Advances in Bioresearch
Adv. Biores., Vol 6 (4) July 2015: 70-72
©2015 Society of Education, India
Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
ICV 7.20 [Poland]

Advances in Bioresearch

ORIGINAL ARTICLE

The Quality of Irrigation Water in Guilan Province (Case study: Olive orchards of Rudbar, Guilan)

Ali Ajili Lahiji[1], Parisa Mohammadpour[2]

1- Department of Soil and Water, Guilan Agricultural and natural resources research and education center, Rasht, Iran

2- 2- Faculty member (Research Assistant), Department of Forest and Range, Research Center for Agriculture and Natural Resources, Guilan province.

ABSTRACT

Olive is a plant that has adapted to different soils and compared to most fruit trees has more tolerant to high salt levels in the soil and low fertility soils. For better fertility olive trees, trees should be planted in deep soils with good aeration and drainage. In heavy soils, olive trees will not grow well. Calcareous soils are preferred for planting. The best pH range is 6.2 to 8. The electrical conductivity under 2.7 dS/m olive yield reduction cannot be seen, but in more than this amount the product is affected. The amount of soil organic matter also should be more than 2%. Olive is a tree that is consistent with different soil conditions. The plant is capable of development and production in the more or less salty soil and can be irrigated with saline water that other products cannot be irrigated. But the same salinity has adversely affected on the olive yield and soils cultivated due to high evapotranspiration and low precipitation. In this study, salinity waters of the area have ranged from 250 to 8250. The closer to the southern regions of the province, the more heavily it is. And the alkalinity of water has ranged 6.59 to 8.21. A small percentage of water is in the range of critical alkalinity and it is used for gardens consumption and has poor quality and salty. Irrigation water of 40 % of gardens has up to 4SAR and 20% of gardens had up to 8SAR.

Keywords*: Guilan, Olives, Water quality, Salinity, SAR*

Received 12/03/2015 Accepted 12/06/2015

How to cite this article:
Ali Ajili L, Parisa M. The Quality of Irrigation Water in Guilan Province (Case study: Olive orchards of Rudbar, Guilan) .Adv. Biores. Vol 6 [4] July 2015: 70-72. DOI: 10.15515/abr.0976-4585.6.4.7072

INTRODUCTION

Access to adequate water supplies is essential for human life in view of the quantity and quality. However the ancient people were aware of the importance of water from a quantitative point of view, understanding the importance of water quality had slower growth. There was not until the development of biology, chemistry and medicine that the methods of measuring water quality and its effects on human health and well-being was discovered. Although the irrigation of arable land has a long history, only in the last century the importance of the quality of irrigation water was realized. Due to lack of information on the effects of water quality, soil irrigation and sufficient attention to this in the past, in many parts of the world, vast fertile irrigated lands have been saline gradually and became salt marsh and swamp and many civilizations has turned to destruction. Development of water land in arid and semi-arid region of the world is faced with constraints of land salinity. In addition, the continuation of irrigation in these areas itself leads to the development of the salty lands and continuously makes more limited the soil resources usability. Identification and classification of the lands is the infrastructure of any planned development and improving the soil resources and prepare a platform for the next activities. Access to new methods of assessment the alkaline soils to be fast enough to provide such studies and classification of soil resources have been under the attention of scientists and researchers in recent decades. Salt is one of the most important factors limiting the expansion of the area under olive cultivation in hot and dry areas of Iran. Olive tree in the literature is considered as half-tolerant plants to saline. Its tolerance to salt is more fruits and less than date. Salt has various physiological effects on plant growth and development. Plant growth parameters such as the length of shoots, the whole leaf area, root length, root ability to perform its duties,

