

Effect of different soil surface formations on the moisture content of the unsaturated zone in weighing lysimeters

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Abstract

One of the most cardinal points of the efforts focusing on the mitigation of the harmful effects of drought is the influence of soil water regime through the decrease of evaporation. Comparison analyses of soil moisture content of soil columns with various surface formations was carried out to determine their effects for different periods in weighing lysimeters. To determine the thickness of the unsaturated zone and the depth of the evaporation front sampler sensors were built in by which soil temperature- and moisture content values can be measured.

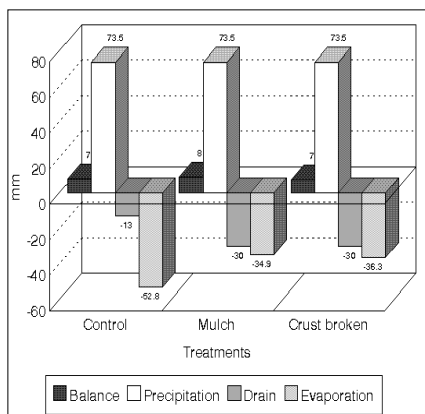


Figure 1: Water balances of three lysimeter units with different surface formations

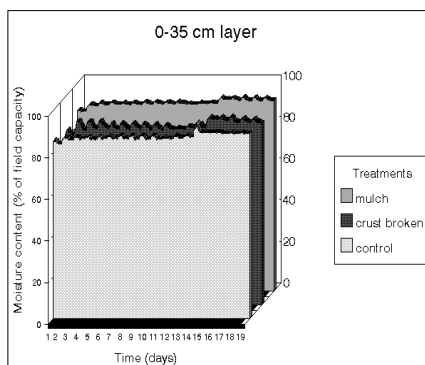


Figure 2: Change of soil moisture content in the upper 35 cm of the three lysimeter units

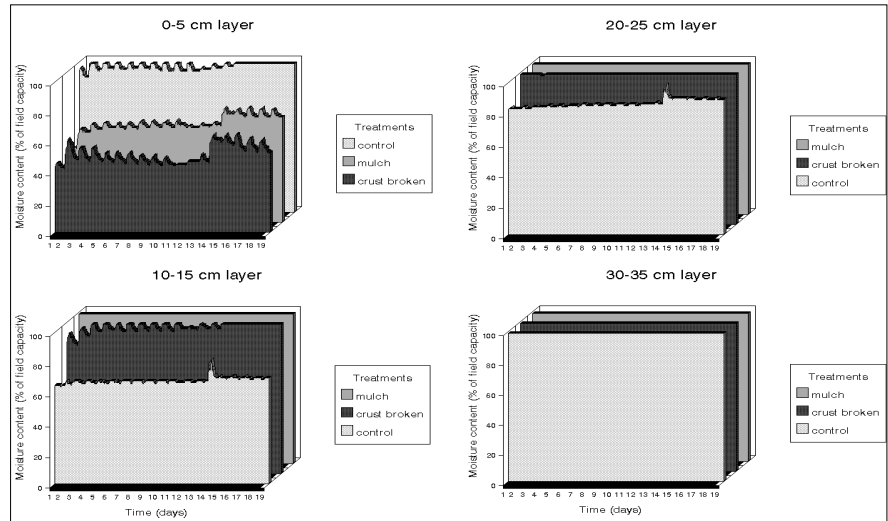


Figure 3: Change of moisture content in four different soil layers

Results and Discussion

In the Research Institute of Debrecen Agricultural University, Karcag the experiments with weighing lysimeters have been carrying out since 1993. During the last six years our measurements proved that water balance data are not always enough to evaluate the differences caused by the different soil surface formations as they are valid for the whole soil columns. This is the reason why we developed a soil moisture sampling set (type TTN) specially for our requirements and conditions.

I have chosen three different treatments and examined their effects on the soil moisture content of four layers during a twenty day long period in August-September of 1998. The three treatments were as follows:

1. *Control*: undisturbed since 1993,
2. *Crust broken*: the surface was loosened after the formation of crust due to the rainfall,
3. *Mulch*: a 10 cm thick mulch cover surface with high organic matter content was created.

If we study the water balances or the moisture state of the upper 35 cm, we can not find considerable differences between the treatments (Figure 1-2). But significant differences can be detected by means of the TTN moisture samplers. Figure 3 shows the change of the soil moisture content in the examined layers in the cases of the three treatments. The upper layer (0-5 cm) of the *control* unit is practically saturated to field capacity due to its low permeability of the precipitation. The 10-15 cm layer is much drier, even the 20-25 cm layer is unsaturated as well. In the regularly loosened *crust broken* unit practically only the upper 0-5 cm layer is unsaturated and this shallow dry layer impedes the process of drying spreading towards the lower layers, hence they are saturated. The *mulch* covered unit preserved the most moisture, the unsaturated zone does not reach the depth of 10 cm. The lowest layer (30-35 cm) was saturated in each unit in the investigated period.

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