

- I. Списък на абстрактите на цялостно публикуваните научни трудове представени в конкурса за академичната длъжност „Доцент”, по научна специалност „Биохимия“:

5. CONTENT OF PB IN WATER, SEDIMENT, AQUATIC PLANTS AND MUSCULATURE OF COMMON CARP (CYPRINUS CARPIO L.) FROM DIFFERENT WATER BODIES IN STARA ZAGORA REGION, BULGARIA

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Abstract

VALKOVA, E., V. ATANASOV, K. VELICHKOVA, G. KOSTADINOVA and G. MIHAYLOVA, 2016. Content of Pb in water, sediment, aquatic plants and musculature of common carp (*Cyprinus carpio* L.) from different water bodies in Stara Zagora region, Bulgaria. *Bulg. J. Agric. Sci.*, 22: 566–572

Heavy metals in high concentration in aquatic habitat (water bodies) are accumulated in different organisms, damaging their tissues and suppressing metabolic processes. The aim of present study was to survey and assessment of lead (Pb) levels in water, sediment, aquatic plants and musculature of *Cyprinus carpio* from different water bodies in Stara Zagora region, Bulgaria. International standards of ISO for sample preparation of water, sediment, aquatic plants and musculature of common carp analyze were used. The lead levels in collected samples were determined by atomic absorption spectrometry. The studied monitoring points located in a region that is under strong anthropogenic impact. However, the levels of lead in the most of the investigated water bodies do not exceed the statutory requirements set by Directive 2008/105/EC and Directive 2013/39/EC. The highest lead concentrations in sediments were measured in Tunja River, Nikolaevo Town (42.96 mg.kg⁻¹), Sazliika River (25.38 mg.kg⁻¹) and Bedechka River (23.88 mg.kg⁻¹). With the highest values of this element in the aquatic plants are characterized Sazliika River (9.26 mg.kg⁻¹), Tunja River, Banya Village (8.02 mg.kg⁻¹) and

Bedečka River (5.12 mg.kg⁻¹). The highest concentration of lead in the musculature, 5 times exceeding the established norms differ Jrebchevo Dam Lake (1.19 mg.kg⁻¹). These results clearly demonstrate the ability of the sediment, aquatic plants and fish to serve as excellent indicators of lead pollution.

Key words: aquatic plants, assessment, common carp musculature, lead, sediment, water

6. Seasonal Changes in Quality and Fatty Acid Composition of Black Mussel (*Mytilus galloprovincialis*)

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Stratev, D., T. Popova, G. Zhelyazkov, I. Vashin, L. Dospatliev and Elitsa Valkova, 2017. Seasonal Changes in Quality and Fatty Acid Composition of Black Mussel (*Mytilus galloprovincialis*). *Journal of Aquatic Food Product Technology*, vol. 26, (7), 871–879. <https://doi.org/10.1080/10498850.2017.1346742>

ABSTRACT

The study was designed to assess the seasonal variations in the quality and lipid profile of mussel meat (*Mytilus galloprovincialis*) harvested along the Bulgarian coast of the Black Sea. The trial period lasted from June to October, and the sampling was carried out in the area of Varna Bay. Technological quality of the mussels was determined by measuring the water holding capacity (WHC) and cooking and roasting losses. Proximate composition, total aerobic plate count, and fatty acid analysis were carried out. Technological parameters and nutritional quality of the mussel meat were strongly affected by the season. During the summer, the mussels had higher mass, meat content, and meat yield ($p < 0.001$) compared to the early autumn, which corresponds to the lowest protein content during this season. Lipid profile showed seasonal variations in both individual and total fatty acid amounts ($p < 0.001$). Saturated fatty acids (SFA) had the highest content in summer, while monounsaturated fatty acids (MUFA) decreased gradually until the autumn. The content of polyunsaturated fatty acids (PUFA) reached its peak in October, contributing to the most favorable values of the nutritional indices of lipids in the early autumn.

