Carpth. J. of Earth and Environmental Sciences, Vol. 2, No. 2, p. 39 - 44

LOESS TESTS CARRIED OUT IN THE SURROUNDINGS OF SOME COVERED KARSTIC DEPRESSIONS (TES-PLATEAU)

ISTVÁN FÜZESI
Berzsenyi Dániel College, Institution of Geography and Environmental Science
4, Károlyi Gáspár Square, Szombathely, 9700, Hungary. fistvan@bdf.hu

Abstract: The grain size distribution, the lime- and Ca^{2+}-ion content of the covering deposit of the Tes-plateau has been studied at different distances from the karst depression, at 0, 50, 100, 150 and 200 cm depths. There is no lime in the upper 1m layer, but the lime content exceeds 30% below. The grain size increases as we get deeper in the sediment. The higher concentration of the small-grain fraction on the surface indicates the formation of an impermeable layer which causes the precipitation to drain on the surface. This helps the development of covered karst forms where karstification is possible

Keywords: covered karst, karst depression, loess, lime content, grain size distribution, degree of fineness, Tes-plateau

1. INTRODUCTION

Tes-plateau is a part of Eastern Bakony Mountains. Its length is about 5-6,2miles (8-10 kms) in E-W orientation, its breadth is about 1,9-3,1 miles (3-5 kms) in North-South orientation. It slants from South to North. Its height is between 400 and 500 meters. The rock building up the area is Jurassic limestone, which turns up in stains as rubble in some spots. On the surface there is loess and its clayey variations in some meters depth, while here and there appears fluvial deposit. (Veress 1999, 2005) The NW- SE oriented valleys, valley-like depressions are common on the plateau, these are often more or less filled up or bushed with sediment. Our survey was carried out to study the effect of the covering sedimentary rock on the process of karstification.

It was analysed if the covering loess nourishes the development and evolution of the covered karstic forms. According to our assumptions there is a correspondence between the lime-content and grain-distribution of loess and the permeability of it: the dissolution of Ca^{2+}-ion has effects on the grain-distribution hereby on the permeability of the loess.

Samples were taken from two karstic depressions (I-28 and I-31 signed) at different distances and depths so that we can come to know the spatial changes of the system.

