diet has improved the feed efficiency (Oliva-Teres, A., Gonçalves, P.,2001).

Replacement of fish meal by yeast (*Saccharomyces cerevisea*) for Gilthead Sea Bream has been studied. Yeast in experimental diets were inactive, old bread yeast, which mostly existences by death cells. This study has been focused on effects of yeast to digestibility, growth rate & blood parameters of Gilthead Sea Bream in several ratios (%10,20). There haven't been significant differences between groups for protein, lipid and cellulose digestibility (p>0,01). Which means that there hasn't been any negative effect of yeast to digestibility (Salnur et all.2004)

This is the first study on the effects of Bio-Mos ® to growth in commercial size at Gilthead Sea Bream which is important species in Mediterranean.

This study is done in commercial size and conditions. Even if differences has been important for FCR numbers it could be conclude that these numbers are so close to each other by 2,29 in control group, 2,23 in group I.

When we compare this results this means that 6% less feed consumption than control group for the farm. This amount means around 6 tones less feed usage. Besides because of weight gain of this group have been higher than the other groups harvesting time have been earlier than others. This is so important point for farmers, because if they harvest their fish earlier it means less feed and labouring. On the other hand when the fish reach up to 300 g earlier, market price would be two-fold higher that would be increase the profit of the farmer.

Acknowledgement

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