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**THE INFLUENCE OF AGRICULTURAL FACILITIES ON THE WATER  
CONDITION OF r. DESNA IN KYIV AND CHERNIGIV REGION**

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*It was established that the water in the Kyiv and Chernihiv regions BSK5 value and concentration of ammonium ions, nitrites, nitrates and heavy metals much higher than the accepted limit.*

**Key words:** integral indicator of the pollution, ecological estimation, surface waters, the maximum allowable concentration.

**Introduction.** Nowadays, when it occurs the intensification of many ecological problems which are connected with the pollution of natural waters, the issues regarding the research of the quality of water resources are becoming particularly significant. Today, the problem of the quality of surface water estimation is topical not only for ecologists, but also for a wide range of water consumers, that requires permanent attention due to the increasing human pressure on water objects. Studying of the ecological state of natural water is essential for research and practical purposes, because it would allow us to use rationally the water objects and to secure their protection from the pollution.

**Analysis of recent research and publications.** It is a difficult assignment to evaluate the qualitative and quantitative condition of the waters in the river Desna which are under the influence of agricultural man activities, because it depends on a lot of factors [1]. The determination of all the indicators is not always necessary and economically expedient. Practically (it depends on the purpose of the research), the estimation of surface water quality is based on the selected indicators, which values have to be determined according to the unified methods of analysis of the environment components quality [2]. The factual estimation of the ecological conditions, as well as the occurring processes in the waters of the river, is impossible without the use of the most reliable criteria, i.e. qualitative or quantitative features, which are used as a base in the surface water classification, that could be performed as a water pollution index (WPI). Today, a lot of scientific papers are devoted to this issue [3, 4].

**Problem.** The irrational use of water resources, a significant technogenic impact contributed to the degradation of ecological conditions of the river Desna within Kyiv and Chernihiv regions. It is very perceptible problem that has a hidden danger for present and future generations. The ecological classification based on the integrated pollution index is the criterion for the ecological estimation of surface water quality. The ecological estimation was conducted by using the integral index of water pollution.

**The purpose of research.** The purpose of research is the ecological estimation of water condition in the river Desna in the control alignment within Kyiv and Chernihiv regions.

**The results of the research.** The river Desna basin is an object of our research. The main motive in choosing the object of research were the peculiarities in the geographical position of the basin. Processing and systematization of data collected during the period from 2010 to 2014 about the chemical analysis of water in Desna in 5 sections (2 in Chernigov –one is located within the city and one is located 1 km above the city, 2 of them situated in Novgorod-Seversky (Chernihiv region) - 0.5 km above the city and 1 km below the town and one of them located in the village Letky, Brovarskoho district of Kyiv region) indicates that during the period of observation total mineralization of water was changed from 238.3 mg / dm<sup>3</sup> (2014 - fresh hipohalynna) to 664.7 mg / dm<sup>3</sup> (2010 - fresh olihohalynna). Thus, the smallest and the highest mineralization of water occurs during the winter time base flows. The average value for the entire period of research is 483.06 mg / dm<sup>3</sup>. So, the degree of water on the top area in Desna was increasing during the period from 2010 to 2014 is growth in concentration of bicarbonate, calcium, magnesium and sodium, while some reduction in the total mineralization occurs by decreasing the sodium and hydro carbonates in the bottom area. This mentioned growth water mineralization (290-670 mg / dm<sup>3</sup>) and concentrations of major ions caused by the fact that the river crosses cretaceous sediments in the upper section, but in the middle section –it obtains more mineralized water from river Seim, which mineralization is more than 600 mg / dm<sup>3</sup>. According to the average level of water mineralization in the river Desna from 2010 to 2014 it belongs to fresh olihohalynna to the second category of quality (very good). The content of the prevailing element - anion hydro carbonate in the water was changing during this period from 172.0 mg / dm<sup>3</sup> (2013) to 351.0 mg / dm<sup>3</sup> (2011), which means that the minimum value is almost in 2 times less than the maximum value. The row of other maximum values that indicates the content of hydrocarbons in water Desna occurs during the winter time base flows - 247 mg / dm<sup>3</sup> (2010 and 2011), and the minimum one occurs in the spring floods and summer base flows - 160 mg / dm<sup>3</sup> (2014) 168 mg / dm<sup>3</sup> (2013). The average values regarding the content of HCO<sup>3</sup> in the water were: 208.8 mg / dm<sup>3</sup> - for the entire period of the research. The percentage of hydrocarbons in the water of the river increased from 74.20% eq. in 2010 to 78.84% eq. – 2011, after that it was decreasing in 2012-2014. The content of sulfates in the water in river Desna changed from 9.7 mg / dm<sup>3</sup> (2013) to 57.6 mg / dm<sup>3</sup> (2011). It is worth mentioning, that the concentration of sulfates that exceeded TLV standard was found in only one sample among those determined as reservoirs for industrial fishing, i.e. 0.8% of all the cases; while there were no cases recorded about the exceeding the TLV norm in water for drinking purposes. The average value of content of SO<sub>4</sub><sup>2-</sup> in water was 41.8 mg / dm<sup>3</sup> – which was stable during the entire period of the research. The average content of sulfates in the water were the highest

