DEVELOPMENT OF HYDROPHYSICAL CHARACTERISTICS OF A TYPICAL CHERNOZEM, FROM THE LOW PLAIN OF BANAT, CULTIVATED WITH CORN FOR GRAIN

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Abstract *The main objective of the research followed, in particular, the evolution of hydrophysical properties of a typical chernozem type soil, dominant in the reference area, with very good fertility characteristics, from the low Plain of Banat, in the period 2016-2020. The researches of the present paper elaborated, consist in the accumulation of scientific data regarding the evolution of some components of the agricultural land productivity, regarding the temperatures and precipitations in the studied area and hydrophysical properties, as well as; humidity, field capacity, useful water capacity, wilting coefficient, which are the basis for the substantiation of current, modern cultivation technologies or high-performance pedo-amelioration work, through a complex approach to the physical-geographical and climatic-edaphic conditions in the low plain Banat. The aim of our own research was to find new current scientific and practical elements, in order to achieve a integrated management, efficient from an agricultural point of view, with low energy and financial efforts, ecological and conservation, improvement of the soil and the environment. In preparing and conducting this paper, we took into account several aspects of physical-geographical and pedo-climatic characteristics based on studies in recent years, during the doctorate, starting with 2016, respectively, research on the cultivation of grain corn for four consecutive years. During this time period, 2016-2020, the periodic determinations of soil moisture within the researched area were made, which were then recorded in its own database. These analyzes and results are a continuation, a small contribution, of the efforts of the last decades on the line on the concerns about climate change, a danger for the whole humanity, taking into account the multitude of factors that affect the global climate.*

Keywords: *development, soil, quality, area, corn, restrictions*

INTRODUCTION

The location and definition in the terrestrial space of each piece of land, establishing at the same time a recordable topographic identity as surface, latitude, longitude, altitude, inclination, exposure and the relief form defined morphologically and genetically, play a significant role in determining pedoclimatic conditions, respectively the vocation of a certain portion of land for certain utilities (agricultural-arable, forestry, social-economic).

Relationships of a complex and varied reciprocity are between the soil properties and cultivated species. Soil properties can have an important influence on root system development,on the mineral nutritionand can ensure the thermal regime and aerohydric regime, necessary for the main physiological processes. The plants, directly, and phytocenoses, indirectly, act both on soil fertility state.

To determine relations between different properties of the soil, numerous researches have been undertaken, which have named the causalities in the relationship to their contribution to the soil productivity and the favorability for different plants (BORCEAN ET AL., 1997, ARIES ET AL. 1979, CANARACHE ET AL., 1980, TEACI, 1980, DAVID GH. ET AL., 2016, MUNTEANU I., 2000, RĂUŢĂ C., 1997, ŢĂRĂU ET AL., 2007 , 2015, 2016, 2018, 2019).

Considering the multitude of scientific information and the research made during the doctoral studies, the paper presents below, some references of the natural environment and the evolution of pedo-climatic components, the elements that can define the quality and productivity of soils, to provide specialized information, necessary for the realization of managerial projects, taking into account both the climate and soil factors, as well as the biodiversity of the area.

When choosing the corn culture, the special importance of grains in human and animal nutrition was taken into account, but also the fact that in Romania corn occupies the largest cultivated areas among field plants and achieves the highest total production among cultivated field plants (DAVID GH. AND BORCEAN A., 2011, BORCEAN I. ET AL., 2002, 2006).

MATERIAL AND METHOD

The ecological and pedological conditions was studied in accordance with "Pedological Studies Elaboration Methodology", elaborated by the Research Institute for Pedological and Agrochemistry Bucharest, in 1987, completed with dates from Romanian Soil Taxonomy System (SRTS-2012), as well as other normative acts, elaborated and updated by the Ministry of Agriculture and Rural Development (Order MADR 278/2011).

The soil analyzes and all other determinations were maded in the laboratory of physico-chemical analysis of OSPA-USAB, located at the Faculty of Agriculture from USAMVB timisoara, accredited by RENAR.

The experiments with corn for grains, from the four years, were placed on a typical Cernozem, weak gleysate, epicalcaric, medium clay-clay / medium clay-clay from the Lovrin Agricultural Research Station, dominant within the low Plain of Banat, from the western part of Romania.

RESULTS AND DISCUSSION

The territory considered, located in the middle of the northern hemisphere, has a great diversity of ecological conditions, determined by the variability of factors (cosmic-atmospheric and telluric-edaphic) that contribute to the environment in which plants grow and harvest.

