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Effect of garlic extract on growth, feed and carcass composition of *Mugil cephalus*

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ABSTRACT

In this study, the effect of garlic extract on the growth performances (body weight increase (BWI), specific growth rate (SGR), condition factor (CF), final length (FL) and weight (FW)), feed indices (feed conversion rate (FCR), protein efficiency ratio (PER), protein production ratio (PPR)) and body composition (protein, fat, moisture and ash) of *Mugil cephalus* larvae were studied in four treatments (three replication for each treatment) for 30 days. For this purpose, *Mugil cephalus* larvae (with average weight of 0.45 ± 0.01 g) were fed with three diets containing 0.5, 1 and 3% garlic extract and control group was fed with diet artificial food without garlic extract. The results showed that at the end of experiment, the highest FW (0.78 ± 0.05 g), FL (4.04 ± 0.14 cm), the highest BWI ($85.13 \pm 17.19\%$), SGR ($1.93 \pm 0.31\%$), PPR ($20.99 \pm 0.03\%$), the lowest fat level of body composition ($3.37 \pm 0.01\%$) and the highest protein level of body composition ($20.99 \pm 0.03\%$) were observed in the diet containing 3% garlic extract, and in all of these parameters, this treatment (3% garlic extract) showed a significant difference compared with control treatment ($P < 0.05$). Finally, the present results suggest that diet containing 3% garlic extract could improve growth, feed performances and carcass quality of *Mugil cephalus* larvae.

Keywords: carcass composition, garlic extract, growth promoter, *Mugil cephalus*, protein production.

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The effect of replacement of vegetable oils with fish oil on gonadal development and sex steroid hormones in female rainbow trout (*Oncorhynchus mykiss*)

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ABSTRACT

To study the effect of dietary animal and plant lipids on gonadal different and sex steroid hormones levels of blood in rainbow trout (*Oncorhynchus mykiss*), the four diets was formulated based on 15% fat. The control uses 100% oil, fish oil was treated in the first, second and third respectively 25% and 75% fish oil, soybean oil, canola and cotton were used. After six weeks of feeding fish with average weight 200 ± 2.5 (g), ovarian tissue and sex steroid hormones levels of blood (Testosterone, Progesterone, 17β -Estradiol) were evaluated. Development of ovarian tissue as well as the hormones testosterone and 17β - Estradiol in the first treatment was significantly greater than other treatments ($P < 0.05$), while progesterone hormone between different treatments and control treatments did not show significant difference. According to the presented study, the best oils in diets for rainbow trout ovarian tissue development and increased levels of see steroid hormones, soybean oil is suggested.

Keywords: rainbow trout, ovarian tissue, replace of vegetable oils, sex steroid hormones.

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Assessment of vitamin C effect on body composition and some antioxidant enzyme activities in Caspian brown trout fry (*Salmo trutta caspius*)

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ABSTRACT

In order to study of vitamin C effect on body composition and antioxidant enzyme activities, including superoxide dismutase and catalase in five diets containing different levels of vitamin C (0, 50, 250, 750 and 1500mg vitamin/kg diet) had been fed by Caspian brown trout fry (*Salmo trutta caspius*) for 6 weeks in triplicate. After 6 weeks, the findings of growth parameters and survival showed significant difference among groups ($P < 0.05$). The lowest amount of SGR, BWG and survival was observed in control group while the group of 750 mg/kg had the highest amount of SGR, BWG and survival than those from others. The vitamin C concentration in tissue correlated positively with increasing its levels in diets. The vitamin C requirements were estimated to be 569.1 mg kg^{-1} based on body weight gain. Body composition including moisture, ash, fat and protein showed no significant difference among groups ($P > 0.05$). The effect of confinement stress on antioxidant enzymes activity of control diet was indicated a significant increase in activity after stress than that from before stress ($P < 0.05$), While other diets showed no significant difference between pre-stress and after stress ($P > 0.05$). The findings suggest that the 750 mg/kg vitamin C could be affected on growth and survival in Caspian brown trout fry.

