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Menba Kastamonu Üniversitesi Su Ürünleri Fakültesi Dergisi 2024; 10 (3): 58-64 Araştırma Makalesi/Research Article

Farklı Protein Seviyesindeki Yemlerle Beslenen Yavru Kerevitlerin (Astacus leptodactylus Eschscholtz, 1823) Büyüme Üzerine Etkileri

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- Besleme
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Öz

Farklı protein seviyelerindeki yemlerle beslenen yavru kerevitlerin (Astacus leptodactylus Eschscholtz, 1823) büyüme üzerine etkileri incelenmiştir. Denemede kullanılan yem grupları; alabalık yemi (A), çiğ patates (B) ve çiğ havuç (C)'dir. Çalışmada toplamda 160 kerevit kullanılmış olup, ortalama ağırlıkları 0,20±0.01 g, ortalama boyları 2,06±0.03 cm olarak ölçülmüştür. Deneme 12 haftalık bir sürede yürütülmüştür. Farklı diyetlerle beslenen yavru kerevitlerin deneme sonunda ulaştıkları ağırlık ortalamaları 0.51±0.07 ile 1.18±0.17 g arasında, ortalama uzunlukları ise 2.45±0.16 ile 3.33±0.18 cm arasında olduğu belirlenmiştir. Boy ve ağırlık artışlarındaki değişim göreceli olarak da gruplar arasında farklı olduğu görülmektedir. İstatistiki olarak; boylar ve gruplar arasında ($F=21.59$; $p<0.01$), ayrıca ağırlıklar ve gruplar arasında da farkın önemli olduğu tespit edilmiştir ($F=28.03$; $p<0.01$). Çalışmada patates ve havuç ile beslenen gruplar arasında boy ve ağırlık ortalaması bakımından farkın önemli olmadığı, alabalık yemi ile beslenen grupta boy ve ağırlık ortalamaları diğer iki gruptan istatistiki olarak farklı olduğu belirlenmiştir ($p<0.05$). Deneme sonunda alabalık yemi, patates ve havuç ile beslenen gruplarda büyüme değerleri sırasıyla boyca mutlak büyüme değerleri 1.28, 0.52 ve 0.39 cm arasında, ağırlıkça mutlak büyüme değerleri ise 0.98, 0.34 ve 0.31 g arasında bulunmuştur. Alabalık yemi, patates ve havuç ile beslenen gruplarda sırasıyla oransal büyüme değerleri ise; boyca %49.23, %25.24 ve %18.93 olarak; ağırlıkça %490, %170 ve %155 olarak belirlenmiştir. Deneme sonunda en iyi büyüme (hem ağırlıkça hem de boyca) alabalık yemi ile beslenen grupta gerçekleşmiştir.

Effects on Growth of Juvenile Crayfish (Astacus leptodactylus Eschscholtz, 1823) Feeding Different Protein Levels

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Abstract

The effects on the growth of juvenile crayfish (Astacus leptodactylus Eschscholtz, 1823) fed diets with different protein levels were investigated. The feed groups used in the experiment were trout feed (A), raw potato (B) and raw carrot (C). A total of 160 crayfish were used in the study with an average weight of 0.20±0.01 g and an average length of 2.06±0.03 cm. The experiment was conducted over a period of 12 weeks. At the end of the experiment, it was determined that the average weights of juvenile crayfish fed with different diets were between 0.51±0.07 and 1.18±0.17 g and the average lengths were between 2.45±0.16 and 3.33±0.18 cm. It was observed that the relative changes in length and weight increases were also different between the groups. Statistically, the difference between lengths and groups ($F=21.59$; $p<0.01$), and between weights and groups ($F=28.03$; $p<0.01$) were statistically significant. In the study, it was determined that the difference between the groups fed with potato and carrot was not significant in terms of length and weight averages, while the length and weight averages in the group fed with trout feed were statistically different from the other two groups ($p<0.05$). At the end of the experiment, the absolute growth values of the groups fed with trout feed, potato and carrot were found between 1.28, 0.52 and 0.39 cm in length and 0.98, 0.34 and 0.31 g in weight, respectively. The proportional growth values of the groups fed with trout feed, potato and carrot were 49.23%, 25.24% and 18.93% in length and 490%, 170% and 155% in weight, respectively. At the end of the experiment, the best growth (both in weight and length) was realized in the group fed with trout feed.