The detailed morphogenetic study of the analyzed soil profile indicates a stage of development of the soil properties, characteristic of cernisols class of soils, having the profile of type Ap-Atp-Am-AC - Approx (table 1)

The structural aggregates, well and moderately developed, with small dimensions and well-made porosity on the entire soil profile (except for the Atp layer 20-38 cm), allow a good aeration and the development of a complex and rich root system.

The most important chemical properties that influence soil fertility are soil reaction or pH, calcium carbonate content and humus content.

The physical, physical-mechanical and hydrophysical properties of the soil within the area where the research was undertaken, are strongly determined by the natural conjunctural factors in which they formed and evolved, as well as by the impact suffered after long and intense anthropogenic activities. .

Bulk density (YES), or the volumetric weight (Gv) of the soil (Ind.44, MESP-1987), presents values between 1.18 (very small) and 1.44 (medium to high), being to a large extent a result of anthropogenic influences of a compressive nature (Atp).

Total soil porosity (PT%) (ind. 44, MESP-1987), confirms in the case of the researched profile, much more truthful the anthropic impact, as well as the pedogenetic one, on the state of looseness. Against a background of porosity with large and medium values in which medium and very fine pores predominate, in the overall soil profile, oscillations appear in the negative direction, with very small values of total porosity in the processed layer (Atp with values of 40.00%) and small (45.00) in the negatively processed layer on the hydrophysical characteristics of the soil and the level of crops.

Table 1

Properties of the typical chernozem, weak gleysate, epicalcaric clay-medium clay / clay-medium clay

HORIZONS	UM	A?	Atp	Amk	ACk	ca.	Ccag1	Ccag2-ac	Ccag3 ac
depth	cm	20	38	56	75	100	130	150	200
Range pt.U%	cm	0-10	-25	-50	+75	-100	-125		
Coarse sand (2.0 - 0.2 mm)	%	2.9	2.2	2.2	1.6	1.3	1.6	1.2	0.6
Fine sand (0.2 - 0.02)	%	30.7	33.7	33.8	33.1	37.6	28.9	28.2	28.6
Dust (I + II) (0.02-0.002 mm)	%	31.1	30.8	28.3	29.8	30.8	31.8	35.4	38.3
Colloidal clay (under 0.002)	%	35.3	33.3	35.8	35.5	30.3	37.7	35.2	32.5
Physical clay (powder II + col clay)	%	54.6	54.3	48.3	48.8	44.3	41.1	41.3	
TEXTURE		TP	TP	TP	TP	TP	TP	TP	TP
Specific density (Ds)	g / cm3	2.43	2.44	2.47	2.49	2.52	2.55		
Apparent density (Yes)	g / cm3	1.35	1.44	1.21	1.18	1.19	1.46		
Total porosity (Pt)	%	45.00	40.00	51.00	52.00	52.00	42.00		
Aeration porosity (Pa)	%	10.69	-3.57	20.88	22.03	24.87	-9.72		
Degree of compaction (Gt)	%	13.31	18.69	-0.32	-4.12	-1.67	16.49		
Hygroscopicity coefficient (CH)	%	8.79	8.50	8.48	8.33	7.17	6.73		
Withering coefficient (CO)	%	13.18	12.75	12.72	12.50	10.76	10.10		
Field capacity (CC)	%	25.90	25.30	24.90	25.40	22.80	22.11		
Total capacity (CT)	%	33.83	27.77	42.14	44.06	43.69	28.76		
Useful water capacity (CU)	%	12.75	12.55	12.18	12.90	12.04	12.01		
pH in water		6.60	7.28	7.95	8.05	8.40	8.90	9.32	9.30
Carbonates (CaCO3)	%	-	0.47	4.06	9.80	18.60	21.50	20.20	19.60
Humus	%	3.55	3.35	3.30	2.70	1.05			
Nitrogen index (IN)		3.07	3.35	3.30	2.70	1.50			
Humus reserves (50)	to / ha	90.45	86.63	47.92	225.00				
P mobile	ppm	75.7	50.5	38.7	8.7	7.0			
K mobile	ppm	205	160	160	132	115			
T	me / 100g				24.4	23.5	15.2	20.2	25.7
N / A	me / 100g					0.21	1.10	1.37	1.32
At% T	%					0.90	5.14	7.68	6.84
salts	mg / 100g				74.3	88.8	145.9	148.5	159.1
saturation in bases (V)	%	80.6	100	100	100	100	100	100	100

In addition to the chemical, mechanical and physical properties, its hydrophysical properties have an important role in defining the fertility status of a certain type of soil, respectively territory.

