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Salinity Characteristics of Soils Supporting Halophyte Vegetation in Saline Desert Ecosystems in Western India

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Abstract: Saline soil limits plant growth by affecting osmotic balance in soil-plant systems. Vast areas of saline deserts exist in arid areas of India where crop production is not feasible. One of the ways to effectively utilise such landscape is to use plant species adapted to such hostile environments. Field survey was carried out in two major saline desert ecosystem of western India, namely Great Rann of Kachchh (GRK) and Little Rann of Kachchh (LRK), during 2013 and 2014. The study indicated that these unique ecosystems were deficient in soil organic carbon with content less than 0.77%. Extremes of salinity are common in the study area recording salinity as high as 102.3 dS m^{-1} in GRK and 85.38 dS m^{-1} in LRK. The major halophytic plants were *Aeluropus lagopoides, Sporobolus marginatus, Suaeda nudiflora* and *Cressa cretica. Aeluropus* was able to grow in soils having salinity upto 27.7 dS m^{-1}, whereas *Sporobolus* could grow in ecological niches with salinity as high as 83.1 dS m^{-1}. The halophytic non grasses like *Suaeda* and *Cressa* were widely distributed in both the saline desert ecosystems. The presence of salts increased the plant population of *Suaeda* and *Cressa* up to certain salinity levels. Beyond salinity value of 9.9 dS m^{-1}, the plant density of *Suaeda* decreased, whereas in *Cressa*, the salinity value beyond which reduction in population decreased was 27.2 dS m^{-1}. These plants which are able to survive at extremely salinity environments, could be explored for greening saline deserts and could be used as local fodder resource to support livestock population.

Key words: *Aeluropus lagopoides, Cressa cretica,* salinity, soluble ions, *Sporobolus marginatus, Suaeda nudiflora.*

Salinisation is one of the most serious degradation affecting crop growth and productivity especially in arid and semi-arid areas, where rainfall is insufficient to leach excess salts and sodium ions out of rhizosphere (Odeh and Onus, 2008). It is the process leading to excess concentration of dissolved salts in soil due to natural processes or anthropogenic actions (Ghassemi *et al.*, 1995). Worldwide, salt affected soils occupy about 952 million hectares (7% of earth's land surface) under various degrees of deterioration (FAO, 1974; Flowers *et al.*, 1977). About 20% of the cultivated lands and 33% of irrigated lands are reported to be affected by salinity (Shrivastava and Kumar, 2015) rendering these lands economically unproductive. In India, salt affected lands occupy 6.73 million hectare (Mandal *et al.*, 2010). A unique vast stretch of saline desert occurring in West Central India known by name Rann of Kachchh, is regarded as the largest salt desert in the world (Pandit *et al.*, 2014). It is spread in two stretches; one part in 7505.22 sq. km known as Great Rann of Kachchh (GRK) and the other in 4,953 sq. km known as Little Rann of Kachchh (LRK). During monsoonal period from June to September, the area becomes marshy land by inundated water from runoff resulting from rainfall and water driven by forces of winds and tides from Arabian Sea. Unlike other deserts where soil texture is dominated by sand, the soils of the desert is dominated by clay (Gupta and Ansari, 2014), which make infiltration and percolation of water through the soil very poor. During rest of the months the land turns into a hyper saline desert.

Soil salinization restricts the plant growth mainly due to low osmotic potential of soil solution which adversely affects the water and nutrient uptake by plants, and toxic effect of specific ions (Patel *et al.*, 2010). Natural salinization occurs due to weathering of minerals or parent materials rich in salts or from deposits of fossil salts (Abrol *et al.*,

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