SOIL AND CLIMATE CONDITIONS FOR SOIL GENESIS IN SAG, TIMIS COUNTY, ROMANIA

Iulia SOPCA, Raluca PERESCU, Ioana MARCHIȘ, Casiana MIHUȚ, V.D.MIRCOV

University of Agricultural Sciences Banat Veterninară „King Michael I of Romania”

Timisoara, Arad Way, no. 119, Romania, Phone: +4025627475, Fax: +40256200296,

Corresponding author: casiana_mihut@usab-tm.ro

Abstract*. The goal of this study was to analyse the soil and climate conditions that engendered the soil cover at Sag, Timis County, Romania. The objectives of the study were to study the soil conditions of soil genesis; the natural landscape including data regarding the lithology, hydrology, and hydrology of the area; climate data; and data regarding the soil cover with a description of the soil types and sub-types within the studied perimeter. (4)The soils in the studied area were formed and evolved through the interaction of the complex of soil and climate factors among which the most important are ground water, relief, parental rock, climate, vegetation, and human factor, while underlying the dominant influence of the water.(1)The parental material (rock) on which these soils formed are generally made up of fluvial-lacustrine deposits and remade loessoid deposits, which formed very different soils. The soils, formed, in general, under the influence of water, are hydric, such as gley soils and stagnosols, and their sub-types.(5)On loess and loessoid deposits formed deeper soils with higher fertility such as chernozems, phaeozems, and preluvisols, and on fluvio-lacustrine materials formed eutricambosols. In areas located in the near vicinity of the River Timis, alluvial soils formed. On plane lands near watercourses with different granulometric structure there are luvisols and on clogged lands whose structure is medium fine and in the presence of 1.2-1.5 m deep ground water, gley soils and gley chernozems appeared. These soils are more or less drained and evolve towards the area type. (2,6)In the same areas, loam levigation produced stagnic and gley phaeozems. As for mean annual temperatures, they range within 10.2-10.6°C. In time, temperatures varied non-periodically, depending on air mass frequency and intensity. Rainfalls also had an uneven distribution per years and months. The highest values were in May and June, and the lowest ones were in January, March, and September.(3,7)*

Keywords: *soil and climate conditions, soil type, soil genesis and evolution*

INTRODUCTION

Şag is 14 km south from Timisoara; it is crossed by the national road 59 Timisoara – Moravita (European road E70). (8)

The mean altitude of the locality is 85-90 m, on a plane relief.

The land studied is part of the Western Romanian Plain, in the eastern extremity of the Tisa Plain, the eastern compartment of the Pannonia Depression, Timis River Plain. (12)

Groundwaters depth influence soil genesis processes. Until recently, part of the low plain was under strong groundwater influence (over 3 m from soil level). The level of the groundwater table is 3.5 m on the average. (10)

The materials on which the soils formed are generally made up of fluvial-lacustrine deposits and re-made loessoid deposits. During bogging and periodical bogging, the plain proper is a flooded meadow with ground water close to the surface or even at the surface. Moisture excess formed hydrosols. Within the studied perimeter, there are also other soil types such as alluvial soils, chernozems, phaeozems, eutricambosols, and preluvisols. (11)

The microrelief of these plains have negative forms – long micro-depressions and small depressions. Positive forms represented by small mounds are dispersed within the area, frequently near ex-meanders or at the limit of the Timișul Mort River.(12)

The studied area is part of the Pannonia Depression, its eastern extremity. In the entire Pannonia Depression, there is a succession of sands, loamy sands, and clays to whom are subordinated gravels. The thickness of the Pannonian ranges within 800-1600 m. (Munteanu & Munteanu, 2002).

The commune of Sag is at the interference of maritime air masses of western origin with eastern continental ones to which is added the invasion of hot air masses crossing the Mediterranean and also some cold polar air masses. The influence of these air masses gives the climate in the area a moderate-continentalism level.

The commune benefits from water supply over a network of 5 km.

MATERIAL AND METHOD

The material studied is represented by the main soil types and subtypes in the area. We also used data from the Sag Town Hall and from O.S.P.A. Timisoara, as well as data collected during field work and from literature.

Data regarding climate conditions were from the Weather Station in Timisoara.

After collecting these data, we made a synthesis and results were processed with the teachers of the Soil Science Department and Agrometeorology and Climatology Department of the Faculty of Agriculture in Timisoara.

RESULTS AND DISCUSSION

On our trips in the field and after collecting data, we have come to the conclusion that the soils in the studied area formed and evolved through the interaction of the complex of soil and climate factors of which the most important are groundwater, relief, parental rock, climate, vegetation, and the human factor, with the dominant influence of water, which produced some characteristic soils with lower productive potential than that of other soils in the area. This is due to the presence of water and of parental material on which formed and evolved these soils, materials with finer structure than that of other soils, except for phaeozems, which did not form in higher areas and, therefore, are not influenced by water.