The water retention force, a force that influences the accessibility of water for plants, is constantly changing depending on the degree of soil moisture (generated either by rainwater or by pedophreatic input), being expressed by certain hydrophysical indices such as: hygroscopicity coefficient (CH), wilting coefficient (CO), field capacity (CC) etc.

In the case of the researched profile, the wilting coefficient (CO) falls within the limit of medium values (9-12), towards high (13-16) according to indicator 46 (MESP-ICPA

Bucharest 1987). As this hydrophysical index provides information on the lower limit of water accessibility for plants, respectively the useful water capacity (CU = CC-CO), it is necessary to follow these thresholds, especially since in the last decade, these values have been reached and exceeded. . Many crops are compromised due to the decrease of soil water content below this value.

Useful water capacity (CU), represents the soil moisture between the field capacity (CC) and the wilting coefficient (CO) and is known as accessible water or productive water, due to the fact that between these limits is the optimal soil moisture for most cultivated or spontaneous plants.

The field capacity (CC) depends on the texture and structure (the texture determining the amount of water retained at the surface of the particles and together with the structure on the capillary pores).

In the case of the researched profile, the values of the field capacity fall within the limit of medium to large values (21-25), according to indicator 47 (MESP-ICPA Bucharest, 1987).

For the characterization of the climatic conditions of the agricultural years 2016-2020 were used data recorded at the Meteorological Station located in Lovrin, where the average multiannual temperature is 11.0 ºC (tab.2), and the average of the multiannual precipitation is 521.4 mm (tab .3) .

Table 2

Average monthly, annual temperatures (2016-2019)
and multiannuals from 1946-2017 (mm)

Agricultural year	**monthly**												**annual**
	IX	**X**	**XI**	**XII**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	
16-17	18.8	11.6	6.2	3.1	-5.3	3.2	9.4	10.9	16.9	22.1	28.9	24.1	12.5
17-18	17.7	12.5	6.5	2.9	5.3	0.8	3.6	16.5	19.9	21.9	22.3	24.7	12.8
18-19	18.3	15.1	7.8	1.0	-0.4	4.6	9	13.4	15.1	22.3	21.6	23.9	12.7
rule	**17.9**	**11.3**	**5.4**	**1.5**	**-1.2**	**0.8**	**5.5**	**11.0**	**16.6**	**19.7**	**21.6**	**21.7**	**10.9**

deviations

The year agricultural	**monthly**												**annual**
	IX	**X**	**XI**	**XII**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	
16- 17	+2	-0.4	+1	+1.7	-4.1	+2.4	+4.2	+0.2	+0.3	+2.3	+6.7	+2.4	+1.6
17-18	+0.9	+1.4	+1	+1.9	+6.4	0	-1.6	+5.8	+3.6	+2.1	+0.1	+3	+2.1
18-19	+1.5	+3.9	+2.3	-0.1	+0.7	+3.8	+3.7	+2.7	-1.2	+2.5	-0.6	+2.2	+1.8

Table 3

Monthly, annual rainfal average (2016-2020)
and multiannuals average from 1946-2017 (mm),

Agricultural year	monthly												annual
	IX	**X**	**XI**	**XII**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	
rule	42.7	40.6	48.2	40.1	32.0	29.4	32.6	42.9	56.8	67.8	55.8	32.5	521.4
16--17	48.0	112.0	37.0	3.0	20.0	25.0	30.0	54.0	29.0	40.0	30.0	22.5	450.5
17-18	34.0	32.0	35.0	16.0	53.0	58.0	86.0	40.0	50.0	152.0	85.0	58.0	698.0
18-19	29.0	10.0	21.0	41.0	58.0	15.0	15.0	34.0	92.0	88.0	55.0	18.0	476.0
19-20	32.5	16.0	44.2	34.8	29.2	48.6	25.2	14.2	33.6	95.0	52.0	43.2	471.2

deviations

The year agricultural	monthly												annual
	IX	**X**	**XI**	**XII**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	
16-17	+5.3	+71.4	-11.2	-37.1	-12.0	-4.4	-2.6	+11.1	-27.8	-27.8	-25.8	-10.0	-70.9
17-18	-8.6	-10.5	-13.0	-23.7	+21.0	+28.6	+53.4	-2.9	-6.8	+84.2	+29.2	+25.5	+176.6
18-19	-13.7	-30.6	-27.2	+0.9	+26.0	-14.4	-17.6	- 8.9	+35.2	+20.2	-0.8	-14.5	-45.4
19-20	-10.2	-24.6	-4.0	-5.3	-2.8	+19.2	-7.4	-28.7	-23.2	+27.2	-3.8	+10.7	-50.2

In order to find out the impact of the meteorological conditions on the land productivity, data from the agro-climatic resources of Timiş county were also used (Berbecel, 1979).

