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Assesment of Salinity and Alkalinity of Groundwater and It Relation to the Geochemical Propersties of Soil in a Specific Site of Lasbela Region

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Abstract
The study was conducted on assessment of salinity and alkalinity of groundwater and it relation to the geochemical properties of soil in a specific site of Lasbela region during 2013-14. Field data was collected through questionnaires. Water and soil samples were collected from 32 randomly selected sites. Both soil and water were analyzed for Electrical Conductivity and SAR by following standard procedures. The general trend line showed that soil salinity increased with an increase in water salinity. ECw has significantly affected the soil properties sites. The Alkanity levels both at water and soil differ significantly with each other. Alkanity of soil is increasing with the application of sodic water. Alkanity levels of groundwater used for irrigation of crops didn't have a significant relation for soil Alkanity at different sites of the study area. There is an inverse relationship between Electrical conductivity and Sodium Adsorption Ratio. The saline groundwater quality from the irrigation to the whole region is although causing reduction in soil alkanity but it is causing lesser impact when compared to the individual sites in the study area.
Keywords: Salinity, Alkanity, Sodium Absorption Ratio, Electrical Conductivity, Assessment

1. Introduction
Salinity and alkanity is the most important criterion for evaluating the quality of irrigation water because of the potential crop yield reductions that can result from the use of saline water which inhibits water uptake by plants. Agricultural practice tends to induce accumulation of salt in land and water. Salts accumulated in soils can be mobilized by irrigation practice through the modification of water circulation across land. For improvement in quality of water used for human consumption and agriculture use depend on reliable analytical measurements. Ground water is the major source of water supply for drinking and other purposes in the rural areas of India (Jitin, 2002). The soil pollution is generally associated with use of polluted water which can alter soil properties as well as plant characteristics (Degens *et al*. 2000). The percentage of exchangeable sodium (ESP), however, increased with the saline concentration of the irrigation water (quantity of NaCl) above all in the 0–0.4m layer, and gradually decreased with depth (Tedeschi *et al.*2005). Emdad *et al.* (2006) stated that the reduction in infiltration associated with the use of high-SAR irrigation water was found to reduce the performance of the irrigations, with the application efficiency of the final irrigation decreasing from 40% where the low-SAR water was used, to 21% where the high-SAR water was applied. With the increase in use of saline water for irrigating urban landscapes, salinization of irrigated soil is becoming a concern (Miyamoto,S *et al.*2004). Weiping Chen *et al* (2010) stated that in arid and semi-arid regions, salinity is a serious and chronic problem for agriculture.

2-Material and Methods
2.1 Study Area
The study was carried out in Tehsil Uthal, District Lasbella. It lies in south of Balochistan; it is dry sub-tropical region. Uthal is lying between the latitudes of 25^o 66 North and the longitudes of 66^o 37 East. The soil texture Uthal is alluvial, and is composed of light loose clay, mixed with fine sand. The temperature ranges from minimum to maximum as 3^{o}C to 17^{o}C in January and 24^{o}C to 38^{o}C in June.
2.2 Data Collection
Water samples for determining the water quality in general and other elements were collected in 1.0 liter plastic bottles according to standard methods. Before collecting the samples, the bottles were washed properly and rinsed thoroughly with distilled water so as to remove any contamination. The data of the soil in the region has been collected to observe the changes in soil salinity and Alkanity for a given soil depth. Electrical Conductivity (EC), Total Dissolved Salts (TDS) and pH in groundwater samples and soil saturation extract were determined by portable conductivity meter. The concentration of Na was determined in the water sample by using flame photometer using appropriate standard following Richard (1954). $Ca^{+} + Mg^{++}$ was be determined by Titration method. SAR was determined by determination of sodium through Flame photo meter by using standard procedures**.** Salinity and alkanity of both groundwater and soil were plotted against each other and their