KEYWORDS: Black mussel; meat; chemical composition; lipid profile; seasons; total aerobic plate count

7. Reproduction impact of mancozeb on rainbow trout (*Oncorhynchus mykiss* W.) and accumulation of its carcinogen metabolite, ethylene thiourea in fish products

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Tzanova, M., V. Atanasov, B. Zaharinov, G. Beev, T. Dinev and **E. Valkova**, 2017. Reproduction impact of mancozeb on rainbow trout (*Oncorhynchus mykiss* W.) and accumulation of its carcinogen metabolite, ethylene thiourea in fish products, *Journal of Central European Agriculture*, 18(2), 369-387, DOI: 10.5513/JCEA01/18.2.1911

Abstract Pesticides can be taken up from the water and accumulated in tissues of hydrobionts, often becoming multiplied thousands of times higher in the organism than in the surrounding water. The dithiocarbamate mannose is applied in plant protection as fungicide. In recent years the amount of mancozeb used in Europe significantly increased. It is carcinogen due to its metabolite - ethylene thiourea (ETU), which causes thyroid and pituitary tumors. The purpose of this study is to determinate the quantity of ethylene thiourea in products of rainbow trout (*Oncorhynchus mykiss* W.), reared in environment containing permissible, according to the European law, amount of mancozeb. Seeking an answer to the question: is this concentration limit really safe for the reproduction of rainbow trout and can the more toxic metabolite - ETU, be accumulated in the fish eggs and fillet and afterwards make them harmful to the consumers? The study included 3 stages: feeding, analysis of ethylene thiourea in fish eggs and fillet by a new developed and validated HPLC (high performance liquid chromatography) method and study of the reproductive indicators. The assays of ETU in all analyzed samples (fish and water) were below the limit of quantification of the method, 0.05 mg·l⁻¹, so fish do not accumulate the carcinogen degradation product of mancozeb and the maximum residue level of mancozeb is really safe for the humans as consumers. But these environmental conditions caused reproductive disorders. They can be partly compensated by using sperm activation medium for artificial insemination of trout eggs, but successful fertilization does not guarantee successful hatching, especially of eggs in trout farms with presence of mancozeb in water, even in allowable concentration. The presented results confirm previous investigation, that Salmonidae are very sensitive fish species, react to the lowest deviations in concentration levels of xenobiotics and are used for indicator of non-polluted water.

Keywords: ethylene thiourea, HPLC, mancozeb, rainbow trout, reproduction, sperm activation medium

8. QUALITY ASSESSMENT OF MARITSA RIVER WATER AS A MAIN SOURCE FOR IRRIGATION IN THRACIAN VALLEY

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Kostadinova, G., D. Dermendzhieva, G. Beev, G. Petkov, D. Pavlov, E. Valkova, 2017. Quality assessment of Maritsa River water as a main source for irrigation in thracian valley, *Fresenius Environmental Bulletin*, Volume 26 ± No. 7, 4367-4374

ABSTRACT

The water of many rivers all over the world is used for irrigation purposes. Maritsa River, located in the Thracian Valley, Balkan Peninsula, on the territory of Bulgaria, Turkey and Greece, is one of them. Apart the water quantity, the performance of irrigated agriculture depends also on its quality. In the present study, the quality of Maritsa River water as a source for irrigation was assessed at two monitoring points (MPs) in Bulgaria - MP-1 (upper river) and MP-2 (middle course of the river). The samples were taken in June and August 2014 and 31 physicochemical and microbiological parameters were screened. Water sampling and preparation were performed according to Bulgarian standard complied with ISO standards. Physicochemical parameters were determined spectrophotometrically, by Multi/340i SET and AAS. For the estimation of total and specific microbial load, selective chromogenic culture medium sheets were used. It was found that river water quality meets the requirements of Bulgarian standard for irrigation water with respect to: temperature, pH, electrical conductivity, total hardness, Ca, Mg, dissolved oxygen, BOD₅, COD, N-NH₄ (except for June), N-NO₃, Cl⁻, SO₄²⁻, P-PO₄ (except for August), suspended solids (except for June), Mn, Fe, Cu, Zn, Pb, Ni, Cd, Cr and As. Deviations from the standard were observed for all microbiological parameters at both MPs. The metal concentrations decrease in the order of Fe>Zn>Ni>Pb>Cr>Cu>As>Mn>Cd. Many significant correlations were revealed between controlled water parameters.

