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Water Quality Monitoring of Surface Resources in Balkan Arboretum Area (Trakya University, Edirne, TURKEY)

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ABSTRACT

The aim of the present study was to determine the quality of surface water resources of Balkan Arboretum Area located in Trakya University including Güllapoğlu Stream (lotic part) and Artificial Pond (lentic part). Total of 9 parameters including total dissolved solids (TDS), salinity, electrical conductivity (EC), pH, turbidity, sulphate (SO4), nitrite (NO2), nitrate (NO3) and phosphate (PO4) were investigated in surface water samples, which were collected monthly from Güllapoğlu Stream and Artificial Pond between the dates of January 2016 – December 2016. The detected results were evaluated according to the surface water quality criteria specified by SKKY (Water Pollution Control Regulation in Turkey) and evaluated as drinking water quality criteria specified by TS266 (Turkish Standards Institute), EC (European Communities) and WHO (World Health Organization).

INTRODUCTION

Rapid growth of world population, developments of industry and agricultural activities cause significant environmental contaminations and they all are adversely affecting the limited freshwater resources of the world. It is known that one of the best protection techniques of freshwater resources is permanent monitoring of these systems (Tokatlı *et al*., 2013; Çiçek *et al*., 2013; Tokatlı, 2014; 2015; Köse *et al*., 2015; Köse *et al*., 2016).

Balkan Arboretum Area contains a few important surface water resources including lotic and lentic ecosystems (Güllapoğlu Stream and Artificial Pond) and it is located in the Edirne Porvince of Turkey, in the northeast part of the Trakya University (Balkan Campus). As in almost all the aquatic habitats, freshwater resources of Balkan Arboretum Area are being affected adversely by the agricultural application conducted around the system (Tokatlı, 2013).

In this study, water qualities of the surface water resources of Balkan Arboretum Area located in the Balkan Campus of Trakya University were investigated and monitored monthly, and the data detected were evaluated according to the national and international surface waters quality standards.

MATERIAL AND METHOD

Study area and collection of samples:

Balkan Campus of Trakya University has an area of 2.215.744 square meter including 256.835 square meter closed area and includes an important freshwater potential especially in the Balkan Arboretum Area (http://www.trakya.edu.tr/; Tokatlı, 2013).

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Surface water samples were collected monthly from 2 selected stations between the dates of January 2016 – December 2016 from Güllapoğlu Stream (lotic part) and Artificial Pond (lentic part). The map of Balkan Campus of Trakya University and the selected stations are given in Figure 1.

Fig. 1: Study area and selected surface water stations

Physical and Chemical Analysis:

Total dissolved solids (TDS), salinity, electrical conductivity (EC) and pH parameters were determined by using "Hach Lange HQ40D Multiparameter" device during the field studies, turbidity parameter was determined by using "Hach Lange 2100Q Portable Turbidimeter" device during the field studies and sulphate (SO4), nitrite (NO2), nitrate (NO3) and phosphate (PO4) parameters were determined by using "Hach Lange DR890 Colorimeter" device during the laboratory studies.

RESULTS AND DISCUSSION

Surface water quality parameters determined in lotic section of the system (Güllapoğlu Stream) and lentic section of the system (Artificial Pond) are given in Table 1 and Figure 2.

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Table 1: Physicochemical data and water quality classes (Uslu ve Türkman, 1987; SKKY, 2004; 2015)

