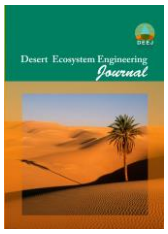
DEEJ (2018) 7 (20) 33-44

University of Kashan

Desert Ecosystem Engineering Journal

Journal homepage: http://deej.kashanu.ac.ir



Seasonal variation in the amount of salt fallout from dust in the north of Yazd-Ardakan plain

Ali Mohamad Ghaeminia[1], Mohamad Ali Hakimzadeh[2]*, Roholah Taghizadeh-Mehrjardi[3], Farhad Dehghani[4]

Received: 12/07/2018 Accepted: 06/11/2018

Extended Abstract

Introduction: Physical, chemical and ecological changes on dust deposition sites are one of the many problems caused by the occurrence of dust phenomena in arid areas. The entrance of additional salts to the ecosystem by dust, makes increased salinity and imbalanced of salts in the growth environment of plants. The purpose of this study is to determine the seasonal variations in the amount of salt sediment accumulation by dust in the arid region in north of Yazd-Ardakan plain.

Materials and methods: The study area is located in the geographical location of 53° 50' 30" to 54° 01' 35" eastern longitude and 32° 22' 45" to 32° 34' 50" northern latitudes with an average height of 990 meters above sea level and have Water and soil resources salinity problems. The average of reference evapotranspiration, temperature and annual rainfall in the studied area according to the Ardakan synoptic station in the 10-year period is 3483 mm, 18.5 °C and 75 mm, respectively. For research purpose, 128 samples of sediment deposited during the four seasons of 2017 were collected by MDCO sediment trap in an area of 20,000 ha. The soil salinity type is sodium chloride in the region. By using the OLYMPUS binoculars stereomicroscope SZ30 instrument was observed salt crystals formed at the bottom of the container from the oven. The data were analyzed using SPSS 16 software using Duncan's method ($p<0.05$) to examine and compare the significant differences between the obtained seasonal data from laboratory stage. Also, to study the relationship between salinity of dust with climate parameters, three parameters include wind speed, precipitation and air temperature were obtained seasonally for the nearest synoptic stations located in the study area (Meybod and Agda). The maximum average wind speed is related to the spring with a speed of 9.3 $m.s^{-1}$ and the smallest is autumn with 2.8 $m.s^{-1}$. Most precipitation falls in winter, with an average of 9 mm and the summer is without precipitation. The average seasonal temperature of the region varies from 11 to 32 ˚C throughout the year and the summer is the warmest and winter is the coldest season. In order to mapping the spatial distribution of salt fallout in the area on the map, the Surfer 13 software was used by Kriging interpolation method.

Result: The result showed that the seasons of spring, winter, autumn and summer have 43.09, 29.92, 16.33 and 11.90 $gr.m^{-2}$ dust fallout, respectively. Observation of the residue material in the bottom of the oven dish

[1]. Ph.D. Candidate of combat desertification, Yazd University
[2]. Assistant professor, Yazd University; hakim@yazd.ac.ir
[3]. Assistant professor, Ardakan University
[4]. National Salinity Research Center, Agricultural Research, Education and Extension Organization (AREEO) Yazd, Iran
DOI: 10.22052/deej.2018.7.20.11

below the binocular stereomicroscope illustrated that were formed small crystals of salt and there was airborne salt with dust subsidence. The results of the comparison of the Average the Total Dissolved solids (TDS) of seasonal dust showed that summer with the significant difference has the highest salinity (20.28%). Autumn dust with 15.43% was in the next rank and spring and winter with 9.36% and 8.03% respectively there were no significant difference with each other. However, according to the amount of deposition of dust in the region, this amount will be equivalent to 4.03, 2.41, 2.51 and 2.40 $gr.m^{-2}$ of salt at spring, summer, autumn and winter respectively. The study between seasonal values of salinity of dust with three meteorological parameters has also shown that increasing its salinity corresponding to low rainfall and high temperature, due to lack of leaching of salts and their accumulation in soil surface, in if the wind speed shows the least correlation with the percentage of salt in the dust. Maps of dispersion of subsidence changes soluble elements with dust in different seasons showed that the areas located in the center and north of the study area have been more soluble subsidence, which is consistent with field studies. The areas in the center include the wind erosion sensitive lands with zibar and ripple mark facies and areas in the north are covered with a surface layer of salt crust.

Discussion and Conclusion: Soil salinization and disruption of plant growth are the effects of saline dust on the ecosystem. One of the main sources of salt lift off by wind is accumulation of water-soluble elements on the soil surface and the presence of saline soil and puffy areas. With regard to the geographical location of the northern Yazd-Ardakan plain (Figure 1), its location in the center of Iran, low rainfall (Figure 2) and the impossibility of leaching salts, salts remain at the surface and create a source of salt harvesting by the wind Which is consistent with the results of Mahmoudi and Khademi (2014) in Isfahan, which determine the cause of salt with dust is saline soils origin. The results obtained (Table 2) also showed that the range of soluble salts in the dust of the north of Yazd-Ardakan plain varied between 8.3 to 28.2% in different seasons, which is close to 10-25% in the studied region (Lake Ebinur, China) by Erdinger et al. (2004) and Abuduwailli et al. (2008). According to the results of Saremi Naeini (2017), the probability of occurrence of erosive winds (above 6 $m.s^{-1}$) in Yazd province is more than in other seasons in spring, and this probability is lower in the autumn than in other seasons, thus the higher amount of dust in these season (Table 1 and 2) can be attributed to changes in wind speed in the region and the occurrence of erosional winds, which is According to the results of Nowruzi and Khademi (2015) in justification of the time distribution of the rate of subsidence of dust in Isfahan and its relation with climate parameters. Investigation of correlation between seasonal variations of saline dust with meteorological parameters showed that increasing the salinity of the origin soil that occurs due to low precipitation and high temperature close to the loading of salt from the soil surface by wind. Indeed, Precipitation has contributed to a portion of soil moisture and increased adhesion between particles in reducing the removal of solutes with dust. With regard to the presence of salt with dust fallout in the region and its various environmental impacts, in order to reduce its risks, in particular, to prevent possible increase in soil salinity and damage to plants through this, it is recommended that stabilize unstable lands against wind and reduce wind speed through the development of windbreaks in the region.

Keywords: Desertification, Salinity, Saline Dust, Arid biome.