KEYWORDS: Maritsa River, physicochemical parameters, heavy metals, microbiological parameters, assessment, water quality

9. REPRODUCTIVE PROCESS IN BULGARIAN TROUT FARMS IN RELATION TO THE PREVENTION OF M74 SYNDROME

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Abstract Atanasov, V., Y. Staykov, M. Tzanova, E. Valkova, B. Krastev and Zh. Dimitrov, 2017. Reproductive process in Bulgarian trout farms in relation to the prevention of M74 syndrome. Bulg. J. Agric. Sci., 23 (1): 147–153

Currently, the term syndrome M74 combines all reproductive disorders of hydrobionts (including their gametes, embryos and yolk-sac fry) with similar symptoms caused by xenobiotics transposed in aquatic organisms from polluted environment. Because in Bulgaria there are only few publications on the M74 and the syndrome is not known to fish farmers in the branch, the aim of the present study was to analyze the reproductive process in Bulgarian trout farms, located in different mountains regions and make recommendations for preventing M74 syndrome. This is why for the first time in the country were developed criteria for assessing the risk of syndrome M74 and questions were formulated in a special „Questionnaire“. The survey data from 14 Bulgarian trout farms were calculated to analyze the reproductive process and investigate the possibility for spreading of the syndrome M74 mainly on farms located in the following mountains: Rila, Rhodope, Stara Planina and Sredna Gora. Additionally, were investigated commonly used biological parameters for assessment of the reproductive syndrome M74 – eggs fertilization, hatchability and survival rate of the rainbow trout fry. Better reproductive parameters were registered in 1st rank trout farms (0-5 points) which have no problems with the M74 syndrome. In the rest farms the unsuitable environmental conditions, which lead to occur M74 syndrome can be partly compensated using a sperm activation medium №49397 for artificial insemination of trout eggs.

Key words: Salmonidae; artificial insemination; sperm activation medium; M74 syndrome

10. Risk assessment of some heavy metals in mussels (*Mytilus galloprovincialis*) and veined rapa whelks (*Rapana venosa*) for human health

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Zhelyazkov, G., T. Yankovska-Stefanova, E. Mineva, D. Stratev, I. Vashin, L. Dospatliev, **E. Valkova**, T. Popova, 2018. Risk assessment of some heavy metals in mussels (*Mytilus galloprovincialis*) and veined rapa whelks (*Rapana venosa*) for human health, *Marine Pollution Bulletin*, 128, 197–201. <https://doi.org/10.1016/j.marpolbul.2018.01.024>

ABSTRACT

The purpose of the present study was to analyze the concentrations of lead, cadmium and mercury in mussels (*Mytilus galloprovincialis*) and veined rapa whelks (*Rapana venosa*) caught in the Varna Bay of Black Sea and to evaluate the risk for human health from the presence of the three heavy metals. The highest average concentrations in mussels were those of cadmium (0.280 mg/kg), followed by lead (0.251 mg/kg) and mercury (0.017 mg/kg). Veined rapa whelks also showed highest levels of cadmium (1.113 mg/kg), followed by lead (0.045 mg/kg) and mercury (0.034 mg/kg). EDI values for adults consuming mussels and veined rapa whelks were below the published RfDo and PTWI values. All THQ and HI values were below 1. The consumption of *M. galloprovincialis* and *R. venosa* caught in the Varna Bay, Black Sea, did not pose any risk for the health of adult people as lead, cadmium and mercury were concerned.

