CONDITIONS OF GENESIS OF THE SOIL COATING IN SÂNPETRU MARE, TIMIS COUNTY, ROMANIA

Andrada GAVRA[1], Florina Nicoleta BOJINESCU[1], Casiana MIHUT[1], Adalbert OKROS[1], Anișoara DUMA-COPCEA[1]
[1] University of Agricultural Sciences Banat Veterninară „King Michael I of Romania" Timisoara, Arad Way, no. 119, Romania, Phone: +4025627475, Fax: +40256200296,
email: casiana_mihut@usab-tm.ro

Abstract: *The paper gives a broad description on the conditions of soil formation in the town of Sânpetru Mare, Timiș County, respectively on the relief, climate, rocks, hydrology and hydrography, vegetation and man. Sanpetru Mare is 55.5 km away from Timișoara and the nearest city is Sânnicolau Mare, 14 km. The commune, covers an area of 19,852 ha, of which 18,836 ha is represented by the agricultural land, being a locality located in the Mureș - Aranca Plain in the northwest part of the Banat Plain. In its composition are the localities Sânpetru Mare, Igriș and Saravale. The climate is a temperate continental, with hot and dry summers and mild winters, the relief being a plain, having small altitudes of only 82-95 m. Hydrographically, the locality is located in the Mureș river basin, respectively the upper basin of the Aranca river, which led to the formation of alluvial soils, such as alluvium, with a different texture on the profile and the gleiosols. Where the groundwater is enriched with salts and sodium ions, the soils of the Salsodisols class have been formed, respectively solonceacs and solonates. Depending on these factors: climate, relief, rock, vegetation and geomorphological forms, the spread of soils within this perimeter is different. While in the meadow and low plains, these are formed exclusively on alluvia and have evolved under the direct influence of groundwater, in the other areas, the soils are formed on loess, which has led to the sleeping of fertile soils such as chernozem. and vertosols, in the case of soils formed on the contractile-inflating clays. From the field studies, it was concluded that the soils that are widespread in the immediate vicinity of the valleys of Aranca and Galațca, are generally represented by alluviosols, those spread in Lunca Mureșului and of the Aranca canal, are represented by gleiosols (cerns, mollusks) and alkalized), solonceacs and solonates and those widespread in the plain area, are represented by chernozems, vertosols and zonal soils. These soils present a series of limitations, either due to the shallow presence of groundwater, which is found in gleiosols, solonceacs and solonites, or in the clay texture, as is the case in vertosols.*

Key words: *formation conditions, soil cover, climate, relief, rock*

INTRODUCTION

Sânpetru Mare is part of the Timiș County and is 55 km from Timisoara and 14 km from the nearest town, Sânnicolau Mare. (ANIȘOARA BĂRBĂLAN, LAURA UNIPAN, BOLDEA M., ANTOANELA COZMA, MIHAI D., 1999; OKROS ADALBERT, 2015) The commune is made up of Sânpetru Mare, Igriș and Saravale (Figure 1).

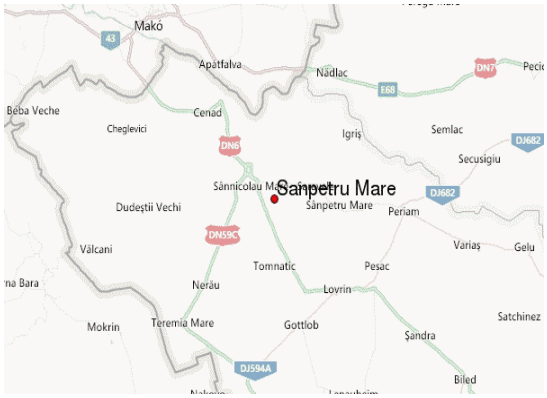

Figure 1. Location of Sânpetru Mare

The commune is located in the Mureş-Aranca Plain, part of the Banat Plain. (BORLAN Z., HERA CR., 1973; CANARACHE A., 1997; V. CIOLAC, E. NISTOR, C. POPESCU, N. BĂBUCĂ, A DIRLEA, L. BÂRLIBA, 2013; V.D.MIRCOV, C. MOISE, CODRUTA CHIS, 2015; L. NIŢĂ, K. LAŢO, SIMONA NIŢĂ, ALINA LAŢO, CASIANA MIHUŢ, ANIŞOARA DUMA COPCEA, 2012)