Table 4

Significance of precipitation in relation with the requirements
for agriculture from 2016-2020

Characteristic periods										
Agricultural year	IX-X	Meaning.	XI-III	Meaning.	N	Meaning.	V-VII	Meaning.	Annual	Meaning.
16-17	160.0	excess	115.0	dry	54.0	Satisfied.	99.0	F. secetos	450.5	dry
17-18	66.0	satisfactorily	248.0	optimum	40.0	F. secetos	180.4	Satisfactorily	698.0	optimum
18-19	39.0	f.secetos	150.0	dry	34.0	satisfactorily	253.0	optimum	476.0	Satisfied.
19-20	48.5	dry	182.0	Satisfied.	14.2	f.secetos				
rule	83.3	optimum	182.3	satisfactory	42.9	optimum	180.4	Satisfied.	521.4	Satisfied.

From data analysis regarding pluviometric regime, in 2016-2017 agricultural year, results it that as a dry year (tab.4), the quantities of precipitations registered an surplus in September-October, in all the other months the values of the multiannual averages were below, with a dry or very dry appearance and only satisfactory in April.

The 2017-2018 agricultural year presents an annual average with optimal values, the quantities of water from precipitations being generally satisfactory. Also, the 2018-2019 agricultural year is characterized by satisfactory values in places with a dry and very dry appearance.

Regarding the evolution of soil moisture, the data obtained by collecting soil samples and determinations in the laboratory highlighted a number of aspects related to the evolution of climatic conditions. Thus, for the area cultivated with corn, in the interval 2016-2020, the soil being kept as a field until the establishment of the crop, the humidity values were maintained close to the field capacity on the entire soil profile, except for the layer of 0-10 cm where at the beginning of August (tab.5) values below the useful water capacity were registered (-2.75%), after which these values returned to normal, respectively between the useful water capacity and the field capacity, which can be observed in 2018 and 2019, when in the 0-10 cm layer were recorded values below the useful water capacity (-2.75% and 4.75%).

Table 5

Momentary soil moisture (U%) relative to the useful water capacity values (CU%) in the period 2016-2020

