

Water Quality of Sultanköy Dam Lake (İpsala / Edirne): A Preliminary Assessment Study

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Abstract – Sultanköy Dam Lake is located in the İpsala District of Edirne Province in the west part of Ergene River Basin. As in many aquatic ecosystem, Sultanköy Dam Lake is also adversely affected by the agricultural applications conducted around the reservoir. The aim of this research was to determine the water quality of this reservoir in rainy season by determining a total of 13 limnologic parameters including dissolved oxygen (DO), oxygen saturation, pH, electrical conductivity (EC), total dissolved solids (TDS), salinity, turbidity, nitrite (NO₂), phosphate (PO₄), sulfate (SO₄), biological oxygen demand (BOD), chemical oxygen demand (COD) and oxidation reduction potential (ORP) and evaluate the detected data in terms of Water Pollution Control Regulations in Turkey. According to data observed, Sultanköy Dam Lake has Class I – II water quality in terms of dissolved oxygen, oxygen saturation, pH, EC, TDS, nitrite, sulphate, COD and BOD parameters, and Class III water quality in terms of phosphate parameters in general.

Keywords – İpsala Province, Sultanköy Dam Lake, Water Quality

I. INTRODUCTION

Growth of world population, developments of industry and intensive agricultural applications cause significant environmental problems and decrease the freshwater quality. Water pollution and lack of access to clean water resources have nearly become a limiting factor for the mankind. Assessment of large number of water quality parameters is an important requirement for an effective pollution control and water quality management [1, 2].

There are very large agricultural lands because of contained rich soil and many freshwater resources in Edirne City. Therefore, agriculture is a significant contamination factor for the region [1, 3, 4]. Sultanköy, which has an irrigation area of 7773 ha, is located in the İpsala District of Edirne Province. It was constructed by DSİ (State Water Works) with body fill types of soil to provide irrigation and drinking water to the local people and flood protection. The body volume of the reservoir is 1762 dam³ and it has a volume of 26 hm³ at normal water elevation and lake area of 3 km² at the normal water level [5].

The aim of this study was to evaluate the water quality of Sultanköy Dam Lake by determining some limnologic parameters and evaluate the detected data in terms of Water Pollution Control Regulations in Turkey.

II. MATERIALS AND METHOD

2.1. Study area and collection of samples

Sultanköy Dam Lake and selected stations on the reservoir are given in Figure 1. Water samples were collected 2 times in autumn season of 2019 and one water sample was taken from selected station on the dam lake.

2.2. Water quality analysis

Dissolved oxygen, oxygen saturation, pH, EC, TDS and salinity parameters were determined by using “Hach Lange HQ40D Multiparameter” device during the field studies; turbidity parameter was determined by using “Hach Lange 2100Q Portable Turbiditymeter” device during the field studies; nitrite, phosphate, sulphate parameters were determined by using “Hach Lange DR890 Colorimeter” device during the laboratory studies; COD parameter was determined by using “Hach Lange DR3900 Spectrophotometer” device during the laboratory studies; and BOD parameter was determined by using “Hach Lange BOD Trak II” device during the laboratory studies.