Keywords: *M. galloprovincialis*, *R. venosa*, Heavy metals, Human health, risk assessment

11. Study of the content of copper in waters and Zebra mussel (*Dreissena polymorpha*) from Ovcharitsa Dam, Stara Zagora region, Bulgaria

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Abstract

Valkova, E. (2019). Study of the content of copper in waters and Zebra mussel (*Dreissena polymorpha*) from Ovcharitsa Dam, Stara Zagora region, Bulgaria. *Bulg. J. Agric. Sci.*, 25 (Suppl. 3), 182–186

The present study aims to determine the levels of the heavy metal copper (Cu) in the water and muscles of Zebra mussel (*Dreissena polymorpha*) inhabiting Ovcharitsa Dam, Stara Zagora, Bulgaria. The preparation, archiving and storage of samples of water and muscles is conducted in August and November 2015 to January and March 2016. The determination of Cu concentrations is performed using a modern method for measuring macro- and microelements with an atomic absorption spectrometer, which is characterized by high selectivity, speed and sensitivity. Concentrations of copper measured in the waters of Ovcharitsa Dam in August 2015 are three times higher (67.4%) compared to the SCC requirement according to Ordinance H-4 of the Bulgarian legislation. The registered data show the presence of a potential copper pollution of the waters of the studied water body, which has a permanent character during all months of

research except for January 2016. The higher Cu levels are characterized by the mussels which inhabited Ovcharitsa Dam in January and March 2013. The content of this heavy metal in all samples tested is far below the MAC as defined in Ordinance 31 (30 mg / kg for molluscs). In the present study, the recorded values of Cu in the Zebra mussel samples, which inhabited Ovcharitsa Dam during the studied period, are several times higher than those observed in the waters of the same water body. Concentrations of copper found in the water can show the state of the hydroecosystem at the time of sampling. However, hydrobionic representatives in the face of *Dreissena polymorpha* have the ability to accumulate heavy metals over time, making them a more reliable biological indicator of contamination of water bodies.

Keywords: Zebra mussel; copper; water body; hydroecosystem; musculature

12. Content of Fe and Mn in waters and zebra mussel (*Dreissena polymorpha*) from Ovcharitsa Dam, Stara Zagora region, Bulgaria

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Abstract

Valkova, E., Atanasov, V. & Veleva, P. (2020). Content of Fe and Mn in waters and zebra mussel (*Dreissena polymorpha*) from ovcharitsa dam, Stara Zagora region, Bulgaria. *Bulg. J. Agric. Sci.*, 26 (4), 870–876

The main objective of this study is to determine the levels of heavy metals iron (Fe) and manganese (Mn) in the waters and muscles of the “Zebra” mussel (*Dreissena polymorpha*) from Ovcharitsa Dam, Stara Zagora, Bulgaria. Iron concentrations measured in the waters of Ovcharitsa Dam in November, 2018 are 4.5 times higher than the requirement for YAV in accordance with Regulation H-4 of the Bulgarian legislation. Concentrations measured during this period indicate the presence of possible temporary pollution in November, 2018. These values fully correspond to the concentrations of the same element measured in the muscle of the Zebra mussel in January, 2019 of 104.36 mg/kg (16.5 units above the arithmetic mean) due to the passage of iron ions from water into the mussel organism. Higher Fe values are also characterized by specimens of mussels inhabiting the Ovcharitsa Dam in August, 2018. Mn levels measured in the waters of the studied water body in November, 2018 are some times higher (5 times) than the YAV regulated by Regulation H-4 of the Bulgarian legislation. The reported data confirm the existence of possible permanent contamination with Mn during all months of the survey except for March, 2019. The reported amounts of manganese in mussels indicate that *Dreissena polymorpha* mainly accumulates the metal in August, 2018 and March 2019. The concentration of this element in the musculature of the examined mussels is gradually increasing, with the lowest value (5.33 mg/kg) established in November, 2018 and the highest (11.74 mg/kg) in March, 2019. Iron and manganese concentrations found in water can indicate the state of the hydroecosystems at the time of sampling.