Experimental field		The interval 0-10 cm				Range 10-25 cm				The interval 25-50 cm			
		U%	CC%	WITH %	The difference WITH%	U%	CC%	WITH %	CU% difference	U%	CC%	WITH %	The difference WITH%
	22.03.17	21.5	25.90	12.75	+ 8.75	21.5	25.30	12.55	+ 8.95	23.6	24.90	12.18	+11.42
Maize	09.05.17	23.0	25.90	12.75	+ 10.25	23.0	25.30	12.55	+10.45	23.0	24.90	12.18	+10.82
	28. 6.17	18.0	25.90	12.75	+ 5.25	18.0	25.30	12.55	+ 5.45	22.0	24.90	12.18	+ 9.82
	01 08.17	10.0	25.90	12.75	- 2.75	16.0	25.30	12.55	+ 3.45	18.0	24.90	12.18	+ 5.82
Field	25.10.17	20.0	25.90	12.75	+ 7.25	18.0	25.30	12.55	+ 5.45	18.0	24.90	12.18	+ 5.82
	08.01.18	22.0	25.90	12.75	+ 9.25	23.0	25.30	12.55	+10.45	24.0	24.90	12.18	+11.82
Maize	06.02.18	21.0	25.90	12.75	+ 8.25	23.0	25.30	12.55	+10.45	24.0	24.90	12.18	+11.82
	04.06.18	21.0	25.90	12.75	+ 8.25	21.0	25.30	12.55	+ 8.45	19.0	24.90	12.18	+ 6.82
	05.07.18	18.0	25.90	12.75	+ 5.25	14.0	25.30	12.55	+ 1.45	18.0	24.90	12.18	+ 5.82
field	17.01.19	23.0	25.90	12.75	+10.25	23.0	25.30	12.55	+ 10.45	22.0	24.90	12.18	+ 9.82
	14.03.19	22.0	25.90	12.75	+ 9.25	23.0	25.30	12.55	+ 10.45	24.0	24.90	12.18	+11.82
maize	21.05.19	15.0	25.90	12.75	+ 2.25	17.0	25.30	12.55	+ 4.45	17.0	24.90	12.18	+ 4.82
	30.09.19	16.0	25.90	12.75	+ 3.25	17.0	25.30	12.55	+ 4.45	17.0	24.90	12.18	+ 4.82
field	04.12.19	20.0	25.90	12.75	+ 7.25	17.0	25.30	12.55	+ 4.45	17.0	24.90	12.18	+ 4.82
	04.02.20	28.0	25.90	12.75	+15.25	28.0	25.30	12.55	+ 15.45	22.0	24.90	12.18	+ 9.82
	01.04.20	21.0	25.90	12.75	+ 8.25	21.0	25.30	12.55	+ 8.45	23.0	24.90	12.18	+10.82
maize	21.04.20	18.0	25.90	12.75	+ 5.25	18.0	25.30	12.55	+ 5.45	19.0	24.90	12.18	+ 6.82
	19.05.20	10.0	25.90	12.75	- 2.75	19.0	25.30	12.55	+ 6.45	22.0	24.90	12.18	+ 9.82
	03.07.20	8.0	25.90	12.75	- 4.75	20.0	25.30	12.55	+ 7.45	19.0	24.90	12.18	+ 6.82
Experimental field		Range 50-75 cm				The interval 75-100 cm				The interval 100-125 cm			
		U%	CC%	WITH %	The difference WITH%	U%	CC%	WITH %	CU% difference	U%	CC%	WITH %	The difference WITH%
	22. 03.17	26.0	25.40	12.90	+13.10	27.2	22.80	12.04	+15.16	28.3	22.11	12.01	+16.29
Maize	09. 05.17	24.0	25.40	12.90	+11.10	25.0	22.80	12.04	+12.96	25.0	22.11	12.01	+12.99
	28. 06.17	23.0	25.40	12.90	+10.10	23.0	22.80	12.04	+10.96	22.0	22.11	12.01	+ 9.99
	01 .08.17	20.0	25.40	12.90	+ 7.10	21.0	22.80	12.04	+ 8.96	22.0	22.11	12.01	+ 9.99
Field	25.10.17	21.0	25.40	12.90	+ 8.10	19.0	22.80	12.04	+ 6.96	21.0	22.11	12.01	+ 8.99
	08.01.18	23.0	25.40	12.90	+10.10	23.0	22.80	12.04	+10.96	21.0	22.11	12.01	+ 8.99
Maize	06.02.18	26.0	25.40	12.90	+13.10	25.0	22.80	12.04	+12.96	23.0	22.11	12.01	+10.99
	04.06.18	22.0	25.40	12.90	+ 9.10	23.0	22.80	12.04	+10.96	22.0	22.11	12.01	+ 9.99
	05.07.18	21.0	25.40	12.90	+ 8.10	22.0	22.80	12.04	+ 9.96	23.0	22.11	12.01	+10.99
Field	17.01.19	19.0	25.40	12.90	+ 6.10	18.0	22.80	12.04	+ 5.96	19.0	22.11	12.01	+ 6.99
	14.03.19	24.0	25.40	12.90	+11.10	25.0	22.80	12.04	+12.96	24.0	22.11	12.01	+11.99
maize	21.05.219	20.0	25.40	12.90	+ 7.10	21.0	22.80	12.04	+ 8.96	20.0	22.11	12.01	+ 7.99
	30.09.19	17.0	25.40	12.90	+ 4.10	17.0	22.80	12.04	+ 4.96	17.0	22.11	12.01	+ 4.99
field	04.12.19	16.0	25.40	12.90	+ 3.10	15.0	22.80	12.04	+ 2.96	15.0	22.11	12.01	+ 2.99
	04.02.20	23.0	25.40	12.90	+10.10	19.0	22.80	12.04	+ 6.96	17.0	22.11	12.01	+ 4.99
	01.04.20	19.0	25.40	12.90	+ 6.10	23.0	22.80	12.04	+10.96	22.0	22.11	12.01	+ 9.99
maize	21.04.20	23.0	25.40	12.90	+1010	24.0	22.80	12.04	+11.96	23.0	22.11	12.01	+10.99
	19.05.20	23.0	25.40	12.90	+10.10	24.0	22.80	12.04	+11.96	24.0	22.11	12.01	+11.99
	03.07.20	24.0	25.40	12.90	+11.10	29.0	22.80	12.04	+16.96	23.0	22.11	12.01	+10.99