rate in 2010 ( $38.03 \text{ mg} / \text{dm}^3$ ), the lowest rate -  $17.45 \text{ mg} / \text{dm}^3$  in 2014 (Table. 3.6-3.10). At all times, the content of sulfates in waters of river Desna belongs to the first category of fresh quality - excellent. The content of chloride in Desna waters was growing till the 2013, and talking about the whole period of the research was changing from  $8.0 \text{ mg} / \text{dm}^3$  (2014) to  $44.3 \text{ mg} / \text{dm}^3$  (2010). There were no records about the excess of chloride content regarding the TLV level in the water reservoirs for drinking purposes and industrial fishing. In different periods during the research process the content of chlorides in Desna water varied from 3.73 to 17.7% equivalent. According to the average chloride content in the water of the river Desna during the period from 2010 to 2014, it's belonged to the second category of quality (very good) which means it is suitable for drinking water. The content of the prevailing cation - calcium varied from  $37.3 \text{ mg} / \text{dm}^3$  (2011) to  $120.2 \text{ mg} / \text{dm}^3$  (2010). The average long-term value of the calcium content in the water was  $80.64 \text{ mg} / \text{dm}^3$ . All in all, the research data about the  $\text{Ca}^{2+}$  content indicates the increasing of calcium concentration over time. The content of  $\text{Ca}^{2+}$  in the river waters, as well as other cations, has the largest rate in the winter time base flow and the smallest one in the spring floods. The content of magnesium cations and sodium was changing in accordance with  $4.9 \text{ mg} / \text{dm}^3$  (2011) and  $5.7 \text{ mg} / \text{dm}^3$  (2010) to  $32.8$  (2013) and  $44.9 \text{ mg} / \text{dm}^3$  (2010). The average rate over the whole period of the research are  $16.56$  and  $19.32 \text{ mg} / \text{dm}^3$ . The percentage of sodium and magnesium in Desna waters did not exceed 47.5 and 24.9% equivalent. The content of potassium separated from sodium varied from 2.6 (2014) to  $8.6 \text{ mg} / \text{dm}^3$  (2010), which does not exceed 2% eq. from the amount of cations. According to the sanitary-ecological indicators Desna waters are characterized in further way. The content of suspended particles fluctuated from  $7.05 \text{ mg} / \text{dm}^3$  (2014) to  $121.0$  (2011)  $\text{mg} / \text{dm}^3$ , which fitted to the 2-7 quality category, i.e. water varied from clean to very dirty diapason. The average in the content of the suspended substances indicates that water suits to the 4th category of quality - slightly dirty. According to the average value of weighted particles content from 2010 to 2014 of the Desna water content was  $8.44 \text{ mg} / \text{dm}^3$  and it belonged to 2nd quality category (clear). The oxygen content in the river water fluctuated from 2.22 (2013) to  $16.6$  (2011)  $\text{mgO}_2 / \text{dm}^3$ . Thus, at different times during the research, according to this measure the water quality belonged very pure condition as well as very dirty. According to the average rates of saturation dissolved by oxygen in the water of the Desna 2010-2014 (which is more than  $8 \text{ mg} / \text{dm}^3$ ) was very clean (1 category of quality). Permanganate oxidation in Desna water fluctuated from 4.8 (2013) to 10.7 (2010)  $\text{NGO} / \text{dm}^3$  bihromatna - from 16.5 (2014) to 47.0 (2010)  $\text{NGO} / \text{dm}^3$  meets 2nd-5th and 3rd-6th grade of quality which is considered as clean - moderately polluted with organic substances. According to the average value - slightly polluted by organic substances. Biochemical oxygen consumption within 5 days in Desna water was 0.7 (2013) - 8.8 (2010)  $\text{mgO}_2 / \text{dm}^3$ , which fits to 1st-6th grade quality. The average value during the entire period of research was 2,27-2,75  $\text{NGO} / \text{dm}^3$ , that