On the territory of the commune, there are two natural reserves, occupying an area of 3.5 ha: one is represented by Movila Sişitac, which is located in the south, where it occupies an area of 0.5 ha, and protects the species *Stipa capillata* (bunchgrass) and *Agropyron cristatum* (crested wheat grass); the other one is mixed in character and protects a typical field of alluvial terrain and forming soils with specific ornithon-fauna and stretching over an area of 3 ha and, located in Igriş. In the area studied, two protected species, namely the pygmy cormorant (*Phalacrocorax pygmeus*) and little egret (*Egretta garzetta*), were reported. (OCTAVIUS COLŢAN, VALERIA CIOLAC, ELENA PEŢ, IOAN PEŢ, ELEONORA NISTOR, 2014; G. CĂBĂROIU, L. NIŢĂ, 2013; GOIAN M., IANOŞ GH., RUSU I., 1993; IANOŞ GH., GOIAN M., 1992)

MATERIAL AND METHOD

Studies were conducted concurrently on the field, in the office and in the laboratory. The material studied is represented by the area-specific soils, as well as the factors that contributed to their genesis and evolution.

Both data from our own studies and field trips were used, as well as data from literature and studies from the town hall of Sânpetru Mare.

RESULTS AND DISCUSSION

The perimeter studied is part of the Banat Plain, namely Mureş-Aranca Plain, with altitudes ranging from 82-95 m, increasing from northwest to southwest. Within this territory, two relief steps are distinguished which are located at an altitude of less than 100 m, which is part of the low subsistence and divagation plains. The two steps are separated by the Aranca River, the lowest step being located north, up to the alignment of the Mureş River, and the highest step to the south, to the right bank, Galaţca. The highest step represents a remodelled, moderately aeolian alluvial chassis, and the lowest step, a typical alluvial chassis. The low step, located in the north of the Aranca River, is separated into two sectors: the non-flood, situated

between the course of the Aranca River and the defensive flood pier, located between the defence pier and the Mureş River.

From a hydrographic point of view, the territory of the commune is located in the Mureş River basin, namely the upper basin of the Aranca River, which is part of the Aranca draining system.

The hydrographic basin of the Aranca system overlaps the older parasitic courses of the Mureş River which, before their decomposition, were flooded when it rained abundantly. The Aranca complex is currently under the influence of the large quotas of the Mureş, but the connection is carried out hydraulically.

The climate specific to this area is temperate-continental, with weak Mediterranean influences, manifested by mild winters and not too warm summers, an average annual temperature of 10.8°C, and an average multiannual rainfall value of 536.3 MM (after the Meteorological Station Sânnicolau Mare).

From a geological point of view, the Aranca Plain is based on a crystalline Carpathian foundation covered by a sedimentary bedspread, above which the rivers of the most diverse types were deposited (in the form of sands, pebbles and silt). They are crowned by unified sands and the clay-loamy rocks, the last leading to stagnation of water from precipitation.

Following studies and field trips, a number of soils have been identified, the genesis and development of which is closely linked to both the main factors of soilification and the obvious changes in climate conditions in recent years.

Thus, the soils in the immediate vicinity of the Aranca River present a number of common characters, namely:

- They are based on the same mother rock, represented by alluvia and, with small exceptions, on the higher lands, by loess;
- The current soils are found at an average stage of evolution and contain a high percentage of slightly soluble salts.

Salsodisols are present through the solonets and various subtypes at different stages of sodization. Automorphic and hydromorphic soils are located north-east, towards Variaş. Several genetic subtypes appear within this group.

From an agricultural point of view, alluviosols are easy to work and very productive soils, except for the salinised ones and for the excessively affected by groundwater soils.