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INTRODUCTION

Crayfish are among the important aquatic products obtained from our inland water resources in terms of both food and economic value. Crayfish are represented by 737 species and subspecies in the world and about 15 of these species are of economic importance (Crandall & De Grave, 2017). The most important crayfish species cultivated in the world belong to 3 different families. Northern hemisphere members belong to Cambaridae and Astacidae, while southern hemisphere members belong to Parastacidae (Huner, 1989).

Although crayfish are omnivores, their main food sources are aquatic and semi-aquatic plants, benthic invertebrates and detritus. These can also be of animal origin (worms, insects, molluscs and zooplankton) (Nyström et al., 1999). Although omnivorous, they are selective consumers (Nyström, 1999).

Astacus leptodactylus, Cherax quadricarinatus, Procambarus clarkii species are cultivated in the world (Vasileva et al., 2006; Valipour et al., 2011; Mohsenpour et al., 2014; Safari et al., 2017; Stanek et al., 2017; James et al., 2017; Alvanou et al., 2024). A. leptodactylus is found naturally in lakes, reservoirs and streams in Turkey (Holdich, 1999). In recent years, feeding studies (mealworms, calcium carbonate, calcium chloride, calcium chloride, mannan oligosaccharides, trout feed, carp feed) on A. leptodactylus species have been conducted in Turkey (Aksu & Harlıoğlu, 2003; Harlıoğlu & Barım, 2004; Harlıoğlu, 2009; Berber et al., 2010; Erol et al., 2010; Güner & Mazlum, 2010; Mazlum et al., 2011; Bahadır Koca et al., 2015; Turan et al., 2012; Bolat & Kaya, 2016; Barım Öz &Yılmaz, 2017; Harlıoğlu & Farhadi, 2017; Şirin & Mazlum, 2017; Mazlum & Şirin, 2020, Mazlum et al., 2021).

Astacus leptodactylus is only produced in our country by hunting from its natural habitat and not by aquaculture. In order to prevent cannibalism in the successful production of crayfish fry, it is important to feed the fry period. In this study, it was tried to determine the effects on growth of juvenile crayfish (A. leptodactylus) fed with trout feed, raw potato and raw carrot with different protein levels.

MATERIAL AND METHOD

This study was carried out in Sinop University, Faculty of Fisheries, Research and Application Unit, between September and November for a period of 12 weeks. The juvenile crayfish (*Astacus leptodactylus* Eschscholtz, 1823) used in the study were obtained from Eğirdir Fisheries Research Institute (Isparta) under the Ministry of Agriculture and Forestry. *A. leptodactylus* juveniles were placed in the aquariums in groups as planned in the study. A total of 160 crayfish were used, with an average weight of 0.20±0.01 g and an average length of 2.06±0.03 cm. The water level in the aquariums was 25 cm and continuous aeration was provided. Crayfish were fed once a day during the experiment. Crayfish were fed 5% of their daily average body weight (Mazlum, 2007). Feeding was done homogeneously in the aquarium and on the bottom. Feces and feed residues were removed from the bottom of the aquarium on a daily basis. After the siphoning process, 20 % of fresh water was added to adjust the decreasing water levels. Measurements were made twice, once at the beginning of the experiment and once at the end of the experiment, to ensure that the crayfish were not harmed or stressed. Group A consisted of commercial trout feed with 51 % protein and 16 % fat content, group B consisted of raw potato with 1.68 % protein and 0.1 % fat content, group C consisted of raw carrot with 0.89 % protein and 0.2 % crude fat content.

The total length of the crayfish was measured from the rostrum (head) to the telson (end of the tail) using a 0.01 mm digital caliper and the body weight was measured using a digital scale with a precision of 0.0001 g. At the end of the experiment, weight gain (%), specific growth rate (%g/day), daily live weight gain (g/day) and survival rate (%) were calculated using the following formulas (Valipour et al., 2019).