relationship was determined by coefficient of determination

3-Results and Discussion

3.1 Effect of Saline Groundwater on Soil Salinity

The general trend line showed that soil salinity increased with an increase in water salinity (Figure 3.1). Results also showed that ECw has significantly affected the soil properties. According to Irrigation and Drainage Paper FAO (1974) if the average salinity of the soil water is about three times the salinity of the irrigation water and a Leaching fraction of at least 15% is accomplished. This salinity, however, will vary with depth and the upper root zone will contain less salinity than the lower parts. Salts will normally be leached out of this upper root zone but accumulate to higher concentrations in the lower rooting zone. The extent of this accumulation will depend upon the leaching that takes place. According to Shahinasi and Kashuta (2008) who reported that of water with low quality has a negative impact on the soil as a result of causing salinity and infiltration problems. The regional advective groundwater flow in unsaturated part of soil profile will drain the salt to help the leaching in other way round to reduce the load in root zone.

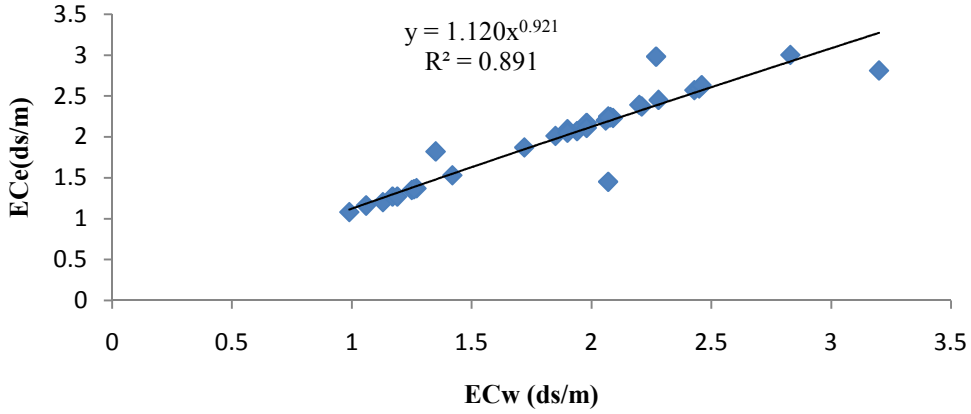

Figure 3.1 Effect of Saline Groundwater on Soil Salinity

3.2 Effect of Sodic Groundwater on Soil Alkanity

The alkanity levels both at water and soil differ significantly with each other. The trend in (Fig No 3.2) shows that alkanity of soil is increasing with the application of sodic water. Alkanity levels of groundwater used for irrigation of crops didn't have a significant relation for soil Alkanity at different sites of the study area. The resulting value of R^2 shows that there was weak relationship between soil alkanity and water alkanity. It can be associated with those found by M.S. Bajwa *et al.* (1992) that soil pH and ESP increased with increase in RSC and SAR of the irrigation water. Alkanity of soils have lesser impact on sandy soil that's why application of sodic groundwater is not affecting the soil. It can be concluded that alkanity level of soil is not much affected by application of sodic water.

