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EVALUATION OF ADDITION OF WHITE WORM (*ENCHYTRAEUS ALBIDUS* HENLE, 1837) TO DIETS ON QUALITY OF BROWN TROUT (*SALMO TRUTTA FARIO*)

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Abstract
This paper evaluated usage possibility of white worm added to brown trout pellets at different percentages. The experiment was designed as 4 groups (Live feed, Pellet, and additions of (0.25 and 0.5%) white worm with 3 replicates. Each tank included 30 fish. After 90 days of feeding proximate analyzes of whole body were made from 16 fish of each group. It was shown that addition of white worm increased meat quality.

Keywords: carcass composition, live feed, Salmo trutta, white worm.

1. INTRODUCTION

Quantity of fish production is mainly foucing on salmonid aquaculture due to its easy artificial reproduction procedures for many years. It is also depend on the fish meat quality of salmonids increasing consumer acceptance and reasonable prices of the farmed product. Sustainable fish farming requires good flesh quality with effective fish processing. Therefore various studies were conducted on the quality of fish flesh with proximate compositions (lipids, proteins, moisture, ash) (Rasmussen, 2001; Regost et al., 2001; Johnston, et al., 2006). Ghittino (1972) reported that the reasons for using dry pellets in aquaculture are varying many such as storage and consumption rate, stablility in water and less pollution as long as they provide sustainability in growth and feed utilization of the fish. It has been reported that fish body conpositions were not changing many based upon plant proteins and lipid sources in comparion to traditional feeds, fish meal and oil. In some studies there were no findings about the effect of dietary plant protein and lipid sources on salmonid body proximate composition (Hardy et al. 1987; Arzel et al. 1994). However, enhanced fat accumulation was observed in rainbow trout had diets with extruded lupin (Burel et al., 1998). Lipid amount in liver may be decreased by using feeds with vegetable origin compared to that of marine protein- and lipid-based one (Arzel et al. 1992; Arzel et al. 1995). Type of feeds change the quality of meat in organisms. Typically, marine fish larvae are initially fed live food (e.g., rotifers and Artemia), and then are weaned onto formulated diets as they attain a size or developmental state that supports consumption ofthese artificial feeds. Weaning onto formulated diets is a stressful time for cultured fish (Sterud et al. 2000), and this may be especially true for flat fish that have just undergone the dramatic morphological and physiological transformations associated with

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metamorphosis. Many fish and crustacean larvae and fingerlings require live food at the onset of exogenous feeding. Generally, different protein sources in salmonids diets have shown only little effect on quality of salmonids (Bjerkeng et al. 1997). Kaushik et al. (1995) reported altered sensory quality, especially flavour, when salmonids were fed with soybean products. Increasing dietary lipid and hence muscle lipid deposition is reported to have impact on sensory juiciness in salmonids (Johansson et al. 1991; Einen and Thomassen, 1998).

In the present study, a zooplankton, white worm, was added at different levels to salmonid diet to see the effects on the proximate content represents quality of fish meat. The effects of different feeding levels on growth performance and survival of rainbow trout alevins with White worm added feed was investigated for 90 days. Feeding level was adjusted based on the water temperature.

2. MATERIALS AND METHODS

Live feed, white worm, Enchytraeus albidus, was produced at aquarium fish rearing center of Ataturk University and used in order to increase the meat quality of the fish in this study. Brown trout (Salmo trutta fario) fry with an initial average weight of around 1.8± 0.01 g was provided by Aquaculture Faculty, Fishery Department Research and Extension Centre at Atatürk University in Turkey. Prior to the experiment, fry were acclimatized for 15 days in tanks and white worm added pellets were offered for 90 days. Experimental diets were Diet 1 (Pellet+0.25 % white worm), Diet 2 (Pellet+0.5 % white worm) and Diet 3 (Pellet). Fry were fed 3 times a day up to satiation with a granule diet with 55.26 % protein, 15.74 % fat, 89% dry matter and 8.41 % ash at a daily ration of 3.4% of their wet body weight throughout the study. White worm had 43.65% protein, 2.24% fat, 2.68% ash and 83.02 % dry matter. Water temperature was 9.0+1 °C during the study.

At the end of the experiment, fish were sampled and proximate analyzes were conducted to determine the nutritional quality of whole body from all of the feeding goups. Crude protein was determined by the Kjeldahl method (N*6:25. Fat content was determined by Sohxlet extraction method. Ash content was determined by the standard method, by incinerating the diets at 550°C for 16 h in a muffle furnace (AOAC, 2000).