In the period 2016-2018, determinations were made regarding the momentary humidity (U%) and the apparent density (DA g / cm3) and the water reserve (W mm) was calculated (U x DA xhx 0,1) on depth intervals. of the ecopedological profile, respectively: 0-10 cm, 10-25 cm, 25-50 cm (tab.6), as well as on the intervals of 50-75 cm, 75-100 cm, 100-125 cm.

If the values obtained are compared with those of the field capacity (CC mm), it is possible to establish with precision the deficit or the excess of humidity in the soil (at the moment of determination) and the ways of bringing the soil to the optimal values of humidity.

Table 6

Soil water reserve (mm) in the range 2016-2020, compared to field capacity values

Experimental field		The interval 0-10 cm			Range 10-25 cm			The interval 25-50 cm		
		Book	DC	The difference	Book	DC	The difference	Book	DC	The difference
	22.03.17	29.03	34.97	- 5.94	46.44	54.65	- 8.21	71.39	75.34	- 3.95
Maize	09.05.17	31.05	34.97	- 3.92	49.68	54.65	- 4.97	69.58	75.34	- 5.76
	28. 6.17	24.30	34.97	-10.67	38.88	54.65	-15.77	66.55	75.34	- 8.79
	01 08.17	13.50	34.97	-21.47	34.56	54.65	-20.09	54.45	75.34	-20.89
Field	25.10.17	27.00	34.97	- 7.97	38.88	54.65	-15.77	54.45	75.34	-20.89
	08.01.18	29.70	34.97	- 5.27	49.68	54.65	- 4.97	72.60	75.34	- 2.74
Maize	06.02.18	28.35	34.97	- 6.62	49.68	54.65	- 4.97	72.60	75.34	- 2.74
	04.06.18	28.35	34.97	- 6.62	42.53	54.65	-12.12	68.40	75.34	- 6.94
	05.07.18	24.30	34.97	-10.67	28.35	54.65	-26.30	64.80	75.34	-10.54
Field	17.01.19	25.65	34.97	- 9.32	49.68	54.65	- 4.97	54.45	75.34	-20.89
	14.03.19	32.40	34.97	- 2.57	49.68	54.65	- 4.97	66.55	75.34	- 8.79
maize	21.05.219	27.00	34.97	- 7.97	36.72	54.65	-17.93	72.60	75.34	- 2.74
	30.09.19	22.95	34.97	-12.02	36.72	54.65	-17.93	51.43	75.34	-23.91
field	04.12.19	21.60	34.97	-13.37	36.72	54.65	-17.93	51.43	75.34	-23.91
	04.02.20	31.05	34.97	- 3.92	60.48	54.65	+ 5.83	51.43	75.34	-23.91
	01.04.20	25.65	34.97	- 9.32	45.36	54.65	- 9.29	66.55	75.34	- 8.79
maize	21.04.20	31.05	34.97	- 3.92	38.88	54.65	-15.77	69.58	75.34	- 5.76
	19.05.20	31.05	34.97	- 3.92	41.04	54.65	-13.61	57.48	75.34	-17.86
	03.07.20	32.40	34.97	- 2.57	43.20	54.65	-11.45	66.55	75.34	- 8.79
Experimental field		Range 50-75 cm			The interval 75-100 cm			The interval 100-125 cm		
		Book	DC	The difference	Book	DC	The difference	Book	DC	The difference
	22.03.17	76.70	74.93	+ 1.77	80.92	67.83	+13.09	103.30	80.70	+22.60
Maize	09.05.17	70.80	74.93	- 4.13	74.38	67.83	+ 6.55	91.25	80.70	+10.55
	28.06.17	67.85	74.93	- 7.08	68.43	67.83	+ 0.60	80.30	80.70	- 0.40
	01 08.17	59.00	74.93	-15.93	62.48	67.83	- 5.35	80.30	80.70	- 0.40
Field	25.10.17	61.95	74.93	-12.98	56.53	67.83	-11.30	76.65	80.70	- 4.05
	08 01.18	67.82	74.93	- 7.11	68.43	67.83	+ 0.60	76.65	80.70	- 4.05
Maize	06.02.18	76.70	74.93	+ 1.77	74.38	67.83	+ 6.55	83.95	80.70	+ 3.25
	04.06.18	66.55	74.93	- 8.38	68.43	67.83	+ 0.60	80.30	80.70	- 0.40
	05.07.18	63.53	74.93	-11.40	65.45	67.83	- 2.38	83.95	80.70	+ 3.25
Field	17.01.19	56.05	74.93	-18.88	53.55	67.83	-14.28	69.35	80.70	-11.35
	14.03.19	70.80	74.93	- 4.13	74.38	67.83	+ 6.55	87.60	80.70	+ 6.90
maize	21.05.219	59.00	74.93	-15.93	62.48	67.83	- 5.35	73.00	80.70	- 7.70
	30.09.19	50.15	74.93	-24.78	50.58	67.83	-17.25	62.05	80.70	-18.65
field	04.12.19	47.20	74.93	-27.73	44.63	67.83	-23.20	54.75	80.70	-25.95
	04.02.20	67.85	74.93	- 7.08	47.50	67.83	-20.33	62.05	80.70	-18.65
	01.04.20	56.05	74.93	-18.88	68.43	67.83	+ 0.60	80.30	80.70	- 0.40
maize	21.04.20	67.85	74.93	- 7.08	71.40	67.83	+ 3.53	83.95	80.70	+ 3.25
	19.05.20	76.85	74.93	- 1.92	71.40	67.83	+ 3.53	87.60	80.70	+ 6.90
	03.07.20	70.80	74.93	- 4.13	86.28	67.83	+18.45	83.95	80.70	+ 3.25

