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Influence of Sodium and Calcium on Vegetation at Saline Desert (Little Rann of Kutch) of Gujarat State in India

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Abstract: Scrutiny of soil and vegetation with their inter-relationship can effectively assist in recognition of the factors to combat land degradation. Saline desert (Little Rann of Kutch of 8820 ha) was selected, for the study of soil (physical and chemical properties) and vegetation. Species richness for herbs was 12, 46, 9, 13 and 35 at Site 1 to 5. Highest density of herbs (21.967 plants m^{-2}) with high FC, OC, OM, N, P and Ca (31.400, 0.799, 1.377, 0.069%, 63.202 kg ha^{-1} and 194.218 mg kg^{-1}) and low BD, EC, K, Na and Pb at Site 5. Lowest density for herbs (2.208 plants m^{-2}) was found with high values of PD, EC, Na and Pb (2.861 gcc^{-1}, 14.581 dS m^{-1}, 137.310 and 67.309 mg kg^{-1}) and low values of OC, N, Ca and Fe at Site 3. Density of shrubs/trees was highest (8.519 plants 10 m^{-2}) at Site 2 with high values of OC, N, Ca and Mn and low values of EC, Na and Pb. Density has negative correlation with Na, EC and clay while positive with OC and Ca. Low species richness and density is the result of low concentration of OC, OM, N, P, Fe, Ca and high concentration of clay, Na, Pb and EC.

Key words: Calcium, density, desert, herbs, sodium and soil.

Soil (physical and chemical properties) and vegetation study was conducted at Little Rann of Kutch; a saline, brackish desert with soaring salinity (Gupta and Ansari, 2012). It is nominated to be a "biosphere reserve" which is defined by the areas of terrestrial and coastal ecosystems internationally recognized within the framework of UNESCO's Man and Biosphere (MAB) program (Goswami *et al.*, 2014).

Soil salinization directly influences plant growth by increasing osmotic pressure of soil moisture causing physiological drought and deterioration of soil (Abdelfattah, 2009). The main effect of salts on vegetation is that during increased osmotic pressure plants find it gradually more difficult to utilize water from the soil. This is the main cause of less vegetation at saline areas, leading to many of the adverse environmental consequences of salinization of desert. Change in vegetation, either due to dominance of additional salt tolerant species or through reduced growth of existing species, is frequently the first understandable signs of desert salinization trouble. These effects depend, mainly on seasonal conditions, plant growth, root zone and salt levels (Charman and Junor, 1989; Pilania and Panchal, 2014; Vaghasiya *et al.*, 2015).

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Great heterogeneity of resources is known to occur in arid and semi-arid ecosystems, mainly due to different plant species and their distribution patterns (Wezel *et al.*, 2000). Spatial heterogeneity of soil resources is recognized as a common feature in natural ecosystems (Palmer, 2003). It has been considered as one of the major drivers of biological processes (Kumar *et al.*, 2006; Zhou *et al.*, 2008) and as a basic element for competitive or facilitative interaction between plants. Consequently, spatial heterogeneity of soil resources may determine landscape patterns, and greatly affect the biogeochemical cycles in many ecosystems (Bekele and Hudnall, 2006; Zuo *et al.*, 2008).

Inter-relation between soil and vegetation have been known since the development of the concept of the factors of soil formation (Jenny, 1941). Vegetation influences soil by recycling different nutrients. Soil and vegetation degradation, is influenced by each other (Langbein and Schumm, 1958). Which suggests that to increase the productivity of the land both soil and vegetation should be studied concurrently. With this alarm the inter-relationship of soil and vegetation was studied at saline desert.