number of leaves and dry weight of plants is reduced with medium and high salinity. The olive stomatal conductance and photosynthesis is affected with increasing salinity. High salinity reduces the weight of the fruit, but increased the fruit humidity and reduces the amount of oil. It has been shown that for per 1dS/m increase in soil salinity in dense garden of olive varieties Arbican with 3 to 5 years, the yield based on the cross-section of the truck reduced at a rate of 16-23 percent. In this study it was shown that salt tolerance over time due to long-term accumulation of sodium ions in shoots and leaves reduced. Also, it will change the fatty acid composition of olive oil. With increasing salt concentration in irrigation water, palmitic acid and saturated fatty acid increases. Verticillium wilt is high in saline soils. But these effects depend on the duration of exposure to salt and varieties and the tolerance of different varieties of olives to salt is different which is affecting the quantity and quality of agricultural products. For example, use of low quality water will reduce the quantity and quality of the product. Unfortunately in conventional farming, the rapid advancement of technology has made the water easily extracted from the earth and placed at the disposal of farmers. And farmers regardless of the adverse effects of inappropriate use of this resource only think to water use and crop [1]. On the other hand, human activities in order to increase the yield per unit area reduced the quality of groundwater. Salt water causes cell dehydration of the plant that through intracellular water loss reduces the volume of vacuoles and Cytosol. The metabolic processes such as photosynthesis reduction, slow growth, reduced seed germination, leaf blight, lack of magnesium and calcium in the plant and hormone abscisic acid production are those initial responses of plants to salt water [2]. The decrease in the level of groundwater, because of numerous drilling water wells and the indiscriminate harvesting of groundwater in some coastal areas of Mazandaran leads to saltwater intrusion into coastal areas and increase the electrical conductivity of wells water. In the study that Rahmani *et al* [3] had been carried out to assess the quality of river water flowing in Hamedan-Bahar Plain for irrigation on the WILCOX diagram, water parameters such as pH, conductivity of water, sodium, calcium, magnesium had been measured for one year at 13 stations. The results showed that in the middle and downstream plains the quality of the river has decreased due to the gradual increase of pollutants, but duo to the distribution of the points on WILCOX diagram, the water quality of the studied rivers for irrigation were in good and middle classes.

MATERIALS AND METHODS

The study area is the olive orchards of Rudbar, Guilan. The garden area is about 6000 hectares that was great source of genetic resources and has played an important role in the expansion of olive plantations in 27 provinces of the country. Guilan province with an area of 1471100 hectares is located in the north of the country. The province is located at 36^0 34' to 38^0 27' north latitude and 48^0 53' to 50^0 34' east length of the meridian. Rudbar city is located in the southern of Guilan and it is bound from the north to the cities of Rasht and Lahijan, Tehran and Qazvin provinces to the south, from the East to Roudsar and from the West to Fouman and Zanjan. The area of this city is about 2,370 km^2. Rudbar city is mountainous and the submontane areas, forests and rangelands in different heights to be seen. Its latitude and longitude is Minimum 11' 49^0 in the East longitude and a maximum of 5' 50^0 and its north latitude is minimum 34' 36^0 and a maximum of 8' 37^0. The main rivers are flowing are Sefidrood, Shahroud, Zylkiroud, Siahroud, Qezelozan and Tutkabon. Its climate is influenced by dry and semi-arid weather of the central region. The climate of the area is Mediterranean climate. And growing the olive trees in the area is a witness to this issue. The study area covers olive plantations of Rudbar from Rostamabad to Loshan. The climate is very dry and low rainfall. From the irrigation water of gardens that wells were drilled mainly in riverside, 40 samples in July (dry season) were sampled and its salinity, alkalinity and water quality parameters including anions and cations in solution was measured. In order to evaluate water quality, water quality parameters such as pH, SAR and EC as well as the concentration of Ca, Mg, Na, SO4, Cl and HCO3 were measured and evaluated. Test methods used in this study as follows: Conductivity: Conductivity meter device; Acidity: The pH meter; Bicarbonate: Titration; Chloride: titration; Sodium: flame photometry; Calcium: titration and Magnesium: titration that had been carried out in water and soil laboratory of Guilan Research Center for Agriculture and Natural Resources.

RESULTS AND DISCUSSION

Test results are calculated for 40 underground sources with all factors and elements. In this analysis, the highest and the lowest salinity is 8250 and 295 μ mho/cm. According to the standard measures of salinity Laboratory, the EC will consider as following: EC <750 are without limitation and has a moderate salinity and are in c2 and 750 <EC <2250 is considered one of the high salinity waters that in the absence of leaching and salt drainage will expand and is in c3 and EC> 2250 is with very high limits which is recommended only for salt tolerant plants. In this study, about 30% of water has salt more than 2,250

