

The long-term experiments of Livada

Location: Someşului Plain, - A.R.S. Livada (Pecitog experimental field).

Longitude: 23°09'

Latitude: 47°86'

Absolute altitude: approx. 130 m

PAEDOGENETIC CONDITIONS, MORPHOLOGICAL CHARACTERISTICS

Relief unit: Someşului Plain.

The local landscape: relatively flat land, local old watercourses

Aspect of land surface: no pronounced unevenness

Underlying rock: fluvial deposits

Parental material: non-carbonate sandy loam fluvial deposits

Global natural drainage: good, ground water level: 3-5 m.

Bioclimatic zone: forest

Land use: arable

Current vegetation: cultivated

Moisture regime: udic

Temperature regime: mesic

Paedoscope: Preluvosols and luvosols ± albic, loamy

The Pannonian subprovince, which includes the plain area of the SCDA Livada territory, is under the influence of a temperate climate with a sub-Atlantic nuance. **The multiannual average temperature recorded at the meteorological station S.C.D.A. Livada for 60 years is 9.9°C. In the period 1961-2022 at Livada, the multiannual average of the amount of precipitation is 753.2 mm.** Under the conditions at Livada, the first frost occurs with the highest frequency in the last half of October, and the last frost occurs in the last decade of March.

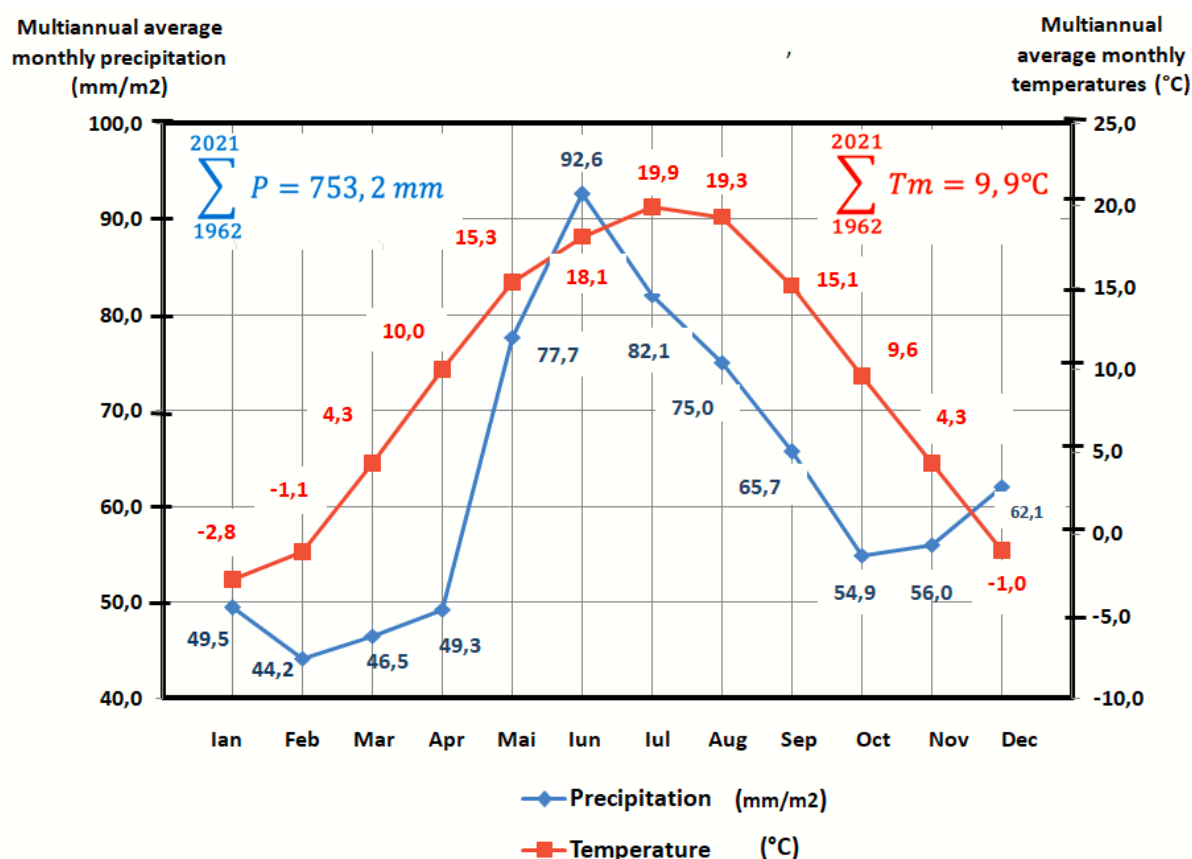


Fig. 1 Evolution of monthly multi-annual average of temperatures and mean precipitation sum recorded in the period 1962-2021 at SCDA Livada

Brief introduction to the soil

PRELUVOSOL MEZOHIPOSTAGNIC, FREATIC UMED (SRTS)

HAPLIC LUVISOL (WRB SR)

TYPIC HAPLUDALF (USDA ST)

Brief introduction to the soil

Loamy-clayey loamy soil, with tick solum and moderate by textural differentiation.

