Statistical methods to study soil infiltration rate in Kharga Oasis, Egypt.

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Agricultural expansion in the Kahrga oasis, located in the western desert of Egypt, strongly depends on irrigation. Hence, the infiltration rate is a key parameter for further development. The infiltration rate was measured in the field using a double ring infiltrometer at 20 m intervals in a 120 m by 120 m plot, together with 12 other relevant physical and chemical soil parameters. The resulting data were statistically analyzed using principal component and linear regression analyses. Results show that the infiltration rate is highly variable in the study area, and strongly positively correlated with hydraulic conductivity and negatively with silt, clay and carbonates contents of the soil. Principle component analysis showed that most of the variation in the data is assigned in the first 3 principle components. The first component explains 36% of the total variation and is strongly linked with soil structure; the second component explains 18% of the total variation and is linked to soil texture; the third component explains 13% and is linked to chemical properties but has no link with infiltration rate; all other components just represent noise in the data and must be attributed to measurement errors, randomness and soil heterogeneity. Multiple linear regression analysis shows that the only relevant factors to predict infiltration rate are hydraulic conductivity, and silt and carbonate content of the soil. The regression equation is only able to predict about half of the variation of the infiltrations rate, while the other half remains unexplained.