been in group c4. Acidity is the other factor was calculated to evaluate the quality of resources to agriculture. According to the calculations and measurements the highest and lowest rate was 8.21 and 7.37, respectively that roughly indicating the uniformity acidity in all resources and has not created a restrictions with regard to the cultivation areas. Another very important factor for the quality of agricultural water is SAR. In the studied samples, the highest and lowest rate is 16.97 and 0.05. According to the standard SAR for agriculture, SAR problem exists and 20% of the gardens have the SAR more than 8, that is in groups s4 and the other 20% are in s2 and s3 groups. SAR is the sodium adsorption to calcium absorption ratio + magnesium. The higher the ratio, water pH increased and in turn the risk of alkalinity will increases. Use of such water in agriculture causes soil degradation and serious damage to the plant and creates the risks to drinking water in terms of uptake in the body. To evaluate the damage property of SAR in the EC, one of the oldest water quality classification systems for use in agriculture, Will Cox classification will be considered [3-6]. In this category, both electrical conductivity and sodium adsorption ratio is considered and each of them is divided into four parts which totally cause to create sixteen groups of water quality. Another important element in the agricultural area is chemical quality of water and the amount of sodium in it. The results of forty agricultural resources in the region, the highest and lowest sodium concentration is equal to 53 and 1.06 mEq. Toxic effects of some elements can be well seen in trees such as suberization and witches broom of branches and finally drying trees. Another important element in agriculture is calcium. Calcium both due to soil dispersion prevents and special nutrient properties are particularly stressed in the plants. In this study, the highest and lowest concentration is 27.4 and 0.8 mEq /liter. Calcium is one of the pillars for SAR. Since practically to exact determine of calcium and magnesium exchange rate in the presence of carbonate calcium and magnesium of soils contain these mineral is very difficult work, the equilibrium relationship that encompasses and represents the relative amounts between these amount with transactional phase, ie, the ions Mg, Ca and Na dissolved in water or soil water was used. Calcium also plays a constructive role in agricultural soils with magnesium in the soil structure and ESP. The highest and lowest bicarbonate measured in the resources is 7.3 and 2.4 mEq/liter, respectively. Bicarbonate is an important factor in modern agriculture, as the main cause of sediment and clogging; particularly in drip irrigation is the bicarbonate, so the Langelier index is recommended to determine the bicarbonate sediment. Range without obstruction in drip irrigation for bicarbonate is as follows that if its rate is less than 1.5 mEq/ liter, there is no limit and for each plant can also be used. If it is in the domain of 1.5 to 7.5 mEq/ liter, we encounter with the restrictions either for use in pressurized systems or the type of plants. However, this problem is solved, to some extent in advanced knowledge of dropper, but in the rate of above 7.5 mEq/ liter, its use to pressurized irrigation is very limit and also there are plant restrictions. The Committee on Irrigation and Drainage knows the bicarbonate rate for irrigation water as follow that concentration of less than 5.1 mEq per liter is good; concentration of 1.5 to 8.5 is average and above 8.5 mEq per liter is unsuitable for irrigation. According to calculations, almost 100% of water has more than 1.5 and less than 7.5 mEq sodium bicarbonate. Chlorine values calculated in this study are as follows: The maximum and the minimum concentration is 52 and 0.8 mEq per liter, respectively. Guide to Water Quality (Cl) for Irrigation by the National Committee and Drainage has determined that in the sprinkler irrigation water, the concentration less than 3 mEq/ liter is good and 3-9 mEq/liter is average and above 9 mEq/liter is unsuitable and for use in shallow water less than 3 mEq per liter is good and above it is average. The results show that about 40% gardens have more than 9 mEq per liter Chlorine.

REFERENCES

1. McLay, C. D. A. Dragten, R. Sparling, G. and Selvarajah, N. 2001. Predicting groundwater nitrate concentrations in a region of mixed agricultural land use: a comparison of three approaches. Environmental Pollution 115: 191-204.
2. Diyanati Tilaki, R. and Falah, F. (2009). Investigate changes in electrical conductivity and hardness of groundwater in the coastal city of Sari. 12th of Environmental Health Congress, University of Shahid Beheshti Medical Sciences, 1097 – 1084
3. Rahmani, A, and Samadi, M. (2008). Hamedan-Bahar plain water quality assessment based to the WILCOX diagram, Journal of Agricultural Biotechnology 2008 No. 8, pp. 13-27.
4. Abedi, M, H, Neirizi, S, Ebrahimi Birang, N, Maherani, M, Khaledi, H,. Mehrdadi, N, Cheraghi, A, M, (2002). " Theuse of salt water in sustainable agriculture", Iranian National Committee on Irrigation and Drainage, p. 68
5. Afuni, M and Mojtaba, R and Nourbakhsh, F. (1997). Saline and sodic soils and amendments books – Publication of Arkan.
6. Amin Alizadeh, (1988), Quality of water in agriculture, University of Mashhad press.