The influence and action over time of soil genesis factors, i.e., relief, rock, climate and hydrology, as well as human intervention through the important hydro-ameliorative works started more than 200 years ago, led to the existence of a soil bedspreads of an increased complexity and diversity.

The studied perimeter has an agricultural area of 18,836 ha. Based on the data obtained from the O.S.P.A. archives Timisoara and the town hall in Sânpetru Mare, the following soil types (Table 1) were identified.

Table 1.

Types and subtypes of soil in Sânpetru Mare

Soil type	**Soil sub-type**	**Area**	
		ha	**%**
Alluviosol	eutric, gleic, mollic, mollic-salty	2335.66	12.4
Chernozem	typical, cambic, alkalised cambic	7553.24	40.01
Vertosol	gleic, alkalised, alkalised gleic	4407.62	23.40
Gleiosol	mollic, salsodic, vertic	94.18	0.50
Solonets	gleic, salty	659.26	3.50

Soil associations		3786.04	20.19
	Total area	**18.836,00**	**100**

Table 1 shows that the largest area is occupied by chernozems, i.e. 7,553.24 ha (40.01%), vertosols 4,407.62 ha (23.40%), followed by alluviosols 2,335.66 ha (12.4%).

Table 2 shows that these soils fall into the following quality (fertility) classes.

Table 2.

Quality (fertility) class of soils in the perimeter of Sânpetru Mare

Quality class	**Area**	
	ha	**%**
1st class	3,128	20.13
2nd class	4,635	29.83
3rd class	5,218	33.58
4th class	1,474	9.49
5th class	1,084	6.97

Among the main limiting factors influencing the quality of the soil coating in this complex, we mention:

- Excess moisture phreatic (moderate 20%, strong-excessive 9%);
- Excess rainwater humidity (low 37%, moderate 6%, strong-excessive 2%);
- Compactness (low 27%, moderate 10%);
- Salted (low 48%, moderate 7%, strong-excessive 14%);
- Reduced bearing (8.36%);
- Reduced humus reserve (12%);
- Soil reaction (low acidic 60%, moderate acidic 28%).

The improvement and valorisation of the productive potential of agricultural land in this area can be achieved under the integrated approach of hydro-ameliorative measures with current agri-food and cultural ones, which aim to ensure air-hydric regime in the soil, in the optimal parameters of functionality. The rehabilitation and modernisation of irrigation, defence, deforestation, and desiccation works should be a priority in the next programmes for ecological reconstruction of soils and agricultural holdings in this area.

Following the massive deforestation over the past decades, the area's woody vegetation is represented only by small stands or isolated specimens of species such as *Querqus robus* (pedunculate oak), *Fraxinus excelsior* (ash), *Ulmus foliacea* (field elm), *Acer campestre* (field maple), *Pinus piraster* (maritime pine) and *Crataegus monogyna* (common hawthorn).

CONCLUSIONS

Sânpetru Mare covers a total area of 19,852 ha, of which 18,836 ha is agricultural land

It is located in the Mureș-Aranca Plain, respectively in the northwest part of the Banat plain. The relief is generally plane, with altitudes of 82-95 m. The commune is made up of Sânpetru Mare, Igriș and Saravale. Soils are mostly formed on fluvial materials such as sand, gravel and silts, but also on loess, which led to the genesis of diverse soils. This resulted in the genesis and evolution of soils of the type of alluviosols, chernozems, vertosols, gleisols and solonets. The largest area, however, is occupied by chernozems, 40.01%, vertosols 23.40%, and alluviosols 12.4%.

Soils are generally fertile, most of them (83.54%) being in the first three classes of fertility. The other soils, which also have lower fertility (gleisols and solonets), cover small areas (4% of the territory) and appear only sparsely.

From the studies carried out in the field, we concluded that soils found in the immediate vicinity of the Aranca and Galaţca valleys are generally represented by alluviosols (Muresului meadow and the Aranca Canal), gleisols (scattered in the plain area), chernozems, vertosols and zonal soils. These soils present a series of limitations, either due to the shallow presence of groundwater, which is met in gleisols and solonets, or clay texture (in vertosols).

