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EVALUATION EFFECTS OF ADDITION OF WHITE WORM (*ENCHYTRAEUS ALBIDUS* HENLE, 1837) TO DIETS ON GROWTH OF BROWN TROUT FRY (*SALMO TRUTTA FARIO* L.)

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Abstract
This paper evaluated usage possibility of white worm, Enchytraeus albidus added to brown trout fry 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. Weigh gains and survival rates of fish were compared and assumptions were made with respect to consumption. It was found that addition of white worm to diets increased weight gain slightly (p>0.05). No differences were observed at survivals of fish (p>0.05). Feed conversion ratio was the higher in Lf group and followed by 0.5, 0.25 % white worm added groups and pellet groups in order. It may be suggested to fish farmers adding White worm at small quantities may provide better survival with not significant changes in total production.

Keywords: Brown trout, fry, live feed, white worm.

1. INTRODUCTION

It is well know that the understanding of early life stage is crucial for a successful fish farming since it is the most sensitive period and vulnnarable to a number of impacts related to human activities (Crisp, 1989). Adequate and balanced diet is the most important factor in fish culture. Growth depends on the feed intake and utilization of feed. Inadequate feed intake may cause health problems and deaths in the end. Balanced diets support fish to overcome environmental stress and to recover from infections. Imbalanced diets may cause deficiency diseases, nutritional toxicoses resulting economical losses. For this reason, diets are of critical concern and should be nutritionally-balanced and quality-controlled in fish production. There have been many efforts to use artificial feeds in fry stage, but this phase still requires a lot of natural food. Rotifers, artemia and copepods are often the first live foods in the aquaculture food chain. In Worldwide marine fish rearing practices, production of live feed organisms is one of the most important step for an optimum growth rate. Therefore, live feed usage in first feding has been a necessity in most aquatic organism hatcheries. Fish larvae at early stages may not be able to consume or ingest dry formulated feeds and require live feeds that swims actively and stimulate their raptorial behaviour. Although the period of emergence and first feeding in salmonids has attracted much attention, studies differ on the usage probibilities of various live feeds for transition to exogenous feeding in salmonid fry (Johnsen and Ugedal, 1990; Mambrini et al., 2004). Brown trout (Salmo trutta fario) is an

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indigenous species and consumed at high pleasure by Turkish people due to its phsical appearence. It has a wide market potential among the other farmed salmonids (Yanik et al. 2002; Kocaman et al. 2006). Brown trout (Salmo trutta L.) spawn in the autumn, hatch in winter or spring. After hatching, and exausting of yolk sac completely, the alevins start feeding exclusively on exogenous food. The first week is very important for fry due to high mortality (Elliott, 1994). Most studies on first feeding are laboratory studies, where the main focus often has been when food first should be presented to the fry in culture. Some studies have dealt with the period of first feeding in fry under natural conditions, where feeding might be constrained by food availability, aggressive competitors and vulnerability to predation (Elliott, 1989; Jonsson, 2001). Although increased larval somatic growth has been reported for fish species fed by live food (Koedijk et al. 2010; Busch et al. 2011). Number of studies dealing with diets of first feeding fry of brown trout is surprisingly low (Gabaudan et al., 1989; Arzel et al., 1992; Arzel et al., 1995; Bekcan and Atar, 2012). It is perhaps due to the difficulties of performing detailed studies of early life stages under natural conditions. A successful transition to exogenous feeding is crucial for fry survival. In the present study, a zooplankton, white worm, was used in order to investigate its effects on feed conversion rate, survival and growth of Brown trout fry to give a suggestion to fish farmers.

2. MATERIALS AND METHODS

Brown trout (Salmo trutta fario) with an initial average weight of around 1.8± 0.01 g was cultured under controlled environmental conditions at the Atatiirk University, Aquaculture Faculty, Fishery Department Research and Extension Centre in Erzurum in Turkey. Initially, fry were acclimatized for 15 days in tanks. Experimental diets were formed as pellet supplied 0.5 % white worm (P+0.5), pellet supplied with 0.25 % white worm (P+0.25), Pellet (P) and white worm as live feed (Lf). White worm was produced at aquarium fish rearing center of Ataturk University and used in the study. A total of 360 fry was stocked randomly in twelve rectangular fiberglass tanks, (four groups with three replicates containing 30 fry per feding group) with 2x0.5x0.4 m dimensions, 40 cm water depth and 1.2 l/min dissolved oxygen was used. Water temperature was 9.0+1 °C during the study. Fry were fed 3 times a day up to satiation with a pellet diet with 55% protein, 15% fat, 92.0% dry matter and 8.9% ash at a daily ration of 3.4% of their wet body weight throughout a 12 weeks of the study. Mortality and periodic feed consumption and body weight were recorded during the study. Fish were weighed collectively twice a month on a scale with an accuracy of 0.01 g and were not fed on those days. Mortality was recorded throughout the experiment.

