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Temporal Variation of Water Quality in Thana Reservoir (Lushnja)

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Abstract

The implementation of sustainable farming systems requires and the completion of quantitative and qualitative water needs of plants. The main part of the water needed in agricultural systems is complemented by rainfall, but in conditions of their lack of need must to intervene with additional irrigation. Water used for irrigation on agricultural comes from sources with different backgrounds like rivers, streams, lakes and watersheds, and it represents very different qualities, especially as far as the level of salinity. In our country, the main part of irrigation water provided by the floodplain (over 600 reservoirs with capacity about 560 million water m^3) that are to nourished which change their apparent qualitative composition. Their management requires, except of dynamic studies of sediment deposition, which is related to their longevity, also the study of their water quality, which is directly related to the quality of agricultural products. Providing quality water for irrigation, when the salinity level exceeds the levels permitted, with negative consequences on the quality of agricultural products, is the request of sustainable farming systems. Changing water quality in the time of various factors, their detection and analysis of water quality for irrigation reservoir Thana (Lushnja) have been the focus of this study.

Keywords: agricultural system, irrigation system, water quality, irrigation reservoir

1. Introduction

Water is the main component and essential for plant life, as with it are related many chemical and physiological processes that take place in the plant as photosynthesis, thermoregulation and translocation of nutrients. Lack of water in the required quantities in agricultural systems leads to declining production, while the quality of irrigation water directly affects the quality of the production. But in many areas deterioration of water quality has reached levels that make a limiting factor for its use, with consequences in productive activities [17]. Most severe deterioration have happened in the agricultural sector with which are interconnected many other activities. Water can carry toxins and pathogenic organisms for both man and animal infection [4, 8, 11]. Some pollutants are very dangerous since they accumulate in plant products without displaying symptoms of their presence in plants [6]. In literature we find numerous studies that provide data on potential pathogens collection of agricultural products [18, 7]. Analysis of chemical, physical and biological as salinisation, pH, amount of elements and oligoelements, temperature, suspended matter, the content of bacteria and fungi parameters are of primary importance in sustainable agriculture systems. This is particularly important in condition when the measured values of the above parameters in water used for irrigation exceeds the permitted limits. The presence of soluble salts and their quantity are key indicators for assessing the suitability of the water used for irrigation in agriculture and reducing production [13].Crossing the limits allowed by European regulations [5],not only harm the quality of agricultural products, but also the qualities of the soil causing phenomena such as salinisation of land [1, 15, 3]. A high salinity of the soil reduces the basic biological processes (limiting flora and fauna) and limit or block the absorption of nutrients from organic matter by limiting their availability [9]. Maintaining normal pH values (6.5 to 7.5) in water used for irrigation is another important indicator. Many studies have been conducted to determine the efficiency of water use by plants and their response to salinity stress [14, 16, 12]. On the other hand the activity of many microorganisms in

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soil is influenced by pH values. Another important indicator is the water temperature, which depends on the source of the receiving water and defining a series of chemical processes in the terrestrial environment. The presence of suspended substances is an indication of the quality of water for irrigation. For the determination of the water qualities for irrigation taken from a supply source, the study said the reservoir Thana (Lushnja) are determined through analysis, several parameters such as pH or water reaction, degree of salinity expressed either as electric conductivity water (ECW) for determining the osmotic pressure caused by soluble salts, as well as to assess the SAR as the presence of Na^+ ions in relation to the Ca^{++} and Mg^{++}. Other physical indicators like temperature, color and blur together with those microbiological remains to be studied. Study aims at determining the values of physico-chemical parameters and their changes in time and determining their values compared with European and Albanian norms allowed.

