

THE TOTAL SALT AND MOISTURE CONTENT OF SOME CHARACTERISTIC SOIL TYPES OF THE LOESS PLAIN OF SZOLNOK

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The area of our investigation is in Nagykunság, in the NE part of Hungary. It is the region with the most extreme continental climate in this country. The loess plain is relatively high flat land; its surface is dissected by long ago filled up river beds, rivulets, and flat stretches of ground

From the pedological point of view the parent material — besides the alluvial soils already mentioned — is lowland loess in the higher places, and loessial silty clay in the lower. Owing to the variety of the hydrographic conditions — leaching, alkalization, gleification — the mother rock is rather varied

The area examined by us receives an average annual total of 2000 sunshine hours and occasionally slightly more. Farther north in the region the annual total of sunshine hours is already under 2000. Thus the sunshine average of the southern parts is somewhat better than that of the whole country. The average annual total of global radiation is around 100 Kcal per sq cm. (fig 1.)

The temperatures in the region are very extreme. The winter is cold, the summer is — except on the north eastern edges of the area — warmer than the nationwide average. Severe frosts are frequent here in the winter. The mean temperature in January varies between -2.5 and -4 °C. The annual average minimum temperature varies between -19 and -22 °C, but occasionally temperatures even ten degrees lower occur.

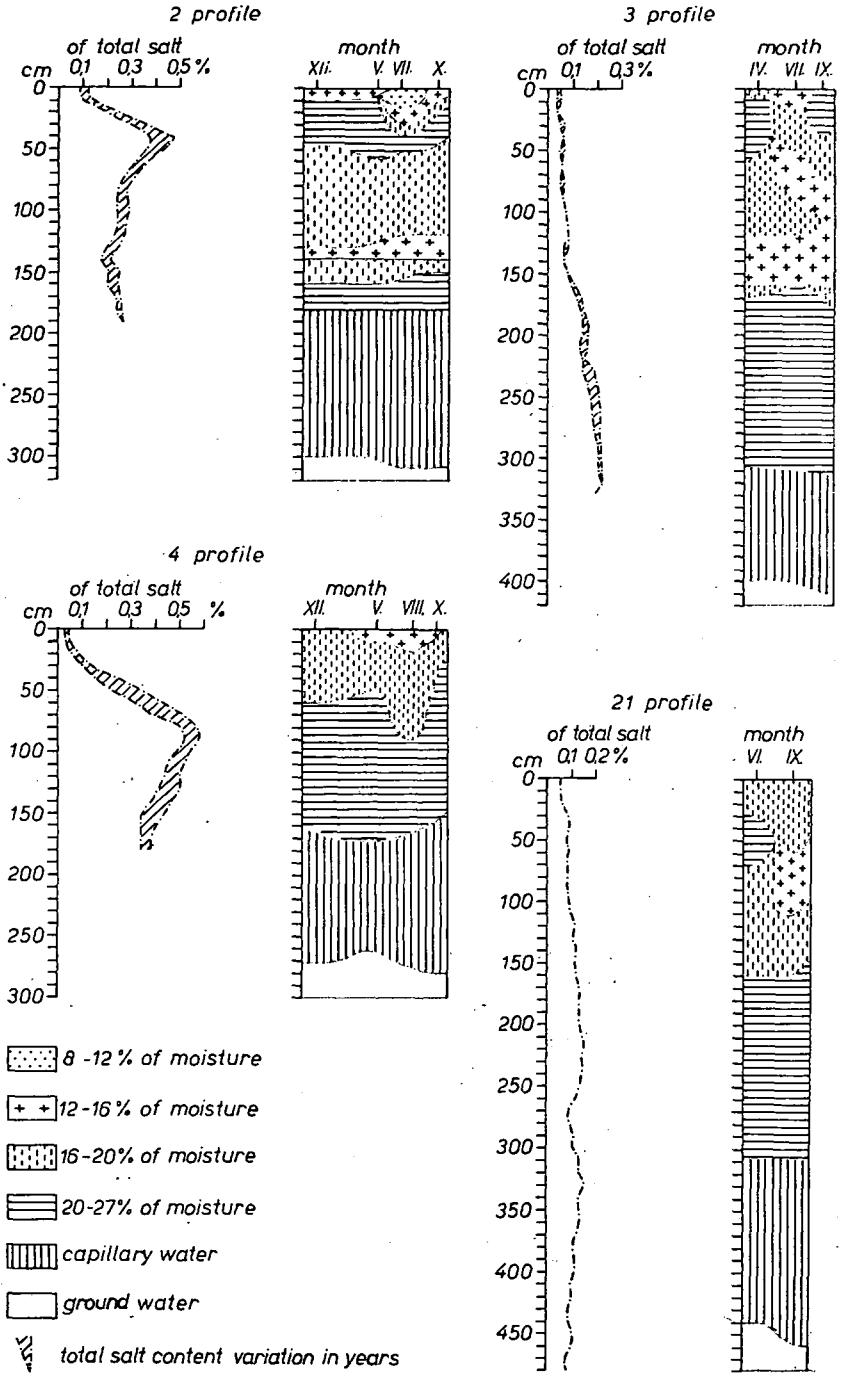
The summer is moderately warm. The average mean temperature in July is between 20 and 22 °C. In spite of this, warming up is intense in places, especially in the area examined, where the average annual temperature maxima are around 35 °C.