Weight gain (%) = (%) = Wt (g) – W_0 (g) / W_0 (g) x 100

Specific growth rate (%g/day) = ln ((Wt -W_0) / t) x 100

Daily live weight gain (g/day) = (Wt -W_0) / t

Wt: End of period weight

W_0: Weight per period

t: day

MINITAB 13 program was used for statistical analyses. The weight and length values of the groups were evaluated by analysis of variance (ANOVA). The difference between the means was tested at $p<0.05$ significance level. Anderson-Darling was applied in the normality test of the data.

RESULT AND DISCUSSION

The effects on the growth of juvenile crayfish (*A. leptodactylus*) were determined by feeding trout feed, raw potato and raw carrot with different protein contents. During the 90-day experiment, the average water temperature was 18.47±0.17ºC, oxygen content was 5.11±2.32 mg/l and pH value was 6.29±1.24 (Figure 1).

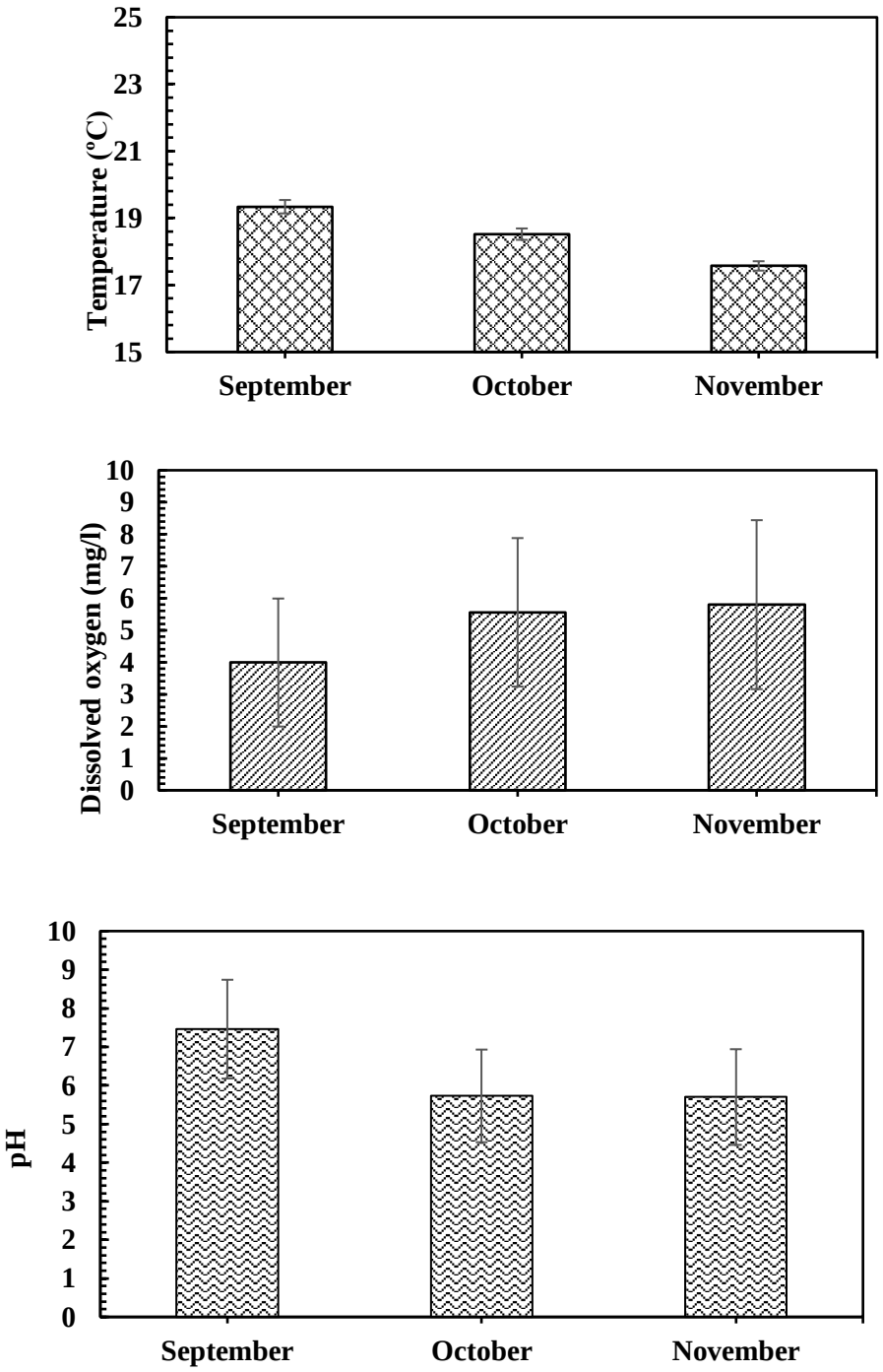

Figure 1. Characteristics of the water used in the experiment

Table 1. Growth values obtained during the experiment

	Parameters	A (Trout feed)	B (Raw potato)	C (Raw carrot)
L	**Final length (cm)**	3.33 ±0.18[a]	2.58±0.08[b]	2.45 ±0.16[b]
	Absolute growth	1.28	0.52	0.39
	Proportional growth (%)	49.23	25.24	18.93
W	**Final weight (g)**	1.18 ±0.17[a]	0.62 ±0.06[b]	0.51 ±0.07[b]
	Absolute growth	0.98	0.34	0.31
	Proportional growth (%)	490	170	155
	Specific Growth Rate (%g/day)	1.95±0.5[a]	1.1±0.4[b]	1.03±0.5[b]
	Daily live weight gain (g/day)	0.010	0.0037	0.0034