Statistical analysis

Growth, feed conversion and survival rates were calculated. All data were analyzed using a one-way analysis of variance with the SPSS Statistics Package Program, version 10 (SPSS, 1999), followed by the Duncan's multiple range test to determine significant differences among means at the $\alpha = 0.05$ level (Duncan, 1971).

3. RESULTS AND DISCUSSIONS

Many fish and crustacean larvae and fingerlings require live food at the onset of exogenous feeding. It is reported that optimum feeding level should be maintained to achieve better survival and FCR. But less feeding might be result in less survival rate and less growth. Because of the dependence of feed conversion ratio on feeding level, fish farmer should choose the optimum FCR which can offer better growth and less mortality. The objectives of this research were to determine how different diets (Live feed, Pellet, and additions of (0.25 and 0.5%) influenced survival and growth of fry of Brown trout. In the present study, growth, feed conversion and survival rates of brown trout are

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presented in Figures 1-3. The initial average weights of brown trout were 1.86, 1.85, 1.86 and 1. 86 g for P+0.5, P+0.25, P and Lf groups respectively and did not significantly differ (p>0.05) from each other. So did the final average weights, except for Lf group, 11.88, 11.70, 11.87 and 1,69 g respectively. Feed conversion rate was so high in white worm group, Lf based on 12 weeks, 3.70; 21.78; -2.83; -2095.00; -2.24 and -27.68 for 2nd, 4th, 6th, 8th, 10th and 12-th weeks respectively. It was followed by P+0.5, P+0.25 and P groups. It has shown that adding white worm caused increase FCR. The mean survival rate of all groups were high and survival did not differ significantly during the study (p>0.05). Feed conversion rates were higher in groups with the addition of white worm than the others (p>0.05), however, survivals were better in these groups at the end of the study (Figure 2, Figure 3).

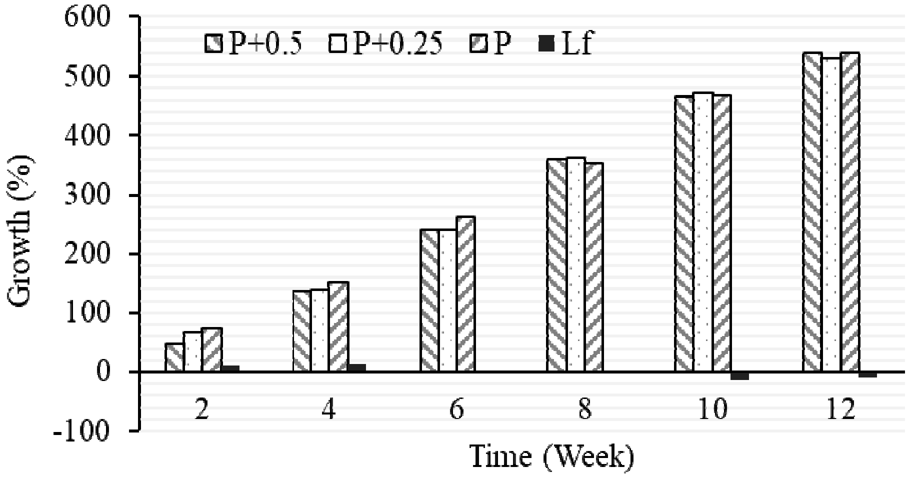
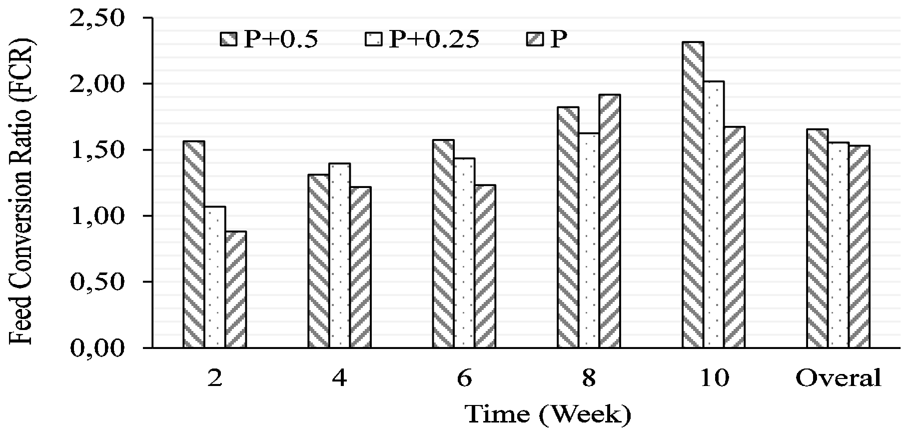