The wind conditions of the area are very changeable. The prevailing wind is from the NNE, but a SSW wind is also frequent. The annual average wind velocity is $2-3$ m/sec. The annual average of windstorm hours is between $145-180$. In the southern parts of the region only $20-25$ stormy days are likely on average

Fog formation is rather rare in the region, especially in its NE parts. In the southern parts of it, however, only $20-30$ foggy days are likely to occur.

The average annual rainfall is $500-55$ mm. The annual average number of rainfall hours is $1300-1800$. On the basis of the average of 50 years (1901—1950) — examining the monthly and annual amounts of precipitation — we come to the conclusion that in the annual variation two waves can be found: the maxima of May-June and October-November on the one hand, and the minima of January-February and August-September on the other. This regularity does not prevail in every year because the distribution of precipitation in time and space is unstable and besides this there is considerable variation in the extreme values.

Salt and moisture profile of soils in 1975, 1976



The soil temperature is also very extreme. In winter it is cold, in summer warm. In the winter frosts are common. The mean soil temperature in January varies between -3 and 0.1 °C at 2 cm depth. In the summer the soil surface is warm. The mean temperature at 2 cm depth under the soil surface is between 35.4 and 29.8 °C on average.

On the loess plain of Szolnok described above we took the following soil profiles characterizing the area (the analysis of only one typical profile is here given for each sampling):

Karcagpuszta: profile 2: solonchaky, shallow meadow solonetz

profile 3: meadow chernozem

Magzarka: profile 4: deep meadow solonetz

Hosszúhát: profile 21: meadow soil.

The profiles were taken with a spade from a sampling pit, and from greater depth by means of a soil tube. The total salt and moisture percentages are the mean values of the analyses of three soil samples taken at the same time. The total salt content was determined on the basis of electric conductivity, and the moisture content by means of a drying oven.

From the data of the analyses and the on-site examinations the following could be established:

In the examined area, which is typical of the loess plain of Szolnok, the ground waters in the first water-supplying layer are generally under pressure. At the time of the investigation the pressure corresponded to that of a 1—1.5 m high water column.

The static water level roughly agreed — with a difference of 20—40 cm — with the upper limit of the zone of capillarity. The thickness of the zone of capillarity varied between 1 m and 1.5 m. In the meadow and field soils it was rather around 1 m, and in the alkali soils around 1.5 m.

Migration of the soil salts in the meadow soil occurred immediately over the zone of capillarity. In the alkali soils, depending on the quality and maximum of the salts, their migration occurred in the 0—50 and 0—100 cm layers.

We found that in the strongly alkali profiles — in the solonchaky types — the annual soil moisture content varied, depending on the salt maximum, only in the approximately 50 cm layer. (Profile 2.) In the mildly alkali meadow and field soils (profiles 3 and 4) variation of the moisture content was observable also in the upper 90 or 120 cm layer of the profiles. The variation of the moisture content is greater in the field and meadow soils than in the alkali soils. The explanation of this is partly poorer water conductivity of the alkali soils. It can also be concluded from these observations that a 12—16% moisture content of the soil is already sufficient for the migration of salts. (Profile 2).

	Profile 2. Chemical analysis							
	Ca ⁺⁺	Mg ⁺⁺	Na ⁺	K ⁺	CO ₃ ⁼⁼	HCO ₃ [']	Cl [']	SO ₄ ⁼⁼
	mg eq/l							
Ground Water								
of profile 2.	0.20	1.18	23.0	0.02	0.40	16.10	15.7	1.33
3.	2.38	7.52	14.0	0.08		27.5	8.3	17.96
4.	16.84	27.12	47.5	0.10		4.7	76.1	15.43
21.	7.61	2.83	4.3	0.04		12.1	1.0	4.81

Moisture conditions
in profile 3 in 1976

capillary water
soil water
moisture

REFERENCES

- BACSÓ, N. (1939): Annual variation of precipitation probability in Hungary (in Hungarian). Official publication of the Central Institute of Meteorology. Vol. XIII. Budapest.
- SIGMOND, E. (1934): Általános talajtan, KORDA, Budapest.
- STEFANOVITS, P. (1963): Magyarország talajai AKAD. KIAD., Budapest.