BIBLIOGRAPHY

ANIȘOARA BĂRBĂLAN, LAURA UNIPAN, BOLDEA M., ANTOANELA COZMA, MIHAI D., 1999, Studiul regimului eolian în Câmpia Timişului [The Study of the Wind Regime in the Timişului Plain], Lucrări ştiinţifice, seria XXXII, vol. II, Editura Agroprint, Timişoara, 285-290.

BORLAN Z., HERA CR., 1973, Metode de apreciere a stării de fertilitate a solului în vederea folosirii raţionale a îngrăşămintelor [Methods to Appreciate the Soil Fertility State for the Rational Use of Fertilizers], Editura Ceres, Bucureşti.

CANARACHE A., 1997, Însuşirile fizice ale solurilor agricole din Banat [Physical Characteristics of Agricultural Soils in Banat], Lucrări ştiinţifice SNRSS Timişoara.

V. CIOLAC, E. NISTOR, C. POPESCU, N. BĂBUCĂ, A DIRLEA, L. BÂRLIBA, 2013 - Study of flora and birds habitat in the Danube Delta : GIS approach. International Multidisciplinary 13th Scientific GeoConference SGEM 2013, 16-22 june, ALBENA-BULGARIA, Conference Proceedings, Vol.I., 935-942, ISSN 1314-2704, ISBN 978-954-91818-9-0, 2013.

OCTAVIUS COLȚAN, VALERIA CIOLAC, ELENA PEȚ, IOAN PEȚ, ELEONORA NISTOR, 2014 - Aspect of using modern techniques for achieving network support. International Multidisciplinary Scientific Geo Conference SGEM; pag. 491-495; Vol. III; ISSN 1314-2704; ISBN 978-619-7105-12-4.

G. CĂBĂROIU, L. NIȚĂ, 2013 - Land quality classes and natural landscape of the mining area Valea Mănăstirii 2, Gorj county, The 9th International Symposium "Young People and Agriculture Research" Timisoara, 29 November 2013 Research Journal of Agricultural vol. 45(4), www.rjas.ro/

GOIAN M., IANOŞ GH., RUSU I., 1993, Cercetări asupra evoluţiei solurilor din Câmpia de Vest [Research on the Soil Evolution in the Western Plain], Lucr. Șt. USAMVB Timişoara, vol.XXVII, partea I.

IANOŞ GH., GOIAN M., 1992, Influenţa sistemelor de agricultură asupra calităţii solurilor din Banat [The Influence of Agricultural Systems on the Quality of Soils in Banat]. Probleme de agrofit. teor. şi aplic., vol. 14, nr. 3-4, ICCPT Fundulea.

MIHUȚ CASIANA, RADULOV ISIDORA, 2012, Științele Solului [Soil Science]. Ed. Eurobit, Timișoara.

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

L. NIȚĂ, K. LAȚO, SIMONA NIȚĂ, ALINA LAȚO, CASIANA MIHUȚ, ANIȘOARA DUMA COPCEA, 2012 - Quantitative and qualitative assessment of soil resources in the Aranca Plain, Research Journal of Agricultural vol. 45(1), www.rjas.ro/

OKROS ADALBERT, 2015 - Fertility status of soils in part western of Romania. Journal of Biotechnology, Volume 208, Supplement, 20 August 2015, Bucuresti Romania 3,14

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).

AURELIA PURDA, A ŢĂRĂU, D. DICU, L.NIŢĂ, 2013 - Evolution of some components of ecosystems productivity from Dumbrava, Timis County, The 9th International Symposium "Young People and Agriculture Research" Timisoara, 29 November 2013, Research Journal of Agricultural vol. 45(4), www.rjas.ro/

* * * - OSPA Timişoara, 1980-2008- Studii pedologice şi agrochimice, judeţul Timiş,. Manuscrise, arhiva OSPA Timişoara.