Aquatic organisms (including *Dreissena polymorpha* mussels) have the ability to accumulate heavy metals over time, making them a more reliable biological indicator of hydroecosystem pollution than conventional water monitoring.

Keywords: zebra mussel; heavy metals; water body; hydroecosystem; musculature

13. The effect of sweet flag (*Acorus calamus* L.) supplemented diet on growth performance, biochemical blood parameters and meat quality of rainbow trout (*Oncorhynchus mykiss* W.) and growth of lettuce (*Lactuca sativa* L.) cultivated in aquaponic recirculation system

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Velichkova, K., I. Sirakov, E. Valkova, 2020. The effect of sweet flag (*Acorus calamus* L.) supplemented diet on growth performance, biochemical blood parameters and meat quality of rainbow trout (*Oncorhynchus mykiss* W.) and growth of lettuce (*Lactuca sativa* L.) cultivated in aquaponic recirculation system, ACCL Bioflux, 13(6)/2020, 3840–3848

Abstract.

The aim of current study was to find the effect of feed, supplemented with sweet flag (*Acorus calamus* L.) on growth performance, blood parameters and meat quality in rainbow trout (*Oncorhynchus mykiss* W.) as well as on growth of heads and roots in lettuce (*Lactuca sativa* L.), raised in the aquaponic recirculation system. Ten specimens from the rainbow trout with an average weight of 114.45±12.18 g (control, C) and 108.85±21.24 g (experimental, A. c.) in good health condition were placed in each tank of aquaponics recirculation system and cultivated for 60 days. At the end of the experiment were calculated: average final weight, specific growth rates, feed conversion ratio, meat quality and blood biochemical parameters. The blood samples were examined by the colorimetric method with blood analyzer (Mindray SC - 120). The meat quality (moisture %, dry matter %, crude protein content, fat, and ash content were determined respectively to Bulgarian State Standards (BSS): 11374-86, BSS-ISO 5983, BSS-ISO 6492, BSS 11374-86). The fish fed with feed supplemented with *A. calamus* extract showed higher final weight with 8.84%, compared to the values of this parameter of trouts from the control group at the end of the experiment ($p \leq 0.01$). The average values of ALB and ALAT were respectively with 26.84% and 52.26% higher in the control group, compared to the value of the same parameter of trouts fed with the *A. calamus* extract supplement ($p \leq 0.05$). The content of crude protein was higher in trouts from experimental group with 1.1% compared with the average value of this parameter found for fish from control group ($p \geq 0.05$). The weight of head and roots in lettuce cultivated in aquaponic system were respectively 95.4±3.06 g and 26.9±0.82 g in the end of trial. Sweet flag extract used as a supplement improve feeding and physiological condition in fish without significantly affect the productivity in aquaponic aquaculture.

Key Words: aquaponic, hydrobiont, growth, fish, sweet flag.

14. Influence of different doses of mineral fertilizer and the controlled water deficit on the antioxidants parameters in tomatoes (*Solanum lycopersicum* L.) irrigated with a drip irrigation system

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Abstract

Stoyanova, A., Veleva, P., Valkova, E. & Georgiev, M. (2020) Influence of different doses of mineral fertilizer and the controlled water deficit on the antioxidants parameters in tomatoes (*Solanum lycopersicum* L.) irrigated with a drip irrigation system. *Bulg. J. Agric. Sci.*, 26 (Suppl. 1), 19-29

