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2. Роль антонінсько-зозуленецького коропа в селекційно-племінній справі України (огляд) / Оборський В. П. та ін. // Рибогосподарська наука України. 2022. № 3(61). С. 31—52. <https://doi.org/10.15407/fsu2022.03.031>.
3. Аналіз генетичної структури українських порід коропів з використанням білкових маркерів / Маріуца А. Е. та ін. // Вісник аграрних наук. 2023. № 4(841). С. 52—57.
4. Тарасюк С. І., Грициняк І. І. Молекулярно-генетичні дослідження в рибництві : монографія. Київ : Аграрна наука, 2013. 310 с.
5. Особливості генетичної структури амурського сазана (*Cyprinus carpio haematopterus*) / Крась С. І. та ін. // Рибогосподарська наука України. 2011. № 1. С. 62—67.
6. Гуменний В. Д., Шаловило С. Г., Кирилів Я. І. Проблема збереження і удосконалення генофонду локальних, аборигенних порід сільськогосподарських тварин і її значення для теорії і практики селекції відповідно до вимог СОТ // Науковий вісник Львівського національного університету ветеринарної медицини та біотехнології імені С. З. Гжицького. 2013. Т. 15, № 1(55), ч. 2. С. 61—80.

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CYTOGENETIC ANALYSIS OF STURGEON (ACIPENSERIDAE)

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The hematopoietic system of fish is high sensitivity to changes of the aquatic environment. The micronucleus assay is a reliable method for assessing the cumulative impact of toxicants on chromosomal structure and for detecting genetic changes of individual organisms. Prolonged exposure of xenobiotics into fish are leading to the accumulation of chromosomal aberrations and genomic mutations in the somatic cells [1]. The micronucleus test of sturgeon species is a sensitive method for assessing the genotoxicity of aquatic environments.

The main advantage of the micronucleus test that is gives an opportunity to quantify micronuclei during the interphase of the cell cycle, which is technically simpler and faster compared to analyzing the frequency of genomic changes and chromosomal aberrations in metaphase plates [2]. In the cytoplasm of fish erythrocytes, micronuclei arise as a result of direct DNA or histone protein breakages and consist of chromosomal fragments, or due to the disruption of the mitotic spindle, incorporating entire chromosomes which should be included into the main nucleus during anaphase [3]. Numerous studies have demonstrated that micronuclei frequently occur in the erythrocytes of peripheral blood in fish, both under field and laboratory conditions, as a result of exposure to various genotoxic agents. This method is sensitive not only for screening of physical and chemical mutagens but also for biological ones.

Cytogenetic monitoring of the chromosomal apparatus of the Siberian sturgeon (*Acipenser baerii* Brandt) is an integral component of the genetic assessment of sturgeon broodstock resources. The implementation of cytogenetic tests in sturgeon breeding enables a relatively rapid determination of the level of somatic mutagenesis and an evaluation of the cumulative impact of exogenous and endogenous factors on the genome of artificially propagated fish.

Group of Siberian sturgeon (12 individuals) has been sampling from fish farm "GOLD FISH" (Sloboda Baniliv village, Chernivtsi reg., Ukraine). In this investigations were used the micronucleus test and analysis of apoptosis frequency in peripheral blood cells of fish. The MN assay was performed as per the protocol of Stoyka Y. O., Garanko N. M., Arkhipchuk V. V. but with own modifications [4]. There were counted the occurrence frequency of cytogenetic indicators (erythrocytes with micronuclei (EMN), lymphocytes with micronuclei (LMN), binuclear lymphocytes (BNL) and apoptosis). Obtained results were expressed as ppm (%). Statistical analysis was performed using the Student's t-distribution.

For detection the level of somatic mutagenesis in the Siberian sturgeon from fish farm "GOLD FISH" the micronucleus test and an analysis of apoptosis frequency were performed. Based on the calculation of individual cytogenetic indicators, the mean values within the studied group of Siberian sturgeon were determined that the studied group was characterized by low values of erythrocytes with micronuclei (EMN) ($3.3 \pm 0.2\%$). It was also established that the individuals of Siberian sturgeon exhibited low levels of lymphocytes with micronuclei (LMN) ($2.5 \pm 0.2\%$) and binucleated lymphocytes (BL) ($1.5 \pm 0.2\%$), which indicates the absence of disturbances in the functioning of the genetic apparatus of the examined fish and the lack of exogenous stress factors exerting pressure on their immune system.

A high degree of individual variability was observed in the frequency of apoptosis. In particular, the highest values (7%) were recorded in individuals characterized by a low level of binucleated lymphocytes, which significantly influenced the average index within the group ($4.4 \pm 0.4\%$). In our opinion, this process reflects the elimination of genetically defective lymphocytes through apoptosis.

REFERENCES

1. Eco-genotoxicology: micronucleus assay in fish erythrocytes as *In situ* Aquatic Pollution Biomarker / Obiakor M. O. et al. // J Anim Sci Adv. 2012. Vol. 2(1). P. 123—133.
2. Okonkwo J. C., Obiakor M. O., Nnabude P. C. Micronuclei profile: an index of chromosomal aberration in freshwater fishes (*Synodontis clarias* and *Tilapia nilotica*) // Online Journal of Animal and Feed Research. 2011. Vol. 1, iss. 1. P. 40—45.
3. Kamel Ahmad, Jaber Saleh. Clastogenic studies on Tandaha Dam water in Asser // Mediterranean Environment. 2010. Vol. 16, № 1. P. 33—42.
4. Стойка Ю. О., Гаранько Н. М., Архипчук В. В. Розробка прижиттєвого мікроядерного тесту на рибах // Наукові записки Тернопільського державного педагогічного університету ім. В. Гнатюка. 2001. Вип. 4 (15). С. 157—159. (Серія : Біологія).