Figure 1. Growth data of brown trout fed with different levels of white worm, 0.5 % (P+0.05), 0.25 % (P+0.25), Pellet (P) and white worm as live feed (Lf) for 12 weeks



Lf	3,70	21,78	-2,83	-2095	-2,24	-27,68

Figure 2. Feed conversions (FCR) of brown trout fed with different levels of white worm, 0.5 % (P+0.05), 0.25 % (P+0.25), Pellet (P) and white worm as live feed (Lf) for 12 weeks

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Fish reared on live feeds exhibited slightly higher survival (p>0.05) and growth (P>0.05) than those reared on the pellet feed. Enhanced or lowered growth rates are explained by an increased feed intake associated (Thodesen et al., 1999) or not associated (Sanchez et al., 2001). Feeding with zooplankton itself was not enough for fry to achieve suitable growth more than artificial feed. It was reported that increaing natural feeds such as rotifers (Brachionus sp.) or brine shrimp (Artemia sp.) in rearing of marine fish species increased the production (Wilcox et al., 2006). In the present study feeding with the worm only did not give desired results in growth and FCR but in survivals.
Similarly, Karlsen et al. (2015) reported no effect on cod larval growth by increasing the prey size of wild zooplankton during larval development. However, several first feeding experiments in some fish species such as atlantic cod and ballan wrasse have shown that there were increase in survival, higher growth, less deformities, better pigmentation and higher stress tolerance by using live feed organisms i.e. rotifer and Artemia compared to traditional feeds (Øie et al., 2017).

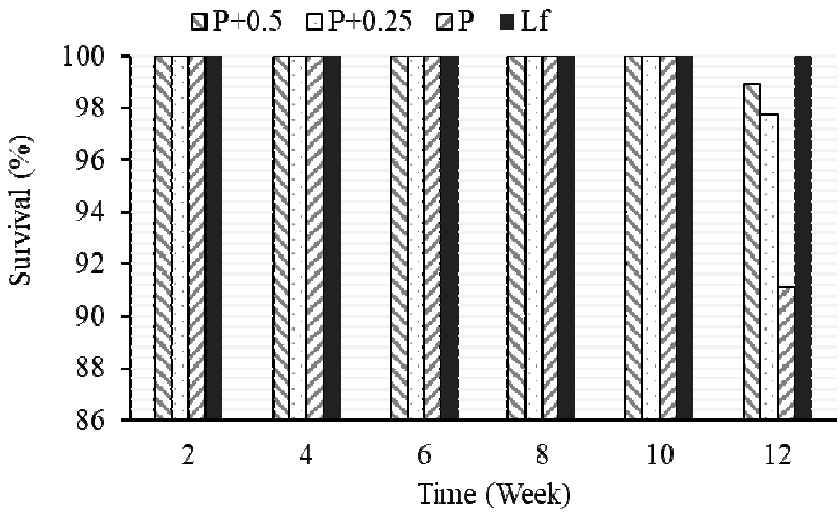

Figure 3. Survivals of brown trout fed with different levels of white worm, 0.5 % (P+0.05), 0.25 % (P+0.25), Pellet (P) and white worm as live feed (Lf) for 12 weeks

4. CONCLUSIONS

Larval rearing success largely depends on fish larvae feeding. The using of zooplankton as live food for fish improved the quality of fish. The results of the present study indicated that the addition of zooplanton to pellet of brown trout fry caused increase in growth performance with better feed conversation ratio and survival.

5. ACKNOWLEDGEMENTS

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