The soils in the area have had different genesis times depending on some factors that contributed to their genesis and evolution: bogging periods, periodical bogging, and steppe solidification, after multiple hydro-ameliorative interventions in the area.

During bogging and periodical bogging, this area was still a flooding meadow with groundwater close to the surface or even at the surface. During this period, moisture excess created anaerobiosis conditions, which made anaerobic microorganisms form ferrous and manganese bicarbonate which later made up the soil colloidal complex which, in the presence of moisture and in reaction with silica, produced secondary minerals such as ferro-silica. These secondary minerals give the characteristic colour of gley horizons or of the entire soil profile; thus, were formed hydric soils, gley soils and different gley sub-types, as well as stagnosols and different stagnic sub-types.

Again, under the influence of water, with the establishment of haymaking field vegetation under excessive moisture conditions, were formed chernozems on different loessoid materials in the higher areas.

Within this area there are also other soil types such as alluvial soils, chernozems, phaeozems, eutricambosols, preluvisols, and luvisols. On plane lands, near watercourses, with different granulometric strata, there occur luvisols, while on clogged lands, riverbeds or deserted meanders with medium fine granulometric surfaces and with groundwater 1.2-1.5 m deep in the soil, there occur gley soils and gley chernozems. In the same area, loam levigation produced Stagnic and gley phaeozems.

These factors engendered the soil types that have been identified, delimited, analysed and then presented in Table 1 below.

Table 1.

Genesis of different soil types and sub-types at Sag, Timis County, Romania

Class	**Type**	Sub-types	**Area**	
			ha	**%**
Protisols	Alluvial soils	eutric, gleic, distric, mollic, molic-salted	1539.83	18,37
	Entianthroposols	mixed	11.71	0,14
Chernisols	Chernozems	typical, cambic, cambic-alkalized, vertyc-salted	513.76	6,13
	Phaeozems	cambic, cambic-gleyic	956.92	11,41
Cambisols	Eutricambosols	typic, molic, aluvyc, gleyic, molyc-aluvic, pelyc, aluvic, gleyic, mollic- alkalized, mollic-gleyc, glevic-alkalized, pelyc-gleyic	46.23	55,1
Vertosols	Pelosols	gleyic, gleyic alkalized	167.25	2,00
Salsodisols	Solonetz	gleyic-salted	6.60	0,08
Soil associations			563,8	6.27
Total			**3806,1**	**100**

As for climate data, the studied area has a mean annual temperature between 10.2 and 10.6˚C during 2010-2017. During the same period, soil temperature was constantly above 5˚C at the beginning of the second decade of April. After about 205 days in the horizon 10 cm temperature dropped below 10°C. vegetation and soils also influence the distribution of multiannual temperature values.

The Commune of Sag is at the interference of the western marine air masses with eastern continental ones, to which add hot air masses from the Mediterranean and polar cold air masses. The influence of these air masses makes the climate in the area moderate-continental. In summer, the tropical maritime air (from south-west) generate unstable weather with downpours and lightnings. Also, in summer, when some tropical air comes from south-east, the weather is hot and very dry.

The many studied carried out show that the highest temperature of 25.1ºC was in July 1936, while the lowest temperature of -9,1ºC was in January 1942. Multiannual mean temperature is 22,7ºC, a value pointing to moderate continentalism.

Absolute maximum temperature was on August 16, 1962 (40.0ºC). Temperatures higher than 39.0ºC were in 1988 and 2000, 39.5ºC on July 6, 1988 and on August 22, 2000. Absolute minimum temperature was – 35.3ºC on January 12, 1963. Absolute thermal span was 75.3ºC.

The distribution of rainfalls depends on air movements. The highest values were in May-June, and the lowest in January, March, and September.

To point out the lack of soil water during certain periods of the year, we show, in Table 2 below, the moisture deficit calculated with the Thornthwaite method depending on evapotranspiration (both real and potential).

Table 2.

Moisture deficit calculated with the Thornthwaite method

Soil moisture deficit	Months											
	I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**
Potential evapotranspiration	0	1	23	53	97	123	135	123	81	44	16	2
Real evapotranspiration	0	1	23	53	97	123	86	52	47	44	16	2
Moisture excess	29	39	0	0	0	0	0	0	0	0	0	0
Moisture deficit	0	0	0	0	0	0	49	71	34	0	0	0

Data presented in Table 2 show that in summer there is a moisture deficit that needs to be compensated through cultural techniques and irrigations. Moisture deficit is not the real one, because part of it is completed through groundwater supply.