The main objective of this study is to analyze the mutual influence of different irrigation schemes and fertilization rates on the greenhouse tomato yield, and the irrigation water usage efficiency for a period of three years (2016-2018). Different irrigation schemes have been examined, achieved by reducing the irrigation depth at different levels. Fertilization plays an important role in the technological process with different rates. This experiment was focused on the effect of both factors (the fertilization rate and the irrigation regime) on the main quality parameters of the greenhouse tomatoes. Multivariate data analysis was applied to process the data, including Scheffe and Dunnett's tests (depending on the Levene's test of equality of variances) were used to find the significant differences ($P < 0.05$) between the control variant and all other irrigation and fertilization schemes based on the investigated quality parameters (Dry matter, %; Ascorbic acid, mg%; Titrable organic acids, %; General dyes, mg%; Lycopene, mg% and β - carotene, mg%) in greenhouse-grown tomatoes. The analysis showed a medium to a high correlation ($R^2 = 0.988, 0.990, \text{ and } 0.062$ for the three investigated years) between Dry matter content and the two investigated factors (the fertilization rate and the irrigation depth) and a very strong correlation ($R^2 = 0.999, \text{ and } 1.000$) between Ascorbic acids and both factors of influence for the first two years and a weak correlation ($R^2 = 0.287$) for the third experimental year. A weak to moderate correlation between Titrable organic acids ($R^2 = 0.414, 0.669, \text{ and } 0.079$), β - carotene ($R^2 = 0.252, 0.673, \text{ and } 0.471$), and both influencing factors were found, and a moderate correlation between General dyes ($R^2 = 0.532, 0.815, \text{ and } 0.590$), Lycopene ($R^2 =$

0.685, 0.796 and 0.643), and the variants of irrigation and fertilization for the three experimental years.

Keywords: antioxidants; fertilization; greenhouse tomato; irrigation regime

15. The relationship between the content of heavy metals Cd and Cu in some components of the environment, fish as food and human health

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Abstract

Valkova, E., Atanasov, V., Vlaykova, T., Tacheva, T., Zhelyazkova, Y., Dimov, D. & Yakimov, K. (2021). The relationship between the content of heavy metals Cd and Cu in some components of the environment, fish as food and human health. *Bulg. J. Agric. Sci.*, 27 (5), 963–971

The aim of the study was to establish the relationship between the content of Cd and Cu in the air, drinking water, musculature of fish (*Cyprinus carpio* L.) and the blood serum of patients with and without COPD. The amount of PM10 has highest values in 2017 (average annual value 25.2 $\mu\text{g}/\text{m}^3$). The results regarding the amounts of cadmium in the air of the Stara Zagora region clearly show the absence of pollution. Determination of the amounts of the studied heavy metals in drinking water and the blood serum of the patients was carried out by the method of atomic absorption. The values of Cu, registered during the year-long study into the water of Stara Zagora and Radnevo are much lower than those adopted in Bulgarian legislation norms of 2 mg/l. The highest value of Cd is characterized by the drinking water in Stara Zagora Town from January 2020 (0.0047 mg/l), the value of which almost reaches the norm of 0.005 mg/l, defined in the normative documents. The cadmium concentrations measured during the same period in the drinking water of the Radnevo City are significantly below the accepted norms. Concentrations of copper in musculature of common carp of from our study from 2015 were significantly lower than the norms in force at that time (Regulation №31 of 2004, laying down maximum levels for certain contaminants in foods). Ovcharitsa Dam (0.60 mg/kg) is characterized by the highest values, far below the norms regulated in the then current Regulation 31 (10 mg/kg). Minimum concentration was measured in the muscles of carp inhabiting the Pastren Dam (0.27 mg/kg). Against the background of extremely low values of the element cadmium in the muscles of the studied specimens of the species *Cyprinus carpio* L. the highest is the concentration measured in the samples from Opan Dam (0.0110 mg/kg), and the lowest in the samples from Pastren Dam (0.006 mg/kg). These concentrations are much lower than the MAC specified in the then active Regulation 31, as well as in the current Regulation №5 and Regulation 1881 (EU).