At the end of the experiment, the average weights of juvenile crayfish fed with different diets were between 0.51±0.07 and 1.18±0.17 g, and the average lengths were between 2.45±0.16 and 3.33±0.18 cm. It was observed that the relative changes in length and weight increases were also different between the groups. In the study, the difference between lengths and groups was significant ($F=21.59$; $p<0.01$) and also between weights and groups ($F=28.03$; $p<0.01$).

Weight (W) test values for trout feed, potato and carrot were 0.262, 0.191 and 0.218, respectively; p values were 0.654, 0.871 and 0.779, respectively. Length (L) test values for trout feed, potato and carrot were 0.228, 0.458 and 0.477, respectively; p values were 0.776, 0.216 and 0.183, respectively.

In the study, it was determined that the difference in length and weight averages between the groups fed with potato and carrot was not significant ($p>0.05$), while the length and weight averages in the group fed with trout feed were different from the other two groups ($p<0.05$). At the end of the experiment, the best growth (both in weight and length) was realized in the group fed with trout feed.

At the end of the experiment, daily live weight gain (g/day) values of the groups fed with trout food, potato and carrot were found to 0.010, 0.0037, 0.0034 respectively

At the end of the experiment, the absolute growth values of the groups fed with the trout feed, the potato feed and the carrot feed are shown in Figure 2.

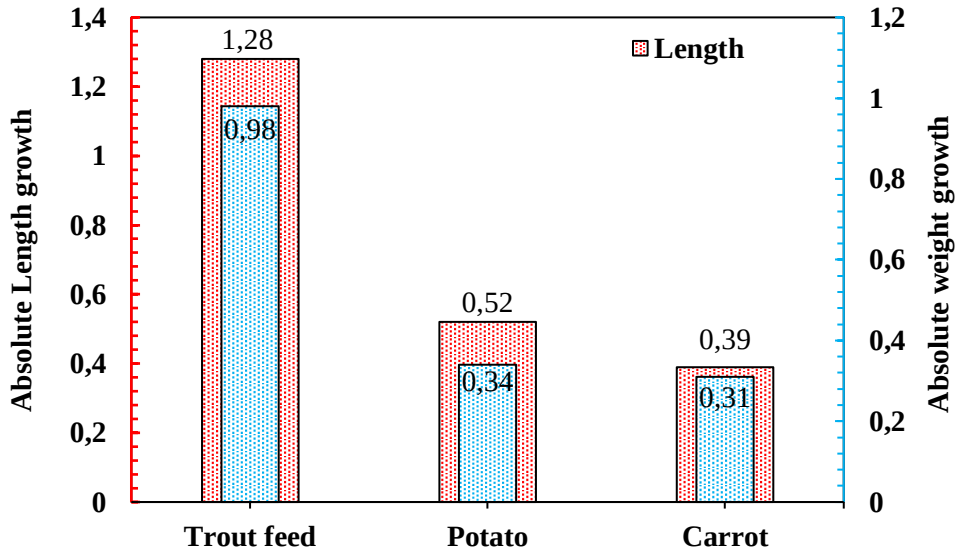

Figure 2. Absolute length and weight values obtained during the experiment

When Figure 3 was analysed, the proportional growth values of the groups fed with trout feed, potato and carrot.