meets the fourth category of quality (slightly polluted by organic substances). The next issue is the content of different forms of nitrogen in the water of Desna. The concentration of ammonium nitrogen in the water was changing from 0.01 (2012) to 0.9 (2013) mgN / dm<sup>3</sup>. During the whole periods of research, the average value of Desna water fitted the 3<sup>rd</sup>-4<sup>th</sup> category of quality, which means: clean - moderately polluted. The content of nitrite nitrogen fluctuated from 0 (2013) to 4.91 (2010) mgN / dm<sup>3</sup>. The concentration of nitrate nitrogen was changing from 0 (2014) to 2.9 (2011) mgN / dm<sup>3</sup>. During the 2010-2014 years, the average value of nitrate nitrogen content in Desna waters belonged to the very dirty category. The concentration of the mineral phosphorus in Desna waters varied from 0.271 (2014) to 0.719 (2011) mg / dm<sup>3</sup>. The phosphorus content in all water samples of Desna River was exceeding the maximum level of the 4th categories of quality water, which is moderately dirty water, from 2006. Increased levels of pesticides were found in samples which were taken from the river in 2010-2011 years. Analysis of data on water quality of the river indicates that it's mostly contaminated by organochlorine pesticides: DDT and its metabolites and isomers HCH. During the research period of river, the content level of such herbicides as atriflan, harness and synthetic pyrethroid (karate) in water samples was lower than the level of detection, which is determined by the prescribed standard methods. The analysis results about the bottom sediments show that they contained the organochlorine pesticides on the level of global dispersion in their biosphere.

**Conclusion:** The analysis of data regarding the indicators of hydro chemical measurements about the quality of surface water during the years of 2010-2014, we are able to conclude the next statements: 1) The most common contaminants are general iron, manganese, phosphates, salt ammonium, COD<sub>5</sub>; 2) the pollution caused by the phosphates and, sometimes, by salt ammonium connected with the anthropogenic sources of pollution, which are the public utilities, industrial and agricultural enterprises. According to the irrigation rates water of Desna River is suitable for irrigation without using chemical ameliorant. In order to water supply to the water of Desna River can be used after pre-filtration and removal of weighted substances, iron removal and disposal of toxic substances.

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**ВЛИЯНИЕ СЕЛЬСКОХОЗЯЙСТВЕННЫХ ПРЕДПРИЯТИЙ НА  
СОСТОЯНИЕ ВОД р. ДЕСНА В ГРАНИЦАХ  
КИЕВСКОЙ И ЧЕРНИГОВСКОЙ ОБЛАСТЕЙ**

Вовкодав Г.М.

**Ключевые слова:** интегральный показатель загрязнения, экологическая оценка, поверхностные воды, гранично-допустимая концентрация.

Резюме

*Качественное состояние вод реки Десна, вследствие сельскохозяйственной деятельности постоянно ухудшается. Установлено, что в воде на территории Киевской и Черниговской областей значения БПК<sub>5</sub>, а также концентрация ионов аммония, нитритов, нитратов и ионов тяжелых металлов значительно превышает гранично-допустимые нормы.*

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Summary

*It was established that the water in the Kyiv and Chernihiv regions BSK<sub>5</sub> value and concentration of ammonium ions, nitrites, nitrates and heavy metals much higher than the accepted limit.*