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EVALUATION OF THE QUALITY OF IRRIGATION WATER AT THE TERRITORY OF VOJVODINA PROVINCE

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Introduction

Besides the control of physical and chemical soil properties, intensive crop farming requires continuous monitoring of irrigation water quality. The use of low-quality water for irrigation and its undesired effects on soil, cultivated plants and irrigation equipment, cannot be ignored under the impending climate change and the concerning decrease in soil organic matter content.




Materials and Methods

The paper aims to show the results of irrigation water quality testing, obtained during 2018 and 2019. The research included 142 samples of water taken at different locations from canal network or water wells. Water quality evaluation was made according to the following parameters: pH, electrical conductivity, the dry residue, the ion balance, and the SAR value. The classification of the US Salinity Laboratory (USSL) for saline soils and the residual sodium carbonate (RSC)is customarily used for this purpose, whereas Neugebauer's classification established for the region of Vojvodina was used in addition.

Results and discussion

The analysis of irrigation water mineralization resulted in the following values of the observed parameters: the average pH value of the tested water samples was 7.88 (min=7.14 max=9.01), while electrical conductivity ranged between 0.102 and 3.5 dS/m, with an average value of 0.844 dS/m. The dry residue analysis resulted in a wide range of values, from 112 mg/l to 2384 mg/l, with an average value of 526 mg/l. The SAR value varied, ranging between 0.04 and 16.52 with a satisfactory average of 1.94 (Table 1).

Table 1. Irrigation water quality

Variable	Valid N	Mean	Min.	Max.	Std. Dev.	Perc. 25%	Perc. 75%
pH	142	7.89	7.14	9.01	0.41	7.59	8.19
EC (dS/m)	142	0.84	0.10	3.50	0.52	0.51	0.98
TDS, (mg/l)	142	526.56	112.00	2384.00	343.96	314.00	585.00
CO_3 meq/l	142	0.24	0.00	2.08	0.42	0.00	0.34
HCO_3 meq/l	142	7.04	1.63	35.24	4.28	4.02	8.76
Cl meq/l	142	1.29	0.00	9.69	1.61	0.48	1.52
SO_4 meq/l	142	1.02	0.02	10.15	1.38	0.24	1.19
Mg meq/l	142	3.46	0.17	13.58	2.32	1.68	4.52
Na meq/l	142	0.24	0.01	4.60	0.50	0.07	0.20
SAR	142	3.36	7.14	9.01	3.09	1.30	4.34

According to the Neugebauer's classification, the majority of the examined waters belonged to the classes I and II (37% and 40%). Based on the analysis of the chemical composition of irrigation water and the subsequent classification according to the USSL, the tested water samples belong to class C2-S1 (57%) and C3-S1 (38%), compared to the total of the tested samples (Fig 1-2). The residual sodium carbonate (RSC) indicates that sodium buildup in the soil is possible in 14% of the investigated samples of irrigation water (Fig 3).

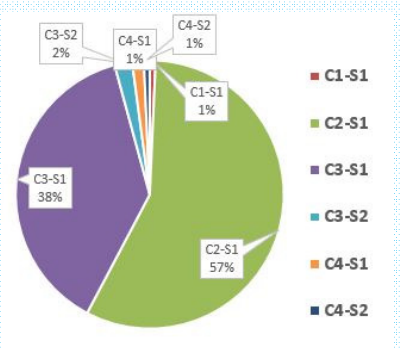

Fig. 1. Classification of irrigation waters (USSL Staff)

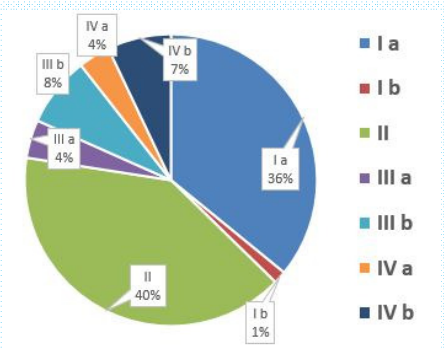

Fig. 2. Classification of irrigation waters (Nejgebauer)

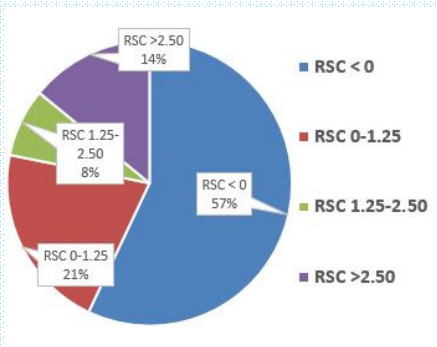

Fig. 3. The residual sodium carbonate (RSC)

Conclusion

Based on the comparative overview of the established classifications, as well as the "additional" evaluation of irrigation usability (FAO), the majority of examined irrigation waters generally exhibited good quality. Problems concerning salt accumulation in soil, sodium hazard could potentially threatened 5-14% of examined water depending on observed classification.