Scientific Papers. Series A. Agronomy, Vol. LXVIII, No. 1, 2025
ISSN 2285-5785; ISSN CD-ROM 2285-5793; ISSN Online 2285-5807; ISSN-L 2285-5785

# RESEARCH ON THE INVENTORY OF THE MAIN PHYSICAL-HYDRIC AND CHEMICAL PROPERTIES OF THE MOLLIC PSAMOSOL IN THE SOUTHERN AREA OF OLTENIA (LEFT OF THE JIU RIVER)

**Jenica CĂLINA, Aurel CĂLINA, Marius MILUȚ**

University of Craiova, Faculty of Agronomy, 19 Libertatii Street, Craiova, Dolj, Romania

Corresponding author email: aurelcalina@yahoo.com

***Abstract***

*The paper presents the main properties of the mollic psamosols from the left bank of the Jiu River, starting from the climatic conditions, the lithology of the area, hydrography, hydrology, natural vegetation. The research included the documentation, field and laboratory stages. This type of soil has somewhat better relations with water and air, is richer in the colloidal complex, in humus and nutrients, for this reason it has somewhat higher fertility compared to other sandy soils. Based on these properties and the natural conditions in the area, bonitation grades can be assigned and classes of favorability can be established for different crops. It should be taken into account that in the climatic conditions of recent years in Oltenia, in order to improve the mollic psamosols, a series of measures must be taken, including: deep loosening, enrichment in humus and clay, application of organic and chemical fertilizers, but especially the completion of the moisture deficit through irrigation.*

***Key words***: *soil profile, horizon, physical-hydric and chemical properties, psamosol.*

## INTRODUCTION

Of the total area of psamosols, the largest part is located in the western part of the Romanian Plain: Blahniței Plain, Băilești Plain and Caracalului Plain, being known as the sands of southern Oltenia. Therefore, psamosols (sands and sandy soils) occupy the largest part of southern Oltenia, starting from Ostrovul Corbului and extending to near Turnu Măgurele, over a length of 200 km and a width ranging between 3-30 km. The dune area itself occupies a strip with an average width of 10 km. The sands and sandy soils on the left side of the Jiu River appear as a strip whose width varies, and in the eastern part of the Leu-Rotunda Plain it is very sinuous.

The main task of agricultural specialists is to increase agricultural production in terms of quality and quantity. The achievement of this very important task in the current context of the food crisis depends, among other things, on the in-depth knowledge of the soil as the main means of production in agriculture (González-Moreno, 2016; Griesbach, 1998). Through pedological research, the soil profile with all its physical, hydrological and chemical properties can be known in detail. The evolution of these soil properties becomes important in the context of climate change, in the studied area, phenomena leading to desertification have been manifesting in recent years (International Organization for Standardization, 2010).

In order to know the types of soils found on the sandy area on the left bank of the Jiu River and their agro-productive potential, complex research has been carried out since 1955, starting with the Tâmburești sands. The results of research conducted at the resort over the years have made it possible to cultivate these sandy soils through modeling-leveling works, combating wind erosion, ameliorative fertilization and irrigation-drainage, as well as in the development of specific technologies for cultivating cereals, technical, fodder, medicinal and vegetable plants, fruit trees and vines.

The concept of sustainable agriculture, which is discussed in all countries with significant agricultural potential, requires an appropriate technology that takes into account the protection of natural resources, the maintenance or increase of the productive capacity of sandy soils, the use of constantly improved technologies, the saving of material and energy resources, the obtaining of high qualitative and quantitative productions.

Pedological studies on sandy lands appear as an objective necessity in order to specify the methods of their rational exploitation, taking into account the fact that their properties are modified by agricultural use, which makes it necessary to be constantly up to date with the situation regarding the properties and productive capacity of these lands (Blaga, 1994; Mihalache, 2014). The work aims to make a modest contribution to the knowledge of the agro-pedological properties of the sandy soils on the left bank of the Jiu River, the Craiova-Dăbuleni area, and to provide agricultural workers with data that will contribute to the intensive and rational exploitation of these lands.

## MATERIALS AND METHODS

The research was carried out in the field and in the laboratory where the following aspects were sought to be pursued (Călina, 2000; 2017):

1 - knowledge of the natural conditions for the formation of psamosols on the left bank of the Jiu River, Craiova-Dăbuleni area. This aspect required an in-depth study from a geomorphological, lithological, hydrographic, hydrological, climate and vegetation point of view of the studied area;

2 - identification and study of the main psamosols on the left bank of the Jiu River, Craiova-Dăbuleni area. The documentation was done in the field by executing and studying soil profiles at points covering the entire studied area and documentation at the specialized institution OSPA Craiova;

3 - determination of the main physical, hydrophysical and chemical properties of the psamosols on the left bank of the Jiu River, Craiova-Dăbuleni area. Samples were taken from the profiles made in the field and analyzed in the laboratory;

4 - establishing the suitability of psamosols for different crops and uses.