Body weight, length, and viscera weight were recorded to calculate the condition factor (CF) = ([total body weight (g)] / [total body length (cm)]3 x 100), the Liversomatic index (LSI) = ([liver weight (g)] / [total body weight (g)] x 100) and the Viscerosomatic index (VSI) = ([viscera weight (g)] /[total body weight (g)] x 100) (Ricker, 1979).

Statistical analysis

All the results were subjected to analysis of variance (ANOVA). Duncan multiple range test was further used to evaluate the mean differences at $\alpha = 0.05$ level (Duncan, 1971).

3. RESULTS AND DISCUSSIONS

The proximate whole body composition (% fresh matter basis) of fish at the end of experiment was presented in Table 1.

Table 1. Whole body composition of Brown trout fed on White worm added pellets for 90 days

	Protein %	Lipid %	Ash %	Dry matter %
Diet 1	15.40±0.49a	8.72±0,15a	1.94±0.10a	75.14±0.27a
Diet 2	15.27±0.70a	8.41±0.35a	2.00±0.10a	75.08±0,38a
Diet 3	17.07±1.38b	8.61±0.51a	1.86±0.02b	74,89±0.62a

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There were no statistical differences between Diet 1 and Diet 2 with respect to protein and ash values, but both differed from Diet 3 ($p<0.05$). Considering lipid values and dry matter no difference were observed among the experimental groups.
Highest vales were determined form the pellet group (Diet 3) followed by 0.25 % white worm added group. There were negative correlation between White worm and protein, lipid and ash content of fish compared to Diet 2.
Body sizde and fish lenght shows the integration of feeding, assimilation and energy expenditure over a period of time. Condition Factor (CF) has been used to compare growth conditions of fish. A high condition factor reflects good environmental quality; while a low condition factor reflects poor environmental quality. Liversomatic Index provides an indication on status of energy reserve in an animal. In a poor environment, fish usually have a smaller liver indicates less energy reserved in the liver. Average final weights and lenghts and visceral organ weights are presented in Table 2. Mean of viscerosomatic index were all normal with no observable irregularity. The condition factor computed for Brown trout were above 1 indicating good health condition during the experiment representing an isometric growth, which is the desirable for fish in aquaculture (Ighwela, 2011)
Analyses of CF, LSI of fish could offer information on the general health condition of the organisms. Calculated values of LSI, VSI and CF are also given in Table 2.

Table 2. Growth and quality traits of Brown trout after 90 days of feding trial

	Weight g	Lenght cm	Viscera g	Liver g	LSI %	VSI %	CF %
Diet 1	14.93 ±3.22a	10.97± 0.62a	1.58± 0.38	0.21± 0.06a	0.014	0.106	1.131
Diet 2	17.28 ± 2.99a	11.50± 0.71a	1.96± 0.50	0.24± 0.09a	0.014	0.113	1.137
Diet 3	17.46 ± 3.43a	11.47±0.81a	1.89±0.39	0.22± 0.05a	0.013	0.108	1.158

At the end of the feeding trial the viscerosomatic index (VSI) and liversomatic index (LSI) were analyzed based on total body weight and organ weights of the fish. The results showed no significant differences in the viscerosomatic (VSI), liversomatic index (LSI) and CF values ($P>0.05$).
Siddika et al. (2012) reported that there was no significant difference between the carcass moisture and lipid of tilapia (O. niloticus) fed with different experimental diets.
Bilguven (2013) reported that dietary protein and fat level caused changes in the average live weight and carcass composition significantly ($P < 0,01$), but not in condition factor and in visceralsometic index.
The results indicated that the using of zooplankton as live food for fry caused slightly increase in growth performance compared to 0.25 group. Also, the fed by zooplankton was enough for fry and fingerlings to achieve suitable growth more than artificial feed (17.46 g average weight) in Diet 1 and Diet 2groups max 21.56 and 22.96 g of fish were produced respectively. The results of this study show that farmers may use live feed to increase utilization of feed and easily transition to dry feed.

4. CONCLUSIONS

Based on organ indices, this work concludes that the hepatosomatic index (HSI) values increased when increased dietary maltose levels, while no effect on viscerosomatic (VSI) index values. Therefore, based on the results of this study, the viscerosomatic index and hepatosomatic index are important indicators of fish condition status.

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6. REFERENCES

AOAC (Association of Official Analytical Chemists) (2000). Official Methods of Analysis. 17th edn. Association of Official Chemist, Washington DC. 2200 pp.