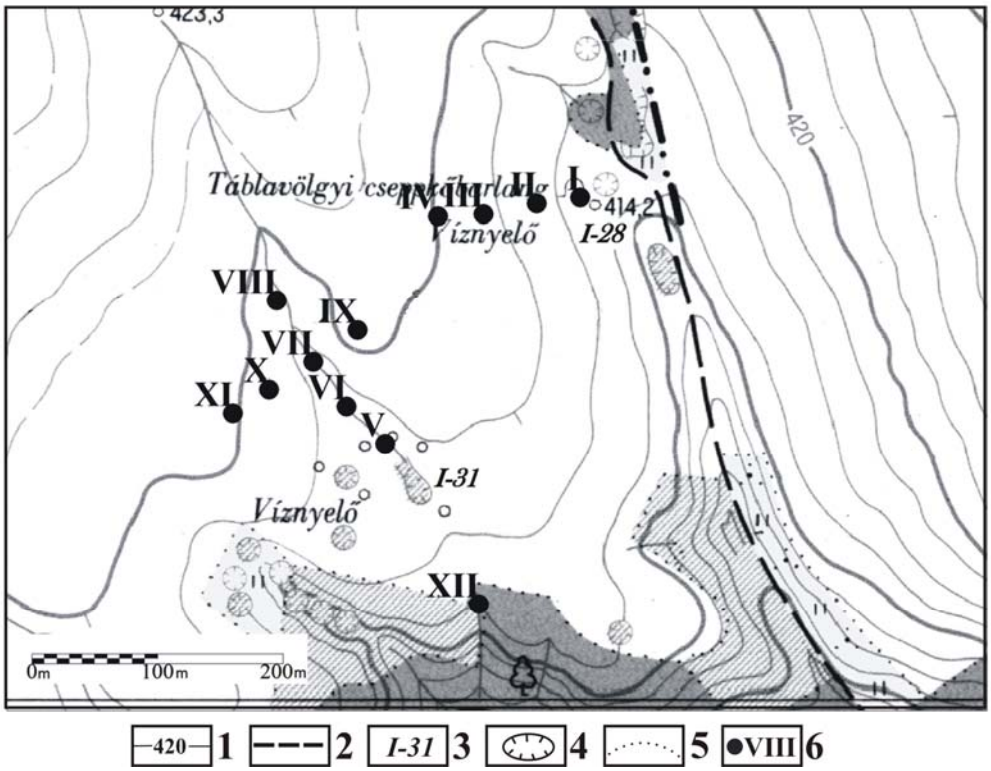


Fig. 1. Sampling places on the Tes-plateau. Legend: 1. contour line, 2.road, 3. symbol of covered karst form, 4. covered karst form, 5. sampling place, 6. boundary of forest,

2. METHODS

The sampling was carried out in November 2006 with soil-drilling. Our 12 sampling places distributed the following way: 4 places were situated at different distances from the I-28- and seven near the I-31 signed karstic depression, and one can be found in the forest. About 500 g weight of sediment was lifted out of the depths of 0, 50, 100, 150, 200 cms at the sampling places. The laboratory tests were partly performed in the laboratory of the Institution of Geography and Environmental Science of Berzsenyi Daniel College, partly in the Soilprotectional Laboratory of Botanical- and Soilprotectional Directory of Agricultural Administrative Department of Vas County.

2.1. Fizzy lime-content ($CaCO_3$)

It is defined with Scheibler device and method. (Kádár, 1998) Soil is shaked together with weak hydrochloric acid then the amount of the developing CO_2 gas is measured with calcimeter. The method does not differentiate among the different carbonate-forms of the soil, so it measures all the carbonates, which is expressed in volume-percentage in $CaCO_3$.

2.2. Mechanical composition (grain size distribution)

It is carried out with pipette-procedure. Elementary particle dispersed suspension is made from the prepared finegranual soil. Soil suspension is stirred up in Andreasen-device then we let it be deposited and we take suspension out by a pipette at particular points of time. The mass-rate belonging to the grain-size domain is defined by the evaporation of the samples. We use Na-pirophosphate for dispersing the soil, we decompose organic matter with H_2O_2 and carbonates with HCL. Particles being bigger than 2 mms are specified with dry screening.

2.3. Calcium-contain determination

The determination of calcium contain quantity happens with ICP device after the exploration of soil with nitric acid.

3. RESULTS

The change of lime contain in the surroundings of the two karstic depression partly diverge. The value measured on the surface is under 0,5%, although samples taken from 100 cm or deeper points exceed 30% at the sampling places. Approaching the karstic depression the fizzy lime-content of the covering sediment grows in a particular depth.

Table I. Lime content of the cover deposit in mass percentage

Sampling place	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Depth	$CaCO_3$ %											
0 cm	0,0	0,6	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
50 cm	7,6	1,3	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
100 cm	34,0	0,0	0,0	5,0	0,0	0,0	0,0	0,0	0,2	0,0	0,0	9,6
150 cm	10,0	14,0	18,0	21,1	0,2	0,2	16,2	18,1	16,1	14,4	18,5	19,3
200 cm	33,0	23,2	18,5	33,0		6,9	17,1	29,0	14,0	17,6	18,4	18,5

In the environment of depression signed I-31 there is no lime above 100 cm, while lime can be detected under this depth. However, approaching the karstic depression the value of the lime detected in the depth of 200 cm shows falling tendency. The determination of calcium was carried out simultaneously, and it shows the same tendency.

At the first sampling place the grain distribution is different in the different depths. The finer fraction is more common on the surface, while the fraction is rougher when one gets deeper in the sample. Moving away from the depression the divergence shows falling tendency.