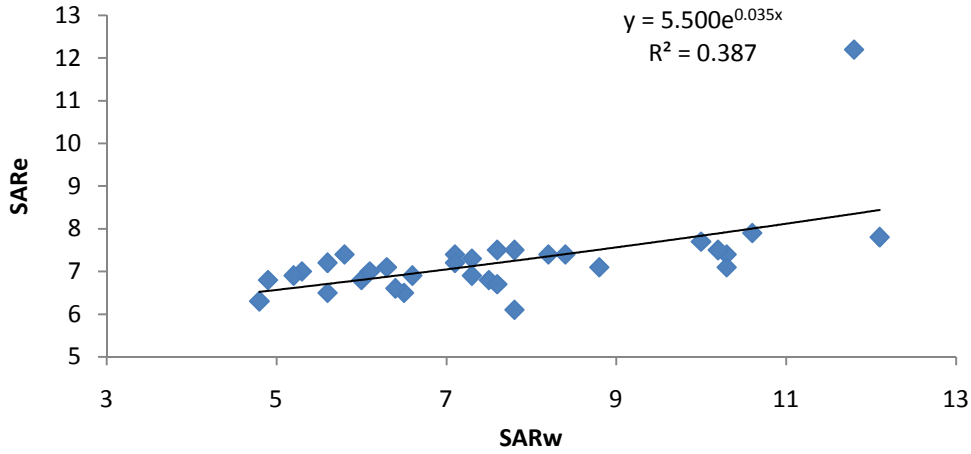

Fig No 3.2 Effect of Sodic Groundwater on Soil Alkanity

3.3 Effect of Groundwater Salinity on Soils Alkanity

There is an inverse relationship between Electrical conductivity and Sodium Adsorption Ratio. The relationship between saline groundwater and alkanity of the soil is clear from the Figure 3.3. The saline groundwater quality from the irrigation to the whole region is although causing reduction in soil alkanity but it is causing lesser impact when compared to the individual sites in the study area. However when this impact is taken on the main scale for the whole area it shows a bit more influence. Generally alkanity level of soil is not much affected by the application of saline water. The role of saline water is negligible when it is compared to other properties under study. These results are similar to those by Phogat *et al.,* (2004) which stated that the concentration of Na^{+}, Ca^{+2} and Mg^{+2} ions generally increased with increase in EC of the water samples.

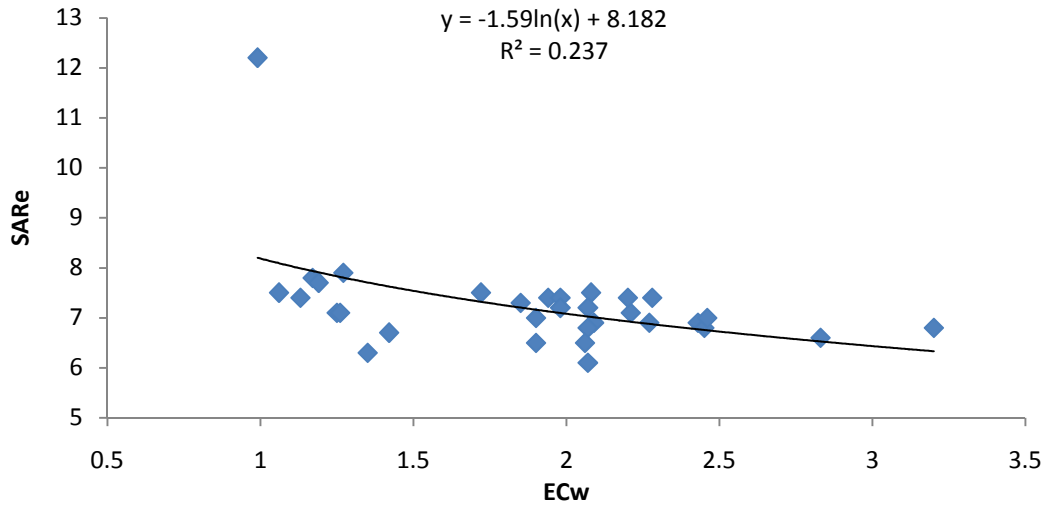

Figure 3.3 Effect of Groundwater Salinity of Soil Alkanity

Conclusions

Soil salinity increased with an increase in water salinity Results also showed that ECw has significantly affected the soil properties. The alkanity levels both at water and soil differ significantly with each other. Alkanity of soil is increasing with the application of sodic water. Alkanity levels of groundwater used for irrigation of crops didn't have a significant relation for soil alkanity at different sites of the study area. There is an inverse relationship between Electrical conductivity and Sodium Adsorption Ratio. The saline groundwater quality from the irrigation to the whole region is although causing reduction in soil Alkanity but it is causing lesser impact when compared to the individual sites in the study area. However when this impact is taken on the main scale for the whole area it shows a bit more influence.

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