	TDS (mg/L)		Salinity (‰)		EC (ms/cm)		pH		Turbidity (NTU)	
	Pond	Creek	Pond	Creek	Pond	Creek	Pond	Creek	Pond	Creek
Jan	192	332	0.19	0.34	387	686	7.41	7.34	37.7	7.06
Feb	223	315	0.22	0.32	464	653	7.02	7.26	114	8.92
Mar	204	290	0.2	0.29	423	598	7.22	7.11	51.6	5.59
Apr	285	298	0.28	0.3	586	614	7.42	7.35	2.22	24.9
May	159	248	0.16	0.25	333	512	7.46	7.23	43.8	33.4
Jun	221	291	0.22	0.29	458	600	7.32	7.2	6.27	11.5
Jul	281	267	0.28	0.27	477	450	7.01	7.42	73.9	5.12
Aug	270	263	0.27	0.26	556	543	7.23	7.1	91.6	2.62
Sep	334	273	0.33	0.27	685	562	7.37	7.16	22.1	1.89
Oct	348	291	0.35	0.29	694	579	7.18	7.12	15.7	2.14
Nov	375	310	0.38	0.31	529	442	7.42	7.72	26	1.91
Dec	455	310	0.46	0.31	926	637	7.28	7.17	40.6	2.51
Min	159	248	0.16	0.25	333	442	7.01	7.10	2.22	1.89
Max	455	332	0.46	0.34	926	686	7.46	7.72	114.00	33.40
Mean	278	290	0.28	0.29	543	573	7.28	7.27	43.79	8.96
SD	86	24	0.09	0.03	163	75	0.15	0.18	34.30	10.07

	SO_4 (mg/L)		NO_2 (mg/L)		NO_3 (mg/L)		PO_4 (mg/L)	
	Pond	Creek	Pond	Creek	Pond	Creek	Pond	Creek
Jan	35	80	0.031	0.018	1.1	2.1	0.77	0.56
Feb	25	37	0.034	0.019	2	2.5	0.75	0.35
Mar	15	28	0.006	0.001	0.6	2.9	0.35	0.56
Apr	7	29	0.004	0.02	0.4	3	0.15	0.55
May	10	17	0.009	0.01	0.1	3.2	0.22	0.15
Jun	5	17	0.019	0.01	0.2	3.9	0.07	0.2
Jul	13	20	0.014	0.028	0.6	3.6	0.06	0.17
Aug	13	15	0.091	0.009	0.4	3.5	0.9	0.23
Sep	32	21	0.011	0.006	1	4	0.95	0.91
Oct	48	18	0.075	0.014	0.3	3.8	0.01	0.19
Nov	68	25	0.012	0.031	0.6	3.5	0.03	0.16
Dec	71	25	0.021	0.007	0.1	4.2	0.21	0.2
Min	5.00	15.00	0.004	0.001	0.10	2.10	0.01	0.15
Max	71.00	80.00	0.091	0.031	2.00	4.20	0.95	0.91
Mean	28.50	27.67	0.027	0.014	0.62	3.35	0.37	0.35
SD	23.03	17.65	0.028	0.009	0.54	0.63	0.36	0.24