After that, based on these elements, the water reserve was calculated for characteristic intervals of the soil profile (tab.7).

Since the water reserve in the first 10 cm of the soil is of particular importance, only in the first phases of crop vegetation, when it is found in sufficient quantities, ensuring a uniform emergence, later, most plants exploring through the roots the soil profile. at different depths, for which the water reserve (W mm) was calculated, at different intervals of the soil profile (tab.8): 0-25cm, 0-50cm, 0-75cm, 0-100 cm, 0- 125 cm. The values thus obtained, being compared with the values of the field capacity (CCmm)

Table 7

Soil water reserve (mm) in the range 2016-2020, compared to field capacity values

Experimental field		The interval 0-10 cm			The range is 0-25 cm			The interval 0-50 cm		
		Book	DC	The difference	Book	DC	The difference	Book	DC	The difference
	22.03.17	29.03	34.97	- 5.94	75.47	89.62	-14.15	146.86	164.96	-18.10
Maize	09.05.17	31.05	34.97	- 3.92	80.73	89.62	- 8.89	150.31	164.96	-14.65
	28. 6.17	24.30	34.97	-10.67	63.18	89.62	-26.44	129.73	164.96	-35.23
	01 08.17	13.50	34.97	-21.47	48.06	89.62	-41.56	102.51	164.96	-62.45
Field	25.10.17	27.00	34.97	- 7.97	65.88	89.62	-23.74	120.33	164.96	-44.63
	08.01.18	29.70	34.97	- 5.27	79.38	89.62	-10.24	151.98	164.96	-12.98
Maize	06.02.18	28.35	34.97	- 6.62	78.03	89.62	-11.59	150.63	164.96	-14.33
	04.06.18	28.35	34.97	- 6.62	70.88	89.62	-18.74	139.28	164.96	-25.68
	05.07.18	24.30	34.97	-10.67	52.65	89.62	-36.97	117.45	164.96	-47.51
Field	17.01.19	25.65	34.97	- 9.32	75.33	89.62	-14.29	129.78	164.96	-35.18
	14.03.19	32.40	34.97	- 2.57	82.08	89.62	- 7.54	146.63	164.96	-18.33
maize	21.05.219	27.00	34.97	- 7.97	63.72	89.62	-25.90	136.32	164.96	-28.64
	30.09.19	22.95	34.97	-12.02	59.67	89.62	-29.95	111.10	164.96	-53.86
field	04.12.19	21.60	34.97	-13.37	58.32	89.62	-31.30	109.75	164.96	-55.21
	04.02.20	31.05	34.97	- 3.92	91.53	89.62	+1.93	142.96	164.96	-22.00
	01.04.20	25.65	34.97	- 9.32	71.01	89.62	-18.61	137.56	164.96	-27.40
maize	21.04.20	31.05	34.97	- 3.92	69.93	89.62	-19.69	139.51	164.96	-25.45
	19.05.20	31.05	34.97	- 3.92	72.09	89.62	-17.53	129.57	164.96	-35.39
	03.07.20	32.40	34.97	- 2.57	75.60	89.62	-14.02	142.15	164.96	-22.81
Experimental fields		The interval 0-75 cm			The interval 0-100 cm			The interval 0-125 cm		
		Book	DC	The difference	Book	DC	The difference	Book	DC	The difference
	22.03.17	223.56	239.89	-16.33	304.48	307.72	- 3.24	407.78	388.42	+19.36
Maize	09.05.17	221.11	239.89	-18.78	295.49	307.72	-12.23	386.74	388.42	- 1.68
	28.06.17	197.58	239.89	-42.31	266.01	307.72	41.71	346.31	388.42	-42.11
	01 08.17	161.51	239.89	-78.38	223.99	307.72	-83.73	304.29	388.42	-84.13
Field	25.10.17	182.28	239.89	-57.61	238.81	307.72	-68.91	315.46	388.42	-72.96
	08.01.18	219.80	239.89	-20.09	288.23	307.72	-19.49	364.88	388.42	- 23.54
Maize	06.02.18	227.33	239.89	-12.56	301.71	307.72	- 6.01	385.66	388.42	- 2.76
	04.06.18	205.83	239.89	-34.06	274.26	307.72	-33.46	354.56	388.42	-33.86
