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Assessing Different Methods of Desert Pavement Measurement and Presenting a Relevant Optimal Method

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Extended Abstract

Introduction: The presence of stones and gravel on the soil surface affects the physical properties of the soil, playing an effective role in controlling water and wind erosion. However, while significantly contributing to the protection of soil, desert pavement is less used as a protective element in arid and extra-arid areas. on the other hand, as Iran is advancing its industrial development based on different natural fields, extensive land use changes lead to shallow soil mixing and the soil's desert pavement, significantly increasing the erodibility of the soil due to the loss of the pavement's protective shield. Consequently, the intensity of wind erosion and the dust that naturally arises from it will increase in the destroyed lands, leading to an increase in accident risks and personal and financial damages due to the reduction of visibility on highly traveled roads.

Materials and methods

Field sampling and laboratory calculations: Thirty points were randomly selected in each plain where the required samples were collected from the desert pavement. Concurrently, the duration of sample collection was also calculated in each plot and transect. Then, the collected samples were transferred to the laboratory and tested separately in terms of granulation. Sediment samples collected from every plot and transect were separated into distinct size classes using the ASTM classification system. These size-separated sediments were then accurately weighed using precision balances. After sieving the samples and determining the weight of particles in different size ranges, the average weight of each sample at thirty specific points was calculated. Finally, the relative abundance, expressed as the percentage frequency of particle weight, was computed for each plot and transect based on the calculated mean weights. The results obtained from each plot and transect were then entered into the SPSS software. Using the least squares and Duncan tests to compare the samples collected from the plots and transects. It should be noted that the two tests are widely used for ranking averages in one-way variance analysis. One-way variance analysis evaluates the effect of a discrete variable with more than two levels on a continuous variable. If the null hypothesis is rejected in terms of significance level, the discrete variable is proved to exert an influence on the continuous variable. In the least squares test method, the average values are compared in binary oppositions, and in Duncan's method, the average values are divided into subgroups based on the specific value of α. The analysis of the results of these two tests shall also be performed in terms of significance level.

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Sampling time in each plot and transect was compared and evaluated using t-tests. It should be noted that the T-test is commonly used to compare two independent statistical samples, whose results may differ based on the equality/ inequality of the variances. Finally, the optimal method for measuring desert pavement was selected based on the results of the statistical tests and the significance level required for sampling in each plot and transect.

Moreover, to compare the desert pavement samples collected from each plot and transect, 30 points were randomly selected in each plain. Then, the sampling of the desert pavement was carried out using a plot with 40x40 cm dimensions and a transect with 60x10 cm dimensions.

Results: The results of Duncan's test revealed that the two categories of plot and transect were placed in the same ranking group, indicating that both methods produce the same results in the measurement of desert pavement. As the duration of collecting samples from each plot and transect was measured concurrently with the sampling, the time of collecting sampling from the plots and transects in different parts of each plain was evaluated and compared via T-Tests using the SPSS software. Moreover, the results of Lyon's test showed that the variances of the two groups (plot and transect), were not the same, suggesting a significant difference between the time used in the plot and that of the transect. In this regard, the average time for the plot and the transect was found to be 1.64 and 0.83, respectively, indicating that the time spent for conducting the sampling in the transect was lower than that of the plot and that there was a significant difference between the two in this regard.

On the other hand, to compare two independent samples of plot and transect, first, the two samples were evaluated using Levene's *test, according to which the null* hypothesis regarding the equality of the variance rates was rejected as the significance level turned out to be less than 0.05 (Sig< 0.05). The results of the T-test based on the hypothesis regarding the equality of the variance rate were also found to be zero in terms of significance level, indicating that the values found for the plot differ from those of the transaction, and thus the null hypothesis is also rejected in this case. As for the choice of a better sample in terms of the difference in the average value, it can be seen that the obtained value is positive (0.8), suggesting that the plot sampling time is longer than that of the transect. Therefore, it can be argued that collecting sampling from the transact would be less time-consuming than that of the plot, and thus it would be a better choice for measuring the desert pavement. Furthermore, the results showed that in terms of variance level, the two categories of plot and transect differ from each other, indicating a significant difference between the time used in the plot and that of the transect. Accordingly, the average time used in the plot and transact was found to be 1.64 and 0.83, respectively, proving that the time spent in the transect sampling method was lower than that of the plot and that there was a significant difference between the two in this regard.

Discussion: Plot and transect methods were compared and evaluated in order to choose the most suitable method for measuring desert pavement. The results of the one-way analysis of variance showed that the sampling method may affect the weight frequency of the collected samples. Then, the average percentage of the frequency rates obtained for the plot and the transact were compared and ranked in binary oppositions using the LSD and DUNCAN tests. The results indicated that both sampling methods exert the same influence on the frequency percentage of the samples. Then the plot and transect methods were compared in terms of sampling time and level. Accordingly, as for the time spent on sampling, the samples were collected in a shorter time from the transect than from the plot. Moreover, it was found that the transect demanded a smaller area (0.06 square meters) for sampling than the one demanded by the plot (0.16 square meters). Therefore, it can be concluded that the transect method is more suitable for sampling the desert pavement in terms of area and time. Finally, it could be argued that the results of this study proved the high efficiency of the software in terms of the spatial resolution of the images and the average size of the riverbed sediments, which can significantly contribute to future development. Therefore, the abovementioned methods can be used as new methods in the study of desert pavement in a large area.

Keywords: Plot, Transect, Plain, Desert Pavement, Sampling.