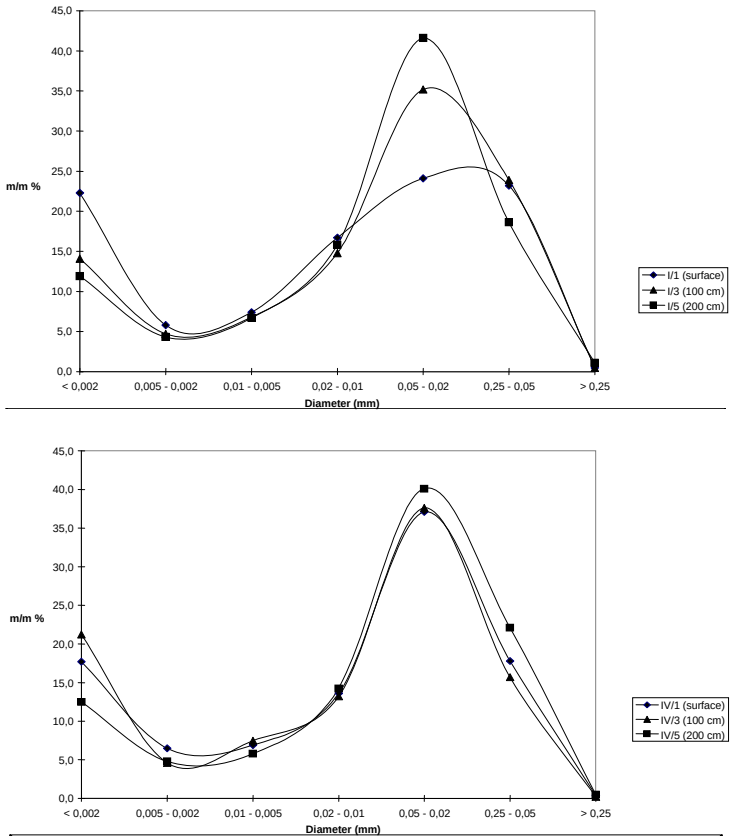
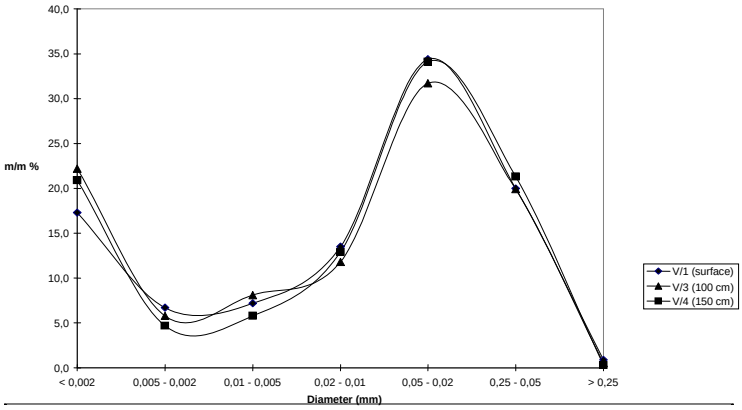


Fig. 2.: The grain size distribution of the cover deposit on the station I. and IV.

The finer fraction is more common on the surface, while the fraction is rougher farther from the surface at covered karst form signed I-31, as well. This divergence remains typical if you move away from the covered karst form, too.



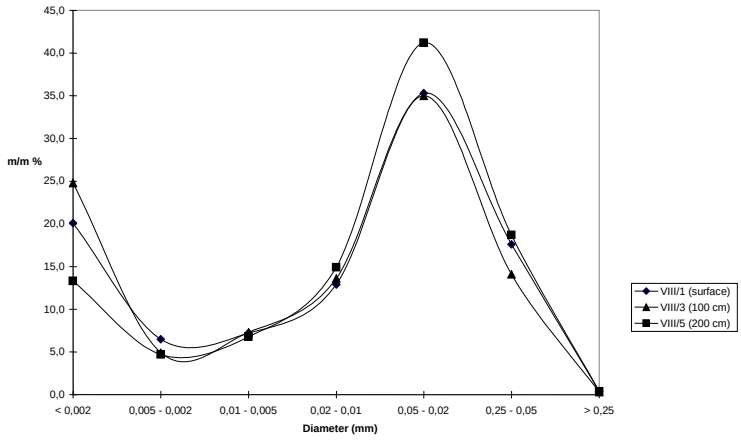
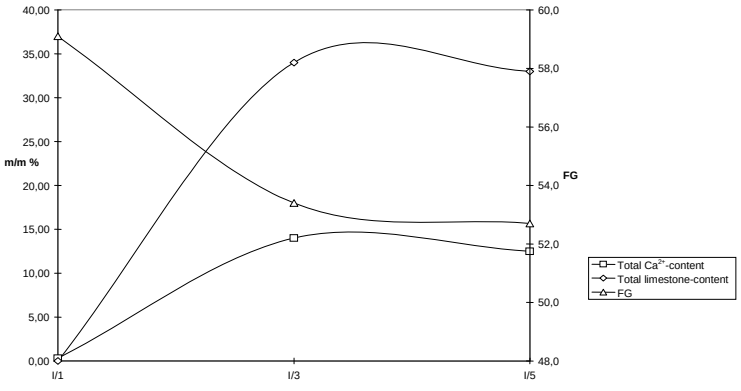


Fig. 3. The grain size distribution of the cover deposit on the station V. and VIII.