Keywords: body composition, Caspian brown trout fry, catalase, superoxide dismutase, vitamin C.

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The effect of photoperiod and light intensity on egg production, hatching rate, maturity time and adult sex ratio in *Acartia clausi*

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ABSTRACT

The aims of this study were to investigate the effect of photoperiod and light intensity on egg production and hatching rate in *Acartia clausi* in laboratory conditions. This zooplankton was collected from Caspian coastal waters of Mazandaran province by the use of a 100 μ net. All tests were performed in five light treatments (photoperiod) namely 24:00, 18:06, 12:12, 06:18, 00:24 (light/dark), and two light intensities of 50 and 1000 lux. The results showed that the highest level of egg production was observed in 18 and 12 hours light treatment at low light intensity (50 Lux) 20.02 ± 4.31 , and the lowest level of egg production was observed in 24 hours light treatment at high light intensity (1000 Lux) 8.15 ± 2.15 . The highest percentage of hatching was observed in the photoperiod of 18 hours light and high light intensity (83.08 ± 7.1), and a lower percentage of hatching was observed in the treatment of darkness (17 ± 2.7). Regarding the time for maturation this species reached to copepod it stage more quickly, and adult stag (there are this process in both high light intensity and low light intensity). About adult sex ratio there are not any signification differences between treatment.

Keywords: *Acartia clausi*, Caspian sea, egg hatching, Light intensity, photoperiod.

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Effects of different levels of Ginger extract on growth performance, nutrition and body biochemical composition of *Mesopotamichthys sharpeyi* fingerlings

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ABSTRACT

In this study, the effects of dietary intake of different levels of ginger (*Zingiberofficinale*) extract on fingerlings of *Mesopotamichthys sharpeyi*, were investigated. For this purpose, 192 fingerlings (mean weight: 11.67 ± 0.32 g) were randomly distributed in twelve 300 litres fiberglass tanks (16 fish per tank) and fed with commercial diet containing 0% (control group), 0.1%, 0.5% and 1% of ethanolic ginger extract (treatment 1, 2 and 3 respectively). The fish were fed by 3% of body weight per day 3 Times a day for 8 weeks. At the end of the experimental period, various growth parameters including weight gain, specific growth rate, condition factor and hepatosomatic index and feeding indices included of feed conversion rate and protein efficiency rate were calculated. Carcass biochemical composition was also analyzed. The results showed that Adding of different levels of ginger extract to fingerlings diet caused an increase in weight gain and specific growth rate ($P < 0.05$) compared to control group. The highest rate of these factors was respectively observed in diet containing 1% and 0.5% of ginger extract and the lowest rate was for control group. The highest rate of hepatosomatic index recorded for 1% of ginger extract diet ($P < 0.05$). Feed conversion rate was highest in 0.5% of ginger extract diet ($P < 0.05$) However there was no significant difference between three experimental and control groups for condition factor, protein efficiency rate, protein content, fat, ash and moisture content of whole body composition ($P > 0.05$). According to the results of this study, adding of 1% of ginger extract to diet of *Mesopotamichthys sharpeyi* fingerlings cause growth inancement.

Keywords: Ginger extract, growth, *Mesopotamichthys sharpeyi*, nutrition.

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Determination of habitat suitability index of *Capoeta gracilis*, Keyserling 1861 from Taleghan River

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ABSTRACT

In fisheries and protection programs of aquatic ecosystems, knowledge on habitat requirement of aquatic animals plays important role. Hence, this study was conducted to investigate the suitability indexes of habitat features and habitat suitability index (HSI) of *Capoeta gracilis* in its distribution range in the Taleghan River. To study the habitat characteristics of this species in this River, its abundance and habitat variables, including elevation, depth, width, flow velocity, average diameter of substrate stones and water temperature at 33 stations from the downstream to upstream were examined during October 2013. According to the results, the suitability index of environmental features of this species were altitudes ranging 1400-1550 meters asl, depths in range 40-55 cm, river width lower than 5 m, velocity in range 0.3-0.6 m/s, with average diameter beds stone in range 30-45 cm and with temperature in range 16-18°C. Presence of these conditions with HIS of 0.813 indicates that Taleghan River is excellent habitat for *C. gracilis*.