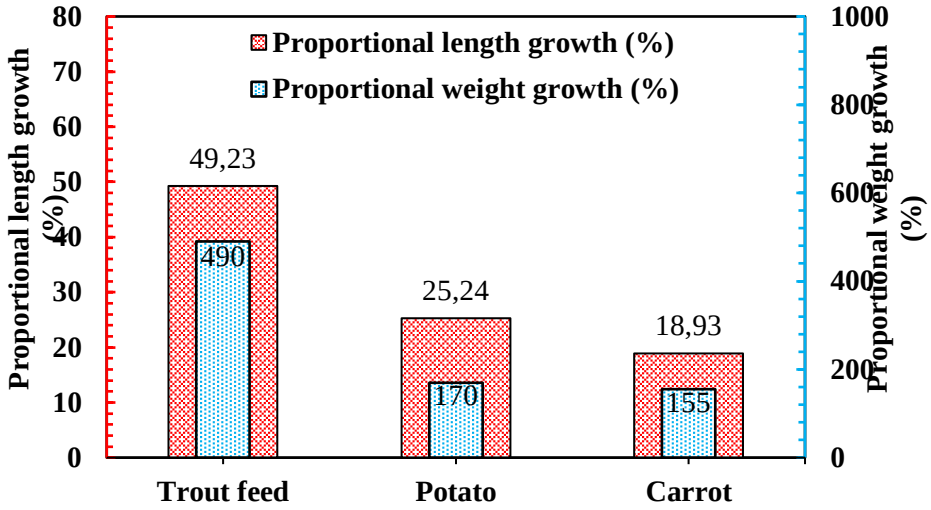

Figure 3. Proportional length and proportional weight obtained during the experiment

CONCLUSION

In the study conducted with three different diets, it was determined that the growth rates were different ($p<0.05$) when fed with trout feed. In similar studies, Erkebay (2004) observed that the best growth was observed in the groups fed with trout feed. In addition, Berber (1999) tried different feeding methods in two earthen ponds containing 200 juvenile crayfish and found that the individuals in the pond fed with trout pellet feed grew better both in length and weight. Güner & Mazlum (2010) conducted a study with juvenile crayfish (A. leptodactylus) and reported that the best growth (both in weight and length) and the highest specific growth rate (0.01 mm/day) were in the group fed with trout feed.

Aydın (1992) found the lowest growth in the group fed with semi-boiled potato. Köksal (1985) reported that the group fed with boiled potato had the lowest growth in a similar study.

Alderman & Wickens (1990) reported that crayfish feed well on potatoes and carrots under laboratory conditions, but breeders should give importance to natural food production in ponds and canals where crayfish are kept.

For successful fry production, crayfish can be fed with live feed, trout pellet feed, boiled potatoes, etc. The nutrient contents of artificial feeds to be used in feeding crayfish are recommended to be 18-44 % protein, 1-5 % lipid and 7-10 % mineral matter (Lee & Wickins, 1992).

Researchers have reported that the main factors affecting the growth and survival rates of the juveniles in crayfish farming are nutrient status, water quality, temperature, stocking density, shelter condition and bottom structure (Alderman & Wickens, 1990; Köksal, 1990).

Huner (1995) stated that the chemical structure of the water they live in, the temperature and nutrient status of the water have an important effect on the growth and development of crayfish, and that the growth will be faster in waters with suitable conditions for aquaculture, as the shell change will be more.

In this study, it was observed that there was no difference in the survival rates of crayfish fed with different diets. It was understood that the growth values of the crayfish fed with trout feed, which is high in protein compared to potato and carrot, were statistically different from the others.With the new researches to be planned, cost analyses should be made and feeds with the ideal protein ratio should be determined for feeding the crayfish to be cultured.

COMPLIANCE WITH ETHICAL STANDARDS

Author Contributions:

G.U.G.: Conceptualization, statistical analysis, methodology, writing-original draft writing-review and editing, visualisation.

Conflict of interest

No conflict of interest.

Statement on the Welfare of Animals

This study does not involve animals.

Declaration of Human Rights

This study does not involve humans.

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