	05.07.18	180.98	239.89	-58.91	246.43	307.72	-61.29	330.38	388.42	-58.64
Field	17.01.19	185.83	239.89	-54.06	239.38	307.72	-68.37	308.73	388.42	-79.69
	14.03.19	225.43	239.89	-14.46	300.01	307.72	- 7.71	387.61	388.42	- 0.81
maize	21.05.219	195.32	239.89	-44.57	257.80	307.72	-49.92	330.80	388.42	-57.62
	30.09.19	161.25	239.89	-78.64	211.83	307.72	-95.89	273.88	388.42	-114.54
field	04.12.19	156.95	239.89	-82.94	201.58	307.72	-106.14	256.33	388.42	-132.09
	04.02.20	210.81	239.89	-29.08	258.31	307.72	-49.41	320.36	388.42	-68.06
	01.04.20	193.61	239.89	-46.28	258.44	307.72	-49.28	338.74	388.42	-49.68
maize	21.04.20	207.36	239.89	-32.53	278.76	307.72	-28.96	362.71	388.42	-25.71
	19.05.20	206.42	239.89	-33.47	278.82	307.72	-28.90	366.42	388.42	-22.00
	03.07.20	212.95	239.89	-26.94	299.23	307.72	- 8.49	383.18	388.42	- 5.24

If we refer to the water reserve (W mm), compared to the values of field capacity (CCmm) it can be seen that it is below the values of field capacity, in most cases from the characteristic periods of the interval 2016-2018, except for the intervals included between 50-

125cm (tab.7), in which the water reserve registers values higher than the field capacity, fact justified by the groundwater contribution from the cold season from 2016-2020.

CONCLUSIONS

The researches from the period 2016-2020, regarding the evolution of some hydrophysical characteristics were carried out on a typical Cernozem, weak gleysate, epicalcaric, medium clay-clay / medium clay-clay, dominant within the Galaţca Plain (Pesac-Lovrin-Teremia) and which is representative for a significant area of the low Plain of Banat.

For a good interpretation of the hydrophysical indices, the climatic data (temperatures and precipitations) registered in the interval 2016-2020, at the Meteorological Station located at Lovrin, were compared with the multi-annual ones.

From the obtained results, it appears that in most of the interval in which the researches were undertaken, humidity values were registered, below the values of the field capacity. Often these values are at the limit of the wilting coefficient, with direct effects on the level of maize production for grains.

The observations regarding the evolution of soil moisture, from 2016-2020, indicate some oscillations depending on the season, but also during the months of the maize vegetation period, in the root development layers, depending on the soil texture and structure.

Given these peculiarities of the ecopedological profile, it is necessary to find those ways that can lead to the storage of water from precipitation in the soil, used during the growing season for plant growth and development.

It is mandatory that in assessing the suitability of the land for crop systems to be taken into account those two determining soil factors, which condition the degree of suitability, soil texture and momentary soil moisture.

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