An Investigation of Land-Use Effect on Dust Concentration and Soil Loss in Desert Areas: A Case of Ein Khosh-Dehloran, Ilam

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Extended abstract

1- Introduction

The occurrence of dust storms caused by wind erosion is a process that causes the destruction of land and can also be considered as a desertification indicator (Xu, 2006). Generally, the formation of a dust storm depends on three factors: the presence of strong winds, a sensitive surface to wind erosion and unstable weather conditions (Xia and Yang, 1996). Humans play an important role in the formation of dust storms through changing land use in sensitive areas to sand storms. In the arid and semi-arid areas covered with tiny and unstable materials, land degradation may occur as a result of land use change caused by over-grazing and farming. As a result, wind erosion increases, leading to more sand storms (Xu, 2006).

2- Methodology

For this research, first, using satellite imagery and land use map, the land uses in the study area that included the *Ziziphus Nummularia* natural forest, planted *Prosopis Juliflora* forests, agricultural land, sand dunes and rangelands were determined. After observing and accurately identifying the area, one week after the first rainfall, 15 undisturbed soil samples and 15 disturbed soil samples were collected from the area. After transferring the samples to the laboratory, the samples were exposed to dry air and then some physical and chemical properties of the soil were measured. Wind tunnel was used to determine the soil loss in different land uses, also the dust density determined using a Microdust pro device, which was installed in the outlet of the wind tunnel. This device measures dust concentrations in milligrams per cubic meter. So soil samples were simulated in 4 wind speeds including 2, 9, 16 m/s and wind erosion threshold velocity for 5 minutes. To determine the wind erosion threshold velocity, soil samples were placed in the wind tunnel. Then, by adjusting the wind speed that was possible by the inverter and using the accelerometer, the wind speed erosion threshold was measured in different land uses. In this way, the velocity has slowly increased, and the first particle that began to move was considered as the wind erosion threshold. In this study, the erosion rate was calculated from the ratio of the weight or volume of eroded soil to the sample surface. So, to determine the amount of soil loss, at the end of each experiment, the amount of sediment accumulated in the sediment trap was collected and weighed, and the soil loss was calculated based on the amount of soil erosion in grams per cm^2 per minute.

3- Results

Based on the results, there was no significant relationship between the dust concentration in the undisturbed and disturbed samples, but there was a significant relationship between soil loss in the undisturbed and disturbed samples. Comparison of the mean of suspended particles and the amount of soil loss in the both sample groups showed that the lowest and highest amount of suspended particles and soil losses was related to the *Ziziphus Nummularia* natural

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forest and sand dunes, respectively. According to the correlation results, there was a positive and significant correlation between wind erosion and SAR parameter ($P < 0.01$), but there was a negative and significant correlation between the erosion and OC, Silt, SP and CS ($P < 0.01$). Also, erosion had a negative correlation with EC, Mg, P and had a positive correlation with sand ($P < 0.05$). The Principal Components Analysis (PCA) showed that three main components of wind erosion controller were Pc_1, Pc_2 and Pc_3, whose quota were about 48.7%, 21% and 9.7%, respectively.

4- Discussion & Conclusions

The results showed that by increasing the wind speed from 2 to 16 m/s, the intensity of wind erosion and dust concentration increased, but the amount of these parameters was various in different land uses. As in both sampling methods, these parameters had decreased from sandy hill, pasture land, planted *Prosopis Juliflora* forests, agriculture and *Ziziphus Nummularia* natural forest, respectively.

In general, it can be said that in different land uses, the amount of soil loss and dust concentration in disturbed samples was more than undisturbed samples. Actually, since the soil structure is broken up during the sampling, the stability between the soil particles is lost and the soil is easily exposed to wind erosion. Also, due to the corrosion of the soil, the bulk density varies. As the bulk density increases, the soil quality will decrease (Harris *et al,* 1996). Finally, it was found that Pc_1 components had more control over wind erosion. The components of Pc_1 include EC, organic matter, Mg, lime, silt, saturation moisture content, porosity and compressive strength. These parameters have an effect on wind erosion, and cause erosion to be further reduced.

Key Words: Dehloran, Wind erosion, Land use, Dust, Microdust Pro