I. Class Water Quality; II. Class Water Quality;
III. Class Water Quality; IV. Class Water Quality

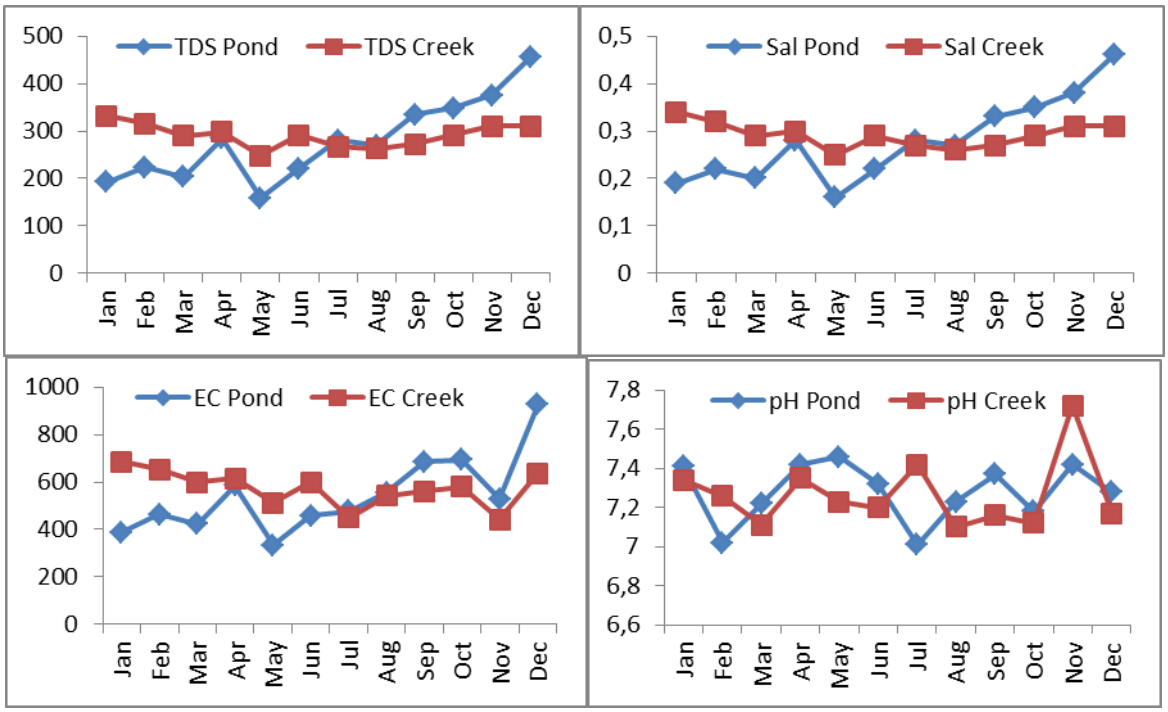

Fig. 2: Comparison diagrams of investigated parameters

According to the criteria of SKKY (Water Pollution Control Regulation in Turkey), Güllapoğlu Stream and Artificial Pond have I. Class water quality in terms of pH, sulphate and nitrate parameters; and they have II. Class water quality in terms of EC parameter except the recorded values in pond station in January and May (I. Class). In terms of nitrite parameter, Artificial Pond has I. Class water quality in March, April and May seasons, II. Class water quality in January, February, June, July, September, November and December seasons, and has III. Class water quality in August and October seasons. Güllapoğlu Stream has I. Class water quality in March, August, September and December seasons, and has II. Class water quality in January, February, April, May, June, July, October and November seasons in terms of nitrite parameter. Pond has II. – III. Class water quality in terms of phosphate parameter except the recorded values in January, February, August and September (IV. Class) and October. Stream has III. Class water quality in terms of phosphate parameter except the recorded values in September (IV. Class) and May (II. Class) (Uslu ve Türkman, 1987; SKKY, 2004; 2015).

According to the limit values specified by Turkish Standards Institute (TS266), European Communities (EC) and World Health Organization (WHO) for drinking water, sulphate (250 mg/L for TS266 and EC), nitrate (50 mg/L for TS266, EC and WHO), nitrite (0.2 mg/L for WHO), EC (2500 ms/cm for TS266 and EC) and pH (6.5 – 9.5 for TS -266) parameters detected in surface water resources of Balkan Arboretum Area were suitable for drinking (TS266, 2005; WHO, 2011; EC, 2007).

Conclusion:

In this study, surface water quality of Güllapoğlu Stream and Artificial Pond located in Balkan Arboretum Area in Balkan Campus of Trakya University (Edirne, Turkey) were investigated in a period of 12 months and evaluated according to the surface water quality criteria and drinking water quality criteria.

In conclusion, surface water resources of Balkan Arboretum Area have quite high nitrite and phosphate levels and these high nutrient levels in surface water reflect the pressure of fertilizers being used in agricultural applications around the region.

According to detected data, surface water quality in Balkan Arboretum Area may decrease further in the future and pose an important risk factor for these aquatic ecosystems. Environmental awareness has to be placed in local society as soon as possible, technical supports may be provided to agriculturalists focusing especially on the use of fertilizers.

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