2. Material and Methods

For irrigation of agricultural land on the 1961 is build the Thana floodplain on the marsh former of Murrizi (Lushnja). The size of this reservoir is about 800 ha, with a volume of exploitable up to 50 million m^3. The main water supply of this reservoir is that of Devolli river through the Vlashuku dam. This reservoir has managed to work out within a year, about 200 million m^3 of water being recharged up to 3 times. Its irrigation ability is about 29 270 ha of Myzeqe field. Water flow through the high waters channel (HWC), right wing, who flows up to 15 m^3/sec, and in half of its length it passes within the city of Lushnja with a length of about 4 km, in which presently are throughing more urban waste, the geological composition of the reservoir and catchment basin characterized by the poor rocky exchange of groundwater. The reservoir has within it some groundwater resources which have minimum flow but they are rich in salts that affect its reservoir water salinisation. Land for their origin and relevant transformations are Sandy - Clay (SC) type. Climate on this basin and its surroundings is characterized by exponential characteristic of the Central Mediterranean climate zone. The average annual temperature varies from 8.2 to 24.4 ^{0}C, while perennial rainfall estimates at the range in 1000 to 1100 mm per year. The main characteristics important for the water quality for irrigation is salinisation. When water contains a high concentration of salts, their abundance, beyond normal limits, accumulate in soil and directly affect the quality and quantity of production . The effects of salt are more analogous to those of drought, because both result in growth of the plant need for water and the inhibition of growth and development. The main salts in the irrigation waters are: sodium chloride, calcium sulfate, magnesium sulfate, sodium sulfate, calcium bicarbonates. The content of soluble salts expressed representing the dry residue or total of water hardness (C') and it is used as an indicator of salinity. According to this criterion the water is defined salted when it reaches or exceeds the value of two per thousand of remaining dry. Dry matter represents a value that is due more to the electrical conductivity are measured water (ECW). In front with more negative phenomena causing the salty waters two are the most negatives: direct damage of agricultural plants and deterioration of soil agronomic qualities. But, to give a fair trial to the damage that causes the use of irrigation with saline waters have converted salinisation of water compared with soil salinisation [9]. Analysis of water quality in watersheds of Thana, have been conducted for irrigation water in the right branch channel. The samples were taken at the beginning of the irrigation season, during the irrigation season, and after irrigation season when the channel performs a dual function and is used as collector for streaming, just for comparison. Laboratory tests were carried out in the Laboratory Analytical Quality of Water on Centre of Agriculture Technology Transfer of Fushe Kruja under defined methodologies divided into three periods of the year on the HWC of Lushnja branch of water reservoir comprising on the study. The analyzes have been conducted in several indicators as pH, electrical conductivity, dry matters, Ca^{++}, Mg^+, Na^+, CO_3, HCO_3, Cl, SO_4, NH_4, PO_3 and pollution elements. The results obtained were compared with normative allowed.

Figure 1. Catchment basin of the Thana reservoir

3. Results and Discussion

The analyzes results of water of Thana reservoir show that these waters are generally rich in salts which can cause light or medium salinisation problems. Referring to our indicators it is note that the value of the electrical conductivity (ECW), which is the basic indicator of this phenomenon before the irrigation and during irrigation season it is low normal and after the irrigation season it is increasing at 1:45 Ms/m but always within allowed limits. This comes as a result that on the Thana reservoir, despite that it is fed by the Devoll river waters, it has a variety of rich in salts groundwater sources that directly affect the salinisation of water and this is noticed when these water flow increases. So as a rule recommended when the water level drops in the reservoir must necessarily be opened gates and entered the waters of the Devoll River with the intention to carry out rinsing and to reduce the concentration of these salts. It is noted that the indicators of Mg and Na are the boundaries slightly higher on average allowed. High content of Mg can cause obstacles to e Ca absorption from plants while the high content of Na and Cl may cause slight problems of plant toxicity. Refering to the values of monitored indicators over the years on this subject it is noted that this year we have a normalization of the quantity of salts containing waters, which did not affect this year in the quality and quantity of agricultural production plant.

Table 1. Results of analyzes water in monitoring point (Thana reservoir, Lushnja) compared with permissible limits of main chemical parameters.

Parameters analyzed	Simbol	Unit	Permissible limits	Ist samples 11.06.11	II^{d} samples 15.07.11	III^{d} samples 04.12.11	Average
Electric conductivity	ECW	Ms/m	0-3	0.756	0.878	1.45	**1.028**
Cations and Anions							
Calcium	Ca^{2+}	m.e / l	0-20	2.31	6.97	1.28	**3.52**
Magnesium	Mg^{2+}	m.e / l	0-5	3.39	3.7	6.94	**4.67**
Sodium	Na^{+}	m.e / l	0-40	1.76	2.1	111.8	**38.5**
Carbonates	CO_3^{2-}	m.e / l	0-0.1	0.07	0.16	1.28	**0.50**
Organic carbonates	HCO_3^{-}	m.e / l	0-10	2.71	3.27	8.38	**4.70**
Chloride	CL^{-}	m.e / l	0-30	2.01	1.8	3.39	**2.40**
Sulphates	SO_4^{2-}	m.e / l	0-20	2.56	3.06	18.34	**7.98**
Nutrient Elementes							
Nitric nitrogen	NO_3^{-}	mg/l	0-5	2.8	14.2	13.5	**10.16**
Ammoniacal nitrogen	NH_4^{+}	mg/l	0-5	1.0	1.4	1.7	**1.36**
Phosphates	PO_4^{3-}	mg/l	0-2	0.058	0.24	-	**0.149**
Potassium	K^{+}	mg/l	0-2	8.0	6.7	10.6	**8.43**
Various factors							
Acidity	pH	-log [H+]	6.0-8.5	7.72	7.1	7.26	**7.36**
Coef.absorb. of Na +	SAR	m.e / l	0-15				
Dry matter		gr/l		0.423	0.585	0.783	**0.597**