Profile of soil description

Morphological characteristics

Ap 0-18 cm; loam; dark brown (10YR 4/3) wet and yellowish brown (10YR 6/3) dry; destructured; friable, firm when wet; hard when dry; weak plastic, fine pores, point-like ferromanganese separations; frequent thin roots; clear passage.

Ao 18-40 cm; silty loam; dark brown (10YR 4.5/3) wet and dark yellowish brown (10YR 6/3) dry; poorly developed medium subangular polyhedral structure; weakly plastic, hard when dry; punctate ferrimanganese separations, porous, frequent roots, gradual transition between 25-30 cm, the horizon is flattened and compact (Atp).

AB 40-55 cm; silty loam; dark brown (10YR 4.5/4) wet, yellowish brown (10YR 5/4.5) dry; structure moderately developed, medium subangular polyhedral; friable; porous, firm when wet, hard when dry, plastic and adhesive; ferrimanganese separations disseminated in spots; rare crotonites and coprolites, thin and rare roots; gradual transition.

Bt1w 55-70 cm; silty loam/silty clay loam; dark yellowish brown (10YR 4.5/4) wet; yellowish brown (10YR 6.5/4) dry; dark cone reduction spots (2.5Y 3/1); structure moderately developed prismatic, medium; clay films on the lateral faces of the aggregates; friable when wet, hard when dry; jilav, punctate ferrimanganese separations; thin and sparse roots; gradual transition.

Bt2w 70-110 cm; silty clay loam; dark yellowish brown (10YR 4/5) with diffuse reduction spots 15% wet; (10YR 5/2) yellowish brown (10YR 6/4) dry; medium prismatic-columnoid structure, moderately developed; clay films on the faces of the structural aggregates, small grains, ferruginous spots; moderately plastic and adhesive, firm, hard when dry; damp; gradual transition.

BC 110-134 cm; loam, yellowish brown (10YR 5/4) with greyish brown spots (10YR 5/2) wet, light yellowish brown (10YR 6/4) dry; weakly developed columnoid-prismatic structure; weak plastic and adhesive; friable when wet; hard when dry; ferrimanganese separations in spots, more clayey deposits in the form of plumes of aubergine gray with a vertical orientation, moist; gradual transition.

2Cni 134-155 cm; sandy loam with unevenly disseminated bags of micaceous sand, yellowish brown (10YR 5/4) with dark yellowish brown patches (10YR 3/6) moist; structured (massive); friable when wet; moderately hard when dry; moist, gradual transition.

Cn2 155-180 cm; loamy sand, with sandy bags of different dark brown

(10YR 3/3) with yellowish brown spots (10YR 5/4) wet; structured (massive); friable, moist.

Observation: in the horizon Bt2 (lower limit) and BC, fine textural deposits of a grayish-blue colour appear in the form of vertically arranged feathers and lenses, which suggest a periglacial evolution.

Microscopic fungi with medium population size create medium-level effectives on the surface (**0-18 cm**) and small on the rest of the depths. A similar development is noted at the depths of 18-40 cm and 55-70 cm, slightly exceeded by that specific to the next layer (**70-100 cm**).

The physiological activities of the microflora are of medium intensity on the surface and low in the rest of the horizons, with a progressive decrease with depth.

Paedogenetic aspects

Holocene soil, formed on loam fluvial deposits, non-carbonate with moderately differentiated textural profile (ID = 1.57).

Characteristics appear in the **Bt** horizon (colours, ferromanganese separations) that show a weak stagnogleying. The higher humidity in the **Cn** horizon shows that the soil is still under phreatic influence today and it is possible that it was gleyed in the past, but due to the sandy texture of the permeable substrate. The specific colours were no longer preserved in the lower part, below 130 cm depth, there appear grey vertical plumes that are more clayey, which suggests that in the past this part of the Someş Plain went through a phase of periglacial climate.

Ecological and agronomic considerations

Soil with a very large edaphic volume, medium texture and relatively well-structured horizon **A** . The values of apparent density and permeability show that the soil is relatively flat, but the profile suggests a satisfactory aerohydric regime. Although there are some periods with a certain excess of water, at the level of the Bt horizon, they are relatively short and do not negatively influence the development of crops. The content of humus, the slightly acidic reaction and the saturation in bases in the upper horizons indicate a good trophic regime. The higher pH values in these horizons are due to calcification, currently found. However, an acidification-debasification tendency in Ap, which shows that, in the absence of calcification, the soil evolves towards a decrease in reaction and impoverishment in bases.