Keywords: cadmium; copper; blood serum; COPD; musculature; carp; environment

16. The relationship between the content of heavy metals Pb and Zn in some components of the environment, fishes as food and human health

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Abstract

Valkova, E., Atanasov, V., Vlaykova, T., Tacheva, T., Zhelyazkova, Y., Dimov, D. & Yakimov, K. (2021). The relationship between the content of heavy metals Pb and Zn in some components of the environment, fishes as food and human health. *Bulg. J. Agric. Sci.*, 27 (5), 954–962

The aim of the study was to establish the relationship between the content of Pb and Zn in the air, water, musculature of fish (*Cyprinus carpio* L.) and the blood serum of patients with and without COPD. The determination of the amounts of the studied heavy metals in drinking water and the blood serum of the patients was carried out by the method of atomic absorption. The concentrations of Pb in the air do not exceed the requirements of Regulation 12 of 15.07.2010. The levels of lead found in the drinking water of the of Stara Zagora Town in the period June 2019 – July 2020 often approach the limit value determined by Regulation №9 of 16.03.2001 (0.01 mg/l). The established concentrations of zinc in the drinking water of the cities of Radnevo and Stara Zagora during the reported period are lower than the MAC of 4 mg/l defined in the normative documents. The analysis of the data on our study of 2015 for the content of Zn in the musculature of common carp does not show an excess of the MAC set by the then current Regulation 31. The highest levels of zinc, which do not even approach the established norms were reached in muscle samples from fish delivered from Ovcharitsa Dam (8.09 mg/kg). With the lowest measured concentrations characterized Pastren Dam (2.69 mg/kg). Musculature samples from all studied water bodies do not exceed the MAC for lead, indicated in the then valid Regulation 31 and now the current Regulation №5 of the Bulgarian legislation and EC Regulation №1881 of 2006 with amendment from 2010 for determining the maximum permissible concentrations of some contaminants in foods. Although the values obtained are much lower than the regulated MAC, the highest concentrations are characterized carps from Lake Pastren Dam (0.04 mg/kg), and the lowest those from the Ovcharitsa Dam (0.01 mg/kg).

Keywords: lead; zinc; blood serum; COPD; musculature; carp; environment

17. Accumulation of Astaxanthin and Canthaxanthin in Liver and Gonads of Rainbow Trout (*Oncorhynchus mykiss* (Walbaum, 1792)) Reared in Water Containing the Fungicide Mancozeb in Concentration Level Permitted by European Legislation

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Abstract:

In this study, we studied the levels of both of the main pigments in Salmonidae—astaxanthin (Ax) and canthaxanthin (Cx)—accumulated in the liver, female gonads, and male gonads of rainbow trout (*Oncorhynchus mykiss*) reared in water containing the fungicide mancozeb (MZ) in concentration levels permitted by European legislation. Experimental fish were divided into three groups: the first was a control group, the second was fed with market feed (containing Ax and Cx), and the third was fed with market feed (containing Ax and Cx) and reared in environmental water containing permissible MZ levels. The diet preparation followed the manufacturer's recommendations. The accumulated pigment quantities were measured using an HPLC-PDA method after selective extraction: Ax ranged from 2.490 ± 0.247 mg/kg (female gonads, second group) to 0.176 ± 0.007 mg/kg (liver, control group), and Cx—from 2.406 ± 0.166 mg/kg (female gonads, second group) to 0.103 ± 0.010 mg/kg (liver, control group). The pattern of the accumulation of both pigments in the three organs in the specimens of the three groups was sustainable: the amount of Ax was always greater than that of Cx, and the correlation between their concentrations was very high. The pigments were accumulated most intensively in the female gonads, followed by the male gonads and the liver. This trend was confirmed for all three experimental groups. However, the differences in the last third group were very small, and the levels of the xanthophylls accumulated were the lowest. A particular cause of the latter findings was the ongoing detoxification reactions and the disposal of MZ, in which Ax and Cx were involved as antioxidants.

Keywords: *Oncorhynchus mykiss* (Walbaum, 1792); astaxanthin; canthaxanthin; gonads; liver; fungicide; mancozeb; HPLC

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Подпис.....

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