



Incidence of Grass cover on the infiltration rate in a semi-arid abandoned land in Guadalajara (Central Spain)

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The vegetation has diverse effects on the soil infiltration rate. The literature shows that the variations found are not simply explained by the mere presence of vegetation, therefore there are other indirect factors to take into account, and they seem to acquire more importance in the medium and long-term. The infiltration is one of the fundamental pillars of the Prediction Models of soil degradation in arid and semi-arid lands. The deepening of its study would allow to improve the accuracy of its results and therefore, the prediction of effects of the agricultural land abandonment when vegetation or land use change. In this paper, some new data can contribute to the knowledge of the magnitude of this indirect influence in the infiltration rate due to the vegetation.

The study was carried out in Guadalajara, central Spain (40°41'0''N; 3°12'26''W). There is a Mediterranean semi-arid cold climate, the mean annual precipitation is 416 mm and the mean temperature is 13.4° C. The soil is a sloping (12.5%) and stony Typic Rhodoxeralf, that was in the past traditionally dedicated to cereal crop. Recently, after 13 years of abandonment, the land was covered by gramineae (*Bromus*, *Vulpia* and *Aegilops*), some of them perennial (*Cynodon dactylon*, *Lolium rigidum* and *Dactylis glomerata* subsp. *Hispanica*).

The vegetation was manually removed in this abandoned soil, later on, we measured the infiltration in that -recently- bare soil situation and as well as the vegetation was growing until it reached the initial plant cover. The results were compared with those obtained in a permanently bare soil (3 years of herbicide treatment).

Circular closed-plots (1 m diameter) with drainage were used, they were randomly located in the study area. The treatments were: i) "permanent" bare soil, ii) "recent" bare soil and iii) different stages of vegetation recovery at 3, 6 and 19 months from the plant elimination. At least 3 replicates per treatment were carried out. Simulated rainfall was used on the plots with a precipitation of 113 mm h^{-1} , coefficient of uniformity of 85%, diameter of drop of 1,4 mm and kinetic energy of $20,33 \text{ J mm}^{-1} \text{ m}^{-2}$. The infiltration was measured as the difference between rainfall and runoff.

An increase of the infiltration rate was observed as the plant cover was recovered, the infiltration three months after the plant elimination was 36%, and it increased until 65 and 82% respectively after 6 and 19 months. Since there was not tillage or damage inside the soil, the infiltration differences in these cases were only due to changes induced in the soil surface by the growth of vegetation, because the elimination of plants was carefully handled, in order to maintain the surface roughness. The water interception didn't play a significant role because the fresh biomass was small, ranging from 0.08 and 0.35 kg m^{-2} .

The comparison between the "permanent" bare soil and the "recent" bare soil one also presented differences. The first bare soil, exposed during 3 years to sealing and crusting phenomena, showed infiltration rates around 10%, compared to the 18% in the recently bare soil. The indirect effects are responsible for these differences, they are also evident in the lack of soil aggregation, as the suspended sediments in runoff were 5 g l^{-1} in the permanent-bare soil, compared to 1 g l^{-1} in the recently bare soil. The indirect effects are related with the soil organic matter and their influence in the stability of the aggregates, the porosity, the water holding capacity and the biological activity of the soil.