After Koppen, the climate of the area belongs to the climate province C.f.6.x.

The mean annual value of De Martonne index is 30.2, which ranges the studied area within the semi-moist sylvo-steppe area.

The predominant wind direction is from north-west, followed by west. The lowest wind frequency is that of south winds in April and May. Mean wind speed is low (about 2.2 m/s). The lowest values are in August and September, and the highest ones are in March and April.

CONCLUSIONS

The soils of the studied area have gone through different genesis periods depending on factors that have contributed to their alter genesis and evolution (bogging, periodical bogging, and steppe soil formation), after multiple hydro-ameliorative interventions. This engendered very different soils. Ground waters are at a depth that influences soil genesis processes and specific soils such as hydrosols and salsodisols.

Under short-term excessive moisture conditions, chernozems and phaeozems formed on loessoid materials and loessoid deposits in higher areas.

On uneven materials alluvial soils formed and, in higher areas, eutricambosols, preluvisols, and luvisols appeared. Where clay was contractile-swelling, vertosols evolved.

On plane lands close to the Timis River with different granulometric structure, luvisols appeared while on clogged lands, canals or deserted meanders with medium fine granulometry and with groundwater at 1.2-1.5 m gley soils and gley chernozems occur. In the same areas, loam levigation produced Stagnic and gley phaeozems.

Climatically, Sag is within the plain climate between the western sub-type with ocean influences and the Banat sub-type with Mediterranean influences. Mean annual temperature is between 10.2°C and 10.6ºC.

- In this area, winters are milder with a mean temperature around 0ºC;
- In general, springs are earlier, shorter, and with wide thermal variations;
- From July to the beginning of September, tropical air masses predominate with mean temperatures in summer of 20ºC;
- Falls are longer than springs and with more constant temperatures, with predominant polar-maritime airmasses that cause a slight increase of rainfalls.

Until recently, part of the low plain was under strong groundwater influence (over 3 m from soil level). The level of the groundwater table is 3.5 m on the average.

BIBLIOGRAPHY

1. LOTREANU, I., 1985 - Monografia Banatului, Institutul de Arte Grafice, Timişoara, pag. 103-105

2. MIHUȚ CASIANA, LAȚO, K.I., 2007 - Pedologie. Metode de analiză. Ed. Gutenberg, Arad, pag. 74

3. MIHUȚ CASIANA, RADULOV ISIDORA, 2014 - Științele Solului. Editura Eurobit, Timișoara.

4. VLAD DRAGOSLAV MIRCOV, S. VUXANOVICI, COSMA ANTOANELA, ADALBERT OKROS, PINTILIE SOFIA, NICHITA ANCA IULIANA, MOISESCU CARMEN IRINA, 2016 - Climate records registered in western Romania, European Biotechnology Conference , vol. 231, ISSN 0168-1656, factor 3,34.

5. MIRCOV VLAD DRAGOSLAV, POP GEORGETA, C. MOISA, A,COSMA, 2013 - Climatic risk determined by the pluviometric regime regstered in the Banat area during 1961-2010, Proceeding of the 4l International Symposium „Actual task on Agricultural Engineering". Opatija, Croatia, 2013, ISSN1884-4425,http://atae.agr.hr, pag. 364-374.

6. V.D.MIRCOV, C. MOISE, CODRUTA CHIS, 2015 - Risk aspects in the warm season 2014- climatological and synoptic characterisation during summer 2014 in western region of Romania. Research Journal of Agriculture Science, vol. 47, pg. 89-95, Timisoara.

7. OKROS A., POP GEORGETA, 2014 - The influence of the western plain topoclimate on cereal and cereal derivative production quality and quantity, Research Journal of Agricultural Science, 46 (4), pag. 78-83, 2014.

8. C. PASCOTA, A.M. TENCHE-CONSTANTINESCU, V. D. MIRCOV, G. F. BORLEA, 2016 - The walnut – a potential social broadleaved tree in western Romania, SGEM 2016 Conference Proceedings, ISSN 2367-5659, Book 149 Vol. 1.

9. RogobETE, GH., ŢĂRĂU, D., CHISĂLIŢĂ, GH., 1997 - Evoluția solurilor din Câmpia joasă a Banatului şi problemele de clasificare, Lucr.şt. Acad.Română, Fii. Iaşi, pag. 175-179

10. ROGOBETE, GH., IANOŞ, GH., 2007 - Implementarea Sistemului Român de Taxonomie a solurilor pentru partea de vest a României, Timişoara.

11. http://www.manuconsulting.ro/temperaturi-extreme-scazute-2/

12. http://www.ospatimisoara.ro/panoptic-sag.html