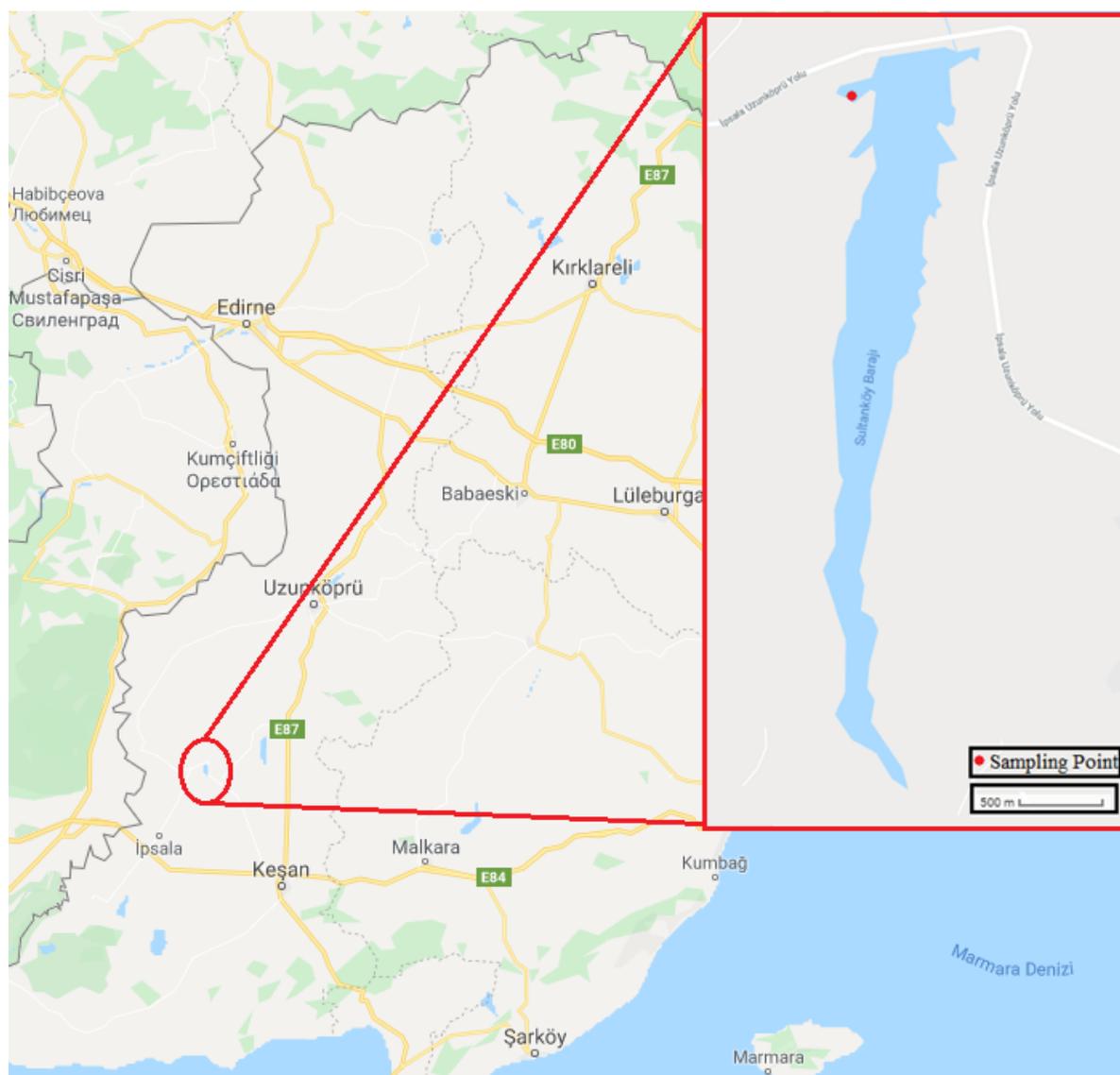


Fig.1. Sultanköy Dam Lake and selected station.

Table 1. Results of detected parameters and some limit values

Limit Values and the Results of Present Study		Parameters													
		DO (mg/L)	%O ₂	pH	ORP (mV)	EC (mS/cm)	^a TDS (mg/L)	Sal (‰)	Tur (NTU)	NO ₂ (mg/L)	NO ₃ (mg/L)	^b PO ₄ (mg/L)	SO ₄ (mg/L)	COD (mg/L)	BOD (mg/L)
*Turkish Regulations Water Quality Classes [6, 7]	I. Class	8	90	6.5-8.5	-	400	500	-	-	0.01	5	0.02	200	25	4
	II. Class	6	70	6.5-8.5	-	1000	1500	-	-	0.06	10	0.16	200	50	8
	III. Class	3	40	6.0-9.0	-	3000	5000	-	-	0.12	20	0.65	400	70	20
	IV. Class	<3	<40	Out of 6.0-9.0	-	>3000	>5000	-	-	>0.12	>20	>0.65	>400	>70	>20
Drinking Water Standards	TS266 [12]	-	-	6.5-9.5	-	2500	-	-	5	0.5	50	-	250	-	-
	EC [13]	-	-	6.5-9.5	-	2500	-	-	-	0.5	50	-	250	-	-
	WHO [14]	-	-	-	-	-	-	-	-	0.2	50	-	-	-	-
Sultanköy Dam Lake	1. Field Study	8.88	85.7	8.75	167.3	449	296	0.30	2.03	0.053	1.1	0.35	95	29.2	4.8
	2. Field Study	8.52	97.2	7.84	98.9	637	328	0.33	2.23	0.025	1.3	0.58	93	28.5	4.5
	mean	8.70	91.4	8.29	133.1	543	312	0.31	2.13	0.039	1.2	0.46	94	28.8	4.6
		Class I	Class I	Class I		Class II	Class I			Class II	Class I	Class III	Class I	Class II	Class II

^aTurkish Regulations, 2004 [6]; ^bUslu and Türkman, 1987 [8]; *III. – IV. Class water qualities are given in bold
 TS266 – Turkish Standards Institute; EC – European Communities; WHO – World Health Organization

III. RESULT AND DISCUSSION

The detected water quality parameters in Sultanköy Dam Lake and some national – international limit values are given in Table 1.

According to the Water Pollution Control Regulation criteria in Turkey [6, 7], Sultanköy Dam Lake has Class I water quality in terms of dissolved oxygen, oxygen saturation, pH, TDS, nitrate and sulphate parameters; Class II water quality in terms of EC, nitrite, COD and BOD parameters; Class III water quality in terms of phosphate parameters [8].

It is clearly known that organic and inorganic fertilizers used in agricultural activities increase the level of nitrogen and phosphorus compounds in water and soil in especially rural areas [9, 10]. In a study performed in dam lakes of Edirne Province in Ergene River Basin, water quality of Sultanköy (İpsala District), Altinyazı (Uzunköprü District), Süloğlu (Süloğlu District), and Kadıköy (Keşan District) Dam Lakes were investigated. According to the results of this study, as similar to the present study, the investigated reservoirs were found to be as highly contaminated by phosphate parameter in general [11].

It is clearly known that agricultural activities conducted around the water ecosystems are adversely affect the water qualities of these aquatic habitats and they are known as one of the most important factors that may significantly increase the contents of nitrogenous and phosphorus compounds in the surface and ground waters [15 - 19].

IV. CONCLUSION

In the present research, water quality of Sultanköy Dam Lake located in the İpsala District was evaluated by investigating some physical and chemical water quality parameters. According to data observed, organic contents in water of reservoir were detected in quite high levels. As a result of this research, it can be concluded that Sultanköy Dam Lake is being affected from agricultural activities and it has Class II. – III water quality in terms of nitrite and phosphate parameters. In conclusion, rice is the main crop produced in İpsala District, where is known as the most important region on rice production in Turkey. The water leached through from these paddy fields, which is being contaminated by fertilizers, is adversely affecting the water quality of Sultanköy Dam Lake.

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