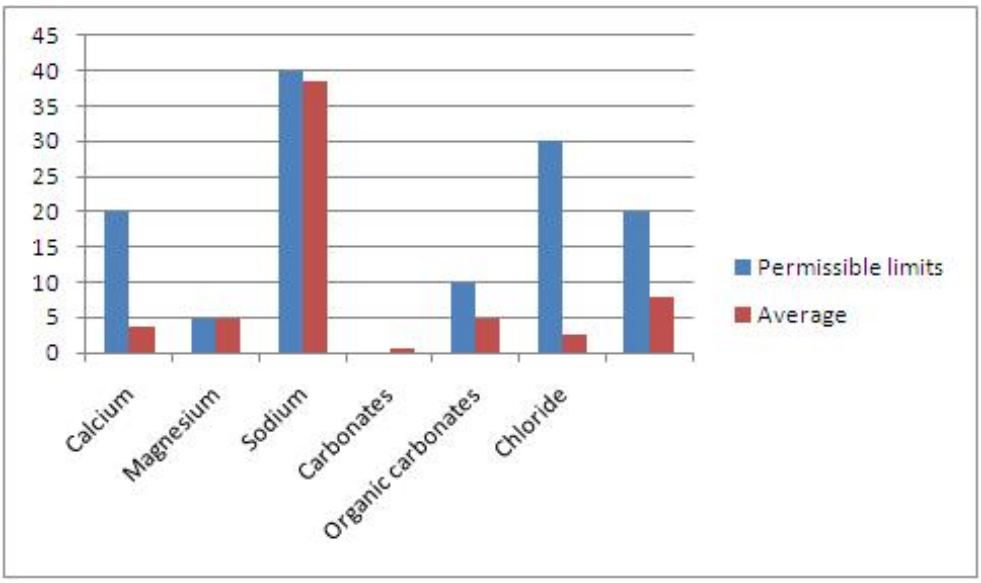

Figure 2. The values of the parameters analyzed (cations and anions) in high waters channel (HWC), Lushnja

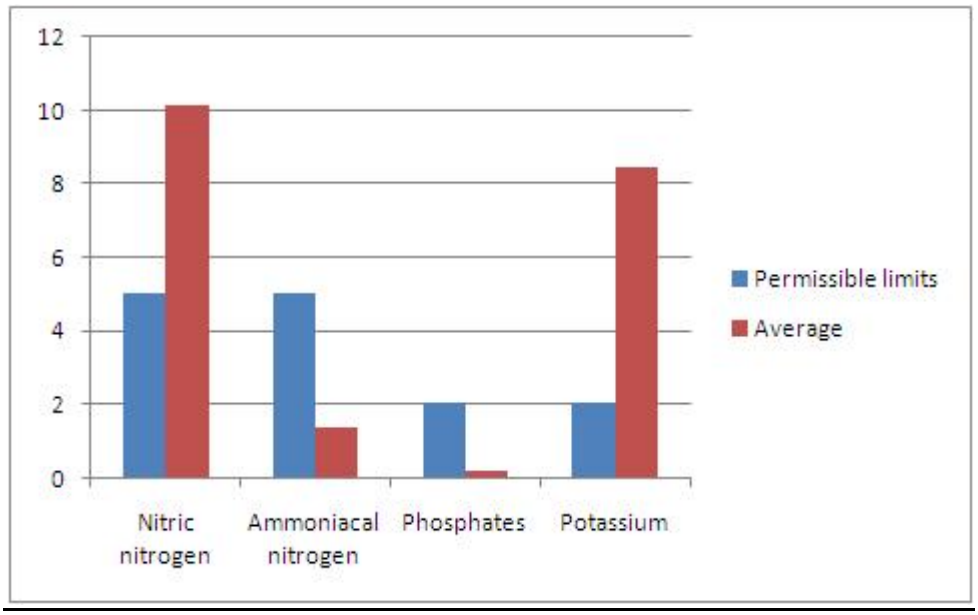

Figure 3. The values of the parameters analyzed (nutrients) in high waters channel (HWC), Lushnja

4. Conclusions

The study shows that the evaluation of water quality for irrigation is an important problem which should be taken into account in the management of agricultural systems and for the plants cultivation. In the sustainable agriculture systems for maintaining environmental and agronomic qualities of the land and the quality of agricultural products also required a high quality of water used for irrigation because through it are being forwarded some of salts and pollutants different agents. The study highlights the need for maintaining control of the level of salinity, which as drought, affecting the quantity and quality of production. The analysis conducted on water followed by floodplain of Thana in Lushnja, for years of analyses shows that based context the required limits no visible difference for all parameters analyzed, but has a tendency to increased level of salinity, influenced especially the tendency declining rainfall.

For getting quality products in sustainable agriculture systems should be done continuously analysis for the quality of irrigation water and makes necessary a periodic check of the values of acidity, especially (pH) and electrical conductivity of water which affects its level of salinity maintaining order within the permitted limits.

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