Keywords: *Capoeta gracilis*, habitat, modeling, suitability index, Taleghan River.

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Effect of temperature lethal concentration (LC₅₀ 96-h) of *Cypermethrin* on the Caspian Kutum fish *Rutilus frisii Kutum* (Kamensky, 1901)

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ABSTRACT

In this study, the acute toxicity of Cypermethrin insecticides on caspian Kutum fry (*Rutilus frisii Kutum* Kamensky, 1901) with the weight of 3 ± 1 g (average \pm SD) in three different temperatures (15°C, 20°C and 25°C) measured. The aim of this study was to determine the lethal concentration of 50% of fish population within 96 hours. According to O.E.C.D standard methods, Experiments conditions were static and lasted for 4 days (96 h). Water physico-chemical parameters such as pH, total hardness, dissolved oxygen and temperature measured during the experiment. To find out cypermethrin cytotoxic range, 10 sea Kutum fry were placed in each 20 Litre aquarium and aerated during the experiment. After obtaining lethal concentration final experiment started with 6 treatments and 3 repetitions. The values of LC₁₀, LC₃₀, LC₅₀, LC₇₀, LC₉₀ and LC₉₉ at 24, 48, 72 and 96 hours for all three temperature treatments obtained By using probity analysis, and Cypermethrin acute toxicity (LC₅₀ 96-h) for Caspian Kutum fry at $15\pm 1^\circ\text{C}$, $20\pm 1^\circ\text{C}$ and $25\pm 1^\circ\text{C}$ was 1.54, 1.49 and 1.30 micro gram per liter, respectively. Results showed that by increasing the temperature Cypermethrin toxicity increases and also more deaths occur. In this experiment, the Clinical signs such as caudal region bruises, abnormal breathing and fish irregular swimming observed.

Keywords: Caspian Kutum (*fish Rutilus frisii*), cypermethrin, insecticide, temperature, LC50 96-h.

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Antibacterial activity of purified extracts of microalgae *Chlorella vulgaris* isolated from Chabahar Bay

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ABSTRACT

Microalgae are important biological resources in a wide range of applications of biotechnology. In this study, microalgae *Chlorella vulgaris* isolated from Chabahar Bay and its antibacterial activity of organic extracts against three strains of Gram-negative bacteria; *E. coli*, *Proteus vulgaris*, *Vibrio chlorella* and two strains of Gram-positive bacteria *Listeria monocytogenes* and *Staphylococcus aureus* was examined. Ethanol and chloroform extracts obtained by disk diffusion and successive dilution methods for determining the minimum inhibitory concentration (MIC) and minimal bactericidal concentration (MBC) were determined. Based on the results, the ethanol extracts has greatest effect on bacterium *V. chlorella* and the MBC for *E. coli* bacteria. The chloroform extract showed the greatest effect on the bacterium *P. vulgaris* and with different concentrations and minimal bactericidal concentration for all tested bacteria were obtained. Overall Iranian local microalgae *Chlorella vulgaris* has a strong antibacterial effect and Chloroform extract against ethanol extract has a more effect on the bacteria.

Keywords: antibacterial activity, *Chlorella vulgaris*, MBC, MIC, microalgae.

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Effect of thyme extract on the chemical quality of raw surimi produced from Common carp (*Cyprinus carpio*) during refrigerator storage

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ABSTRACT

In this study, thyme extract (0, 2 and 4% w/v) on the chemical quality of common carp surimi was investigated during refrigerator storage. Samples were withdrawn at four 3 days intervals over a storage period of 15 days (0, 3, 6, 9, 12 and 15 days), and analyzed to determine the extent of deterioration by chemical tests such as thiobarbitoric acid (TBA), total volatile bases nitrogen (TVB-N) and pH. Results showed that the amount of thiobarbitoric acid in the control samples was over the treated with thyme extracts, significantly. The TVB-N in control samples was higher of limit from third day until the end of storage, in samples treated with 2% thyme extract was 2.39 mg nitrogen per 100 grams of meat the last day, but the sample was treated with 4% extract maintenance was acceptable until last day. pH value was significantly, in control samples more than samples treated with the extract, during the whole storage period ($P < 0.05$). Based on the findings of the study revealed that 4% of thyme extracts can used for enhance the shelf life of the raw common carp surimi refrigerator.