PHYSICAL PROPERTIES OF THE SOIL PROFILE

Horizon	Um	Ap	A		AB	Bt ₁ w	Bt ₂ w	BC	2 Cn ₁	Cn ₂
The depth of the horizon	cm 0-18	0-18	18-40		40-55	55-70	70-110	110-134	134-155	155-180
Sample depth	cm 0-15	0-15	20-30	30-40	40-55	55-70	80-95	115-130	140-155	160-175
Coarse sand (2.0-0.2 mm)	%g/g	4,6	4,7	5,0	3,6	3,4	3,8	6,6	23,9	30,9
Fine sand (International system) (0.2-0.02mm)	%g/g	46,9	39,1	37,9	35,6	31,0	32,5	40,3	43,2	40,6
Fine sand (American system) (0.2-0.05 mm)	%g/g	5,8	6,0	5,7	4,8	4,0	4,7	7,3	16,8	13,2
Silt (international sist) (0.02-0.002 mm)	%g/g	27,6	35,1	34,0	33,8	33,2	30,6	27,6	19,4	12,0
Silt (US system) (0.05-0.002 mm)	%g/g	68,7	68,2	66,2	64,6	60,2	58,4	60,6	45,8	39,4
Clay (<0.902mm)	%g/g	20,9	21,1	23,1	27,0	32,4	33,1	25,5	13,5	16,5
Physical clay (<0.01 mm)	%g/g	39,8	40,0	42,4	46,1	51,1	49,5	39,8	23,4	22,5
Densified appearance	g/cm ³	1,35	1,54	1,49	1,48		1,48		1,63	
Total porosity	%v/v	49,6	42,4	44,6	44,7		44,7		39,2	
Degree of subsidence	-	2,47	12,47	8,54	9,52		11,3		16,95	
Standard penetration resistance	kgf/cm ²	23	34	33	44		44		31	
Shrinkage index	-	0,0088	0,0057	0,0065	0,0079		0,0113		0	
Coefficient of hygroscopicity	%g/g	4,1	3,6	4,1	5,9	7,5	8,1	6,5	5,1	4,8
Coefficient of wilting	%g/g	6,2	5,4	6,2	8,9	11,3	12,2	9,8	7,7	7,2
Humidity equivalent	%g/g	11,2	9,8	11,2	16,1	20,5	22,1	17,7	13,9	13,1
Field capacity for water	%g/g	24,1	22,0	22,7	22,6		23,1		15,3	
Total capacity for water.	%g/g	36,7	27,5	29,9	30,2		30,2		24,0	
Useful water capacity	%g/g	18,0	16,6	16,6	13,8		10,9		7,7	
Drainage capacity	%g/g	12,6	5,5	7,2	7,6		7,1		8,7	
Hydraulic conductivity	mm/h	31 27	5,87	3,11	0,35		1,04		6,74	

CONTENT IN MICROELEMENTS, TOTAL AND MOBILE FORMS, OF THE SOIL PROFILE

Horizon	UM	Ap	Ao	AB	Rt,w	Bt ₂ w	BC	2Cn1	Cn ₂	
The depth of the horizon	cm	0-18	18-40	40-55	55 -70	70-110	110-134	134-155	155-180	
Sample depth	cm	0-15	20-30	30-40	40-55	55-70	80-95	115-130	140-155	160-175
Microelements	ppm									
Zn	totals	39,0	37,0	39,0	39,0	66,0	-	54,0	-	34,0
	mobile	4,61	3,20	4,68	2,36	3,10	-	0,75	-	1,2
Cu	totals	12,0	15,5	13,5	22,5	28,0	-	22,0	-	16,0
	mobile	0,72	0,62	0,49	0,65	1,10	-	0,80	-	0,90
Fe	totals	-	-	-	-	-	-	-	-	-
	mobile	44	22	18	23	-	-	-	-	-
Mn	totals	585	605	635	595	565	-	545	-	515
	mobile	12,2	16	8,1	7,6	8	-	7,3	-	4,9
Pb	totals	14,5	28,0	21,0	28,5	30,0	-	21,5	-	21,0
	mobile	12,1	10,3	8,9	10,3	1,6	-	1,6	-	0,7
Ni	totals	16,0	22,5	26,0	29,5	30,5	-	35,0	-	26,0
	mobile	-	-	-	-	-	-	-	-	-
Cr	totals	-	-	-	-	-	-	-	-	-
	mobile	-	-	-	-	-	-	-	-	-
Co	totals	6,0	6,0	8,5	9,0	10,0	-	8,5	-	8,5
	mobile			-	-	-	-	-	-	-
Cd	totals	sld	0,800	sld	sld	sld	-	sld	-	sld
	mobile	sld	sld	sld	sld	sld	-	sld	sld	sld

MINERALOGICAL COMPOSITION OF CLAY (< 0.002 mm) FROM THE SOIL PROFILE

Horizon	UM	Ap	Ao	Bt ₁ w	Bt ₂ w	2Cn ₁
The depth of the horizon	cm	0-18	18-40	55-70	70-110	134-155
Sample depth	cm	0-15	30-40	55-70	80-95	140-155
Smectit	%	-	-	47	48	51
Illit	%	65	60	48	48	44
Clorit	%	29	33	-	-	-
Caolinit	%	7	7	5		5

Bibliography

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