Arzel, J., Lopez, F. X. M., Métailler, R., Stéphan, G., Viau, M., Gandemer, G., Guillaume, J. (1994). Effect of dietary lipid on growth performance and body composition of brown trout (Salmo trutta) reared in seawater. *Aquaculture*, *123*(3-4), 361-375.

Arzel, J., Metailler, R., Huelvan, C., Faure, A. and Guillaume, J. (1992). The specific nutritional requirements of brow trout (Salmo trutta). Buvisindi (Icel. Agr. Sci), 6: 77-92.

Arzel, J., Métailler, R., Kerleguer, C., Le Delliou, H., Guillaume, J. (1995). The protein requirement of brown trout (Salmo trutta) fry. *Aquaculture*, *130*(1), 67-78.

Arzel, J., Metailler, R., Le Gall, P., Guillaume, J. (1998). Relationship between ration size and dietary protein level varying at the expense of carbohydrate and lipid in triploid brown trout fry, Salmo trutta. *Aquaculture*, *162*(3), 259-268.

Bilguven, M. (2013). The effects of different dietary proteın and lipid levels and oil sources on the growth performance and body composition of rainbow trout (Oncorhynchus mykiss,W.). 1st Annual International Interdisciplinary Conference, AIIC 2013, 24-26 April, Azores, Portugal - Proceedings- 807

Bjerkeng, B., Refstie, S., Fjalestad, K. T., Storebakken, T., Rødbotten, M., Roem, A. J. (1997). Quality parameters of the flesh of Atlantic salmon (Salmo salar) as affected by dietary fat content and full-fat soybean meal as a partial substitute for fish meal in the diet. *Aquaculture*, *157*(3), 297-309.

Einen, O., Thomassen, M.S. (1998). Starvation prior to slaughter in Atlantic salmon (Salmo salar). II. White muscle composition and evaluation of freshness, texture and colour characteristics in raw and cooked fillets. Aquaculture, 169, 37–53.

Gomes, E. F., Rema, P., Kaushik, S. J. (1995). Replacement of fish meal by plant proteins in the diet of rainbow trout (Oncorhynchus mykiss): digestibility and growth performance. *Aquaculture*, *130*(2), 177-186.

Hardy, R. W., Scott, T. M., Harrell, L. W. (1987). Replacement of herring oil with menhaden oil, soybean oil, or tallow in the diets of Atlantic salmon raised in marine net-pens. *Aquaculture*, *65*(3), 267-277.

Ighwela, K. A., Ahmed, A. B., Abol-Munafi, A. B. (2011). Condition factor as an indicator of growth and feeding intensity of Nile tilapia fingerlings (Oreochromis niloticus) feed on different levels of maltose. *Agric. & Environ. Sci*, *11*(4), 559-563.

Johansson, L., Kiessling, A., & Carlsson, R. (1991). Eating quality and growth of rainbow trout (Oncorhynchus mykiss) on feed with different admixtures of leaf nutrient concentrate. *Journal of the Science of Food and Agriculture*, *57*(2), 217-234.

Johnston, I. A., Li, X., Vieira, V. L., Nickell, D., Dingwall, A., Alderson, R., ... Bickerdike, R. (2006). Muscle and flesh quality traits in wild and farmed Atlantic salmon. *Aquaculture*, *256*(1), 323-336.

Rasmussen, R. S. (2001). Quality of farmed salmonids with emphasis on proximate composition, yield and sensory characteristics. *Aquaculture Research*, *32*(10), 767-786.

Regost, C., Arzel, J., Cardinal, M., Laroche, M., Kaushik, S. J. (2001). Fat deposition and flesh quality in seawater reared, triploid brown trout (Salmo trutta) as affected by dietary fat levels and starvation. *Aquaculture*, *193*(3), 325-345.

Ricker, W. E. (1975). Computation and interpretation of biological statistics of fish populations. *Bull. Fish. Res. Bd. Can.*, *191*, 1-382.

Siddika, I., Das, M., Sumi, K. R. (2012). Effect of isoproteinous feed on growth and survival of tilapia (Oreochromis niloticus) fry. *Journal of the Bangladesh Agricultural University*, *10*(1), 169-174.

Sterud, E., Hansen, M. K., Mo, T. A. (2000). Systemic infection with Uronema□like ciliates in farmed turbot, Scophthalmus maximus (L.). *Journal of Fish Diseases*, *23*(1), 33-37.

Walsh, M. L., Fairchild, E. A., Rennels, N., Howell, W. H. (2015). The effects of live and artificial diets on feeding performance of winter flounder, Pseudopleuronectes americanus, in the Hatchery. *Journal of the World Aquaculture Society*, *46*(1), 61-68.

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