Keywords: chemical quality, fish, shelf life, surimi, thyme extract.

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Changes in aggressive behaviors and testosterone concentration of fighting fish *Betta splendens*, exposed to fluoxetine

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ABSTRACT

The present study was aimed to investigate the effect of fluoxetine on aggressive behaviors towards female and testosterone concentration of male fighting fish (*Betta splendens*) during one reproduction event. Male specimens were exposed 6 days to concentrations of 0 (control treatment) and 0.54 µg/L fluoxetine (exposed treatment) and aggressive behaviors of them assessed on different reproductive phases consisted of before bubble nest, after bubble nest, after spawning and after hatching. After 6 days, testosterone concentrations of exposed treatment decreased significantly compared to control treatment. Aggressive behaviors were affected by fluoxetine in most reproductive phases; the number of sweeps to the nest after bubble nest and after spawning was significantly different between treatments. The results of present study indicate that fluoxetine in low concentration (0.54 µg/L) with affect on endocrine system of fighting fish reduced whole body testosterone and aggression of male encountered females during reproduction.

Keywords: aggressive behavior, *Betta splendens*, fluoxetine, reproduction, testosterone concentration.

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The genetic structure of Pike *Esox lucius* Linnaeus 1758 in the Southeast of the Caspian Sea, using microsatellite markers

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ABSTRACT

Esox lucius Linnaeus1758 is one of the economically valuable species of Caspian Sea. Genetic diversity of marine resources is of vital importance in their management and protection. Considering the lack of information about genetic differences this species; seven microsatellite loci were used for 90 sample analyses. The results showed conspicuous genetic variation in regions using Fst, AMOVA and a relatively high level of gene flow was found among populations. The average observed and expected heterozygosities were 0.383 and 0.622, respectively. Assessment of Hardy-Weinberg equilibrium showed that all samples of studied tests were significantly deviated from H-W equilibrium ($P \leq 0.05$). Results show evidences for genetic bottleneck in the populations. Graphical cluster represents a distinct molecular variance test, there are three distinct and separate population in the three areas that should be considered in the management of these reserves.

Keywords: esox lucius, hardy-weinberg equilibrium, heterozygosity, microsatellite.

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Growth and biochemistry changes of Caspian Kutum (*Rutilus frissi Kutum*) under different levels of dietary protein and lipid

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ABSTRACT

This study was carried out to evaluate the effects of different dietary protein (30, 35, 40%) and lipid levels (10, 12, 14%) on growth performance and physiological changes of juveniles Caspian Kutum (*Rutilus frissi Kutum*). Six hundred and seventy five fish (1.15 ± 0.01 g) were distributed into 27 aquaria (45 L) and were fed four times daily for 8 weeks. Interaction between protein and lipid did not significantly affect the growth factors ($P > 0.05$). Results showed that increasing the level of protein to 35% significantly increase some growth indices such as final weight (WF), weight gain (WG). The best growth performance was observed in fish 14% dietary lipid. Protein efficiency ratio (PER) and glucose of fish was not affected by interaction dietary protein and dietary lipid level. Triglyceride and cholesterol levels were significantly affected by protein and lipid and the interaction, High levels of triglycerides in fish fed with 30% protein and 10% and 12% lipid and the maximum amount of cholesterol in fish fed with 40% protein and 12% and 14% lipid were observed. The results of this study show a lower protein content (30%) and older (40%) than Kutum need can be a negative influence on the growth and physiological parameters. Increasing dietary lipid to 14% of Kutum juveniles were no negative effects on growth parameters. In order to improve the performance of Kutum in this weight range fed diets with 35% protein and 14% lipid is suggested.

Keywords: Caspian Kutum, growth, lipid, protein.

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