Fineness Grade (FG) can be used for the comparison of the different sampling places and layers. Its value can be calculated on the basis of the volume-percentage of the different grain-size domains.(Pécsi, 1993). Our experiences are similar in case of the different sampling places. The value of the fineness grade declines in the deeper layers, which can be explained by the higher rate of the rougher fraction.

Table II. Calculation of the degree of fineness

Grain fraction(mm)	Participation (m/m %)	Totality of the parts (m/m %)	Fineness Grade (FG)
< 0,002	22,3	22,3	
0,005 - 0,002	5,8	28,1	
0,01 - 0,005	7,4	35,5	
0,02 - 0,01	16,7	52,2	
0,05 - 0,02	24,1	76,3	
0,25 - 0,05	23,2	99,5	
> 0,25	0,5	100,0	
Össz.	100,0	413,9	59,1



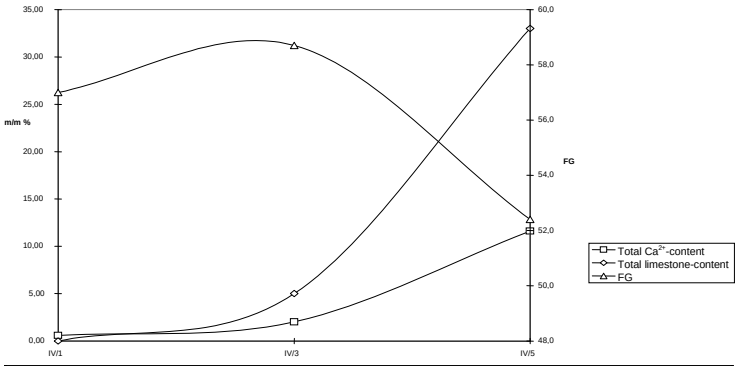


Fig. 4.: Modification the grain sizes of the samples I.and IV.

4. CONCLUSIONS

According to our studies there is a correspondence between the calcium-content and the fizzy limestone-content of the cover deposit. Calcium can be found mainly in the limestone.

The lime-content is minimal in the top one meter, it cannot even be detected at all in many cases, so this layer can be qualified as highly lixiviated. The amount of the streaming water grows approaching the depression, and it increases the grade of the dissolution. The rate of the fizzy limestone exceeds 30% in the deeper layers.

The higher rate of smaller grains in the closer to the surface can be explained by the dissolution of lime. As a result of this, the grain size is smaller, because of which the grade of the adhesion of the grains grows, which increases the watertightal quality. The concentration of the finer fractions near the surface refers to the development of a watertightal layer: rainwater flows down mainly on the surface.

Approaching the karstic depression does the watertightal quality of the covering deposit grow, because of the increasing dissolution of the lime. Since the depression modifies the orientation of the water-flow, the covered karstic form helps with its own development. It is expedient to perform other studies in the area of inquiry and to compare it with the results of other inquiries at different areas in order to learn to know the exact effects of the covering sedimentary rock on the covered karst forms.

BIBLIOGRAPHY

Kádár, I., 1998. *About the survey of tainted soil*, Ministry for Environment Protection, Budapest.

Pécsi, M., 2005. *Quarterage and survey of loess*, Akadémia Publishing House, Budapest, pp. 53-99.

Veress, M., 2005. *Datas for the covered karstification of the Táblavölgyi Field (Tes-plateau) – Karstification X.*, Berzsenyi Daniel College, Department of Physical Geography, Szombathely, pp. 267-291.

Veress, M., 1999. *The covered Karst of the North-Bakony*, Bakony Museum of Science, Zirc, pp. 10-19.

Received at 01. 10. 2007
Accepted for publication 06. 10. 2007