The soil profiles were deepened to approximately 150-200 cm. Each profile was characterized, establishing the following properties (Florea, 1987; 2003; Mihalache, 2006; 2009; Călina, 2023; Beek, 2000):

- the color of the horizons is determined using the Munsell Soil Color Charts, for wet and dry soil samples;
- the granulometric composition was determined by treating the soil with sodium pyrophosphate solution and separating the granulometric fractions by the wet sieving method (coarse sand), the siphoning method (fine sand) and the pipetting method, using the Kubiena mechanical pipette (dust and clay);
- the texture classes were established using the texture triangle;
- the density (D, g/cm$^3$), was determined by the pycnometer method, using the pump to remove air from the soil samples;
- the bulk density (BD, g/cm$^3$) was determined by the metal cylinder method, with a volume of approximately 100 cm$^3$ for soil samples collected in natural settings;
- total porosity (TP, %), was calculated with the relationship: TP, % = (1 – BD/D)/100;
- the maximum hygroscopicity coefficient (HC, %) was determined according to the Mitscherlich method, using a 12% sulfuric acid solution;
- the wilting coefficient (WC, %) was determined by calculation based on the maximum hygroscopicity coefficient, using the relationship: WC, % = HC x 1.5;
- the moisture equivalent (ME, %) was determined by centrifuging the wet soil sample at a centrifugal force of 1000 times the gravitational acceleration;
- the usable water capacity (UWC, %) was determined by calculation based on the moisture equivalent and the wilting coefficient, using the relationship: UWC, % = ME – WC;
- humus (%) was calculated by the Walkley-Black method, treating soil samples with concentrated sulfuric acid and potassium dichromate;
- total nitrogen (Nt, %) was determined using the Kyeldhal method;
- mobile phosphorus (P, mg/100 g soil) was determined by the Egner-Riehm-Domingo method, using a photocolorimeter;
- mobile potassium (K, mg/100 g soil) was determined by the Egner-Riehm-Domingo method, using a flame photocolorimeter;
- soil reaction (pH value) was determined by the potentiometric method, in 1/2.5 aqueous solution;
- calcium carbonate ($CaCO_3$, %) was determined using a Scheibler calcimeter, in percentages.

## RESULTS AND DISCUSSIONS

### 1. Spread

The surface occupied by the sands and sandy soils on the left side of the Jiu has a triangular shape, with one side on the Jiu, another very sinuous one that starts from the place where the Amaradia flows into the Jiu, to the west of the Corabia locality and the third side runs parallel to the Danube in the direction of the localities of Sadova-Vădastra (Figure 1).

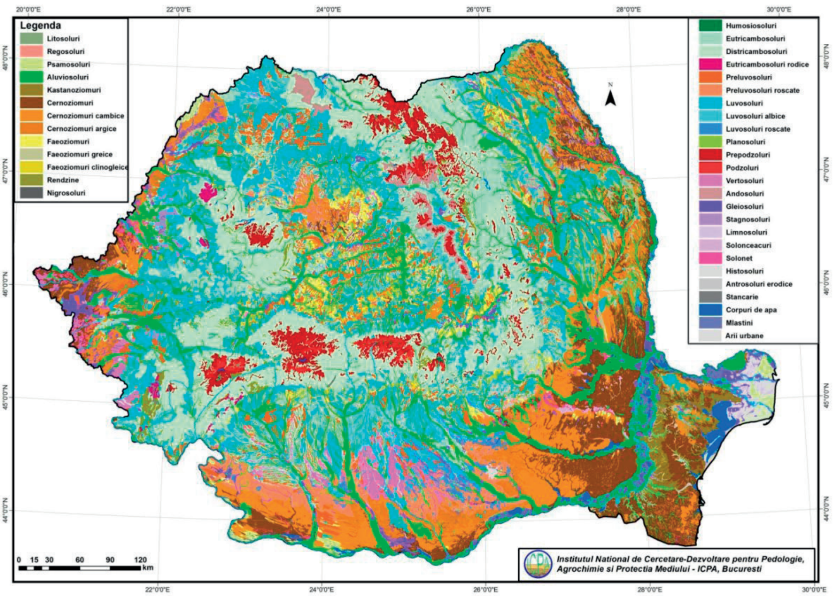

Figure 1. Soil map of Romania (according to ICPA Bucharest)

Of the total area of psamosols, approximately 80,000 ha are found between Jiu and Olt, being spread especially in the eastern plain of Oltenia, known as the "Romanați Plain" which is located south of the sinuous line Podari - Cârcea - Slatina (Canarache, 1990). The sands have a lacustrine origin and were Levantine deposits reworked by the Jiu River, which over time moved with its bed to the west. The sands were blown away by the dry winds from the southwest (Șorop, 1990).

The eastern plain of Oltenia which forms the southern part of the territory between Jiu and Olt constitutes, through its geological past, one of the important sectors of the Romanian Plain. It includes the central part "Leu - Rotunda Plain" as an extended tongue of the Getic plateau, surrounded by the terraces of Jiu to the west, of Olt to the east, and of the Danube to the south (Pop, 1971). All these terraces were formed in the first part of the Quaternary under the influence of the glacial epochs and interglacial phases that followed each other.

The terrace system on the left bank of the Jiu River is represented in the form of narrow strips arranged more or less regularly between the Jiu Plain and the Leu Field - Rotunda. The Jiu Terraces are connected to those of the Danube by a prolonged connection between the localities of Sadova and Listeava. From a lithological point of view, the terraces are made up of Quaternary deposits 10-20 meters thick, formed by loess or loessoid material deposited over layers of different thicknesses, of sand and gravel.

The sandy material on these terraces was probably brought by the waters flowing from the mountainous and hilly area, long before the Jiu River established its current bed. The action of scattering (wind shaping) of the sandy material with the formation of dunes and interdunes continues today more or less intensely on the entire sandy surface on the left side of the Jiu River. This section is favored by the relatively small and unevenly distributed precipitation during the year and by the high temperatures in

July and August, which sometimes reach over 60°C on the surface of the sands. The wind with a strong action of scattering the sands is the Austrul, which blows from the west. The Crivătul which blows from the north-east and east has a less scattering action.

The sand area between Jiu and Olt is presented as a set of longitudinal dunes, fixed or semi-mobile, oriented in the west-east direction, with heights of up to 8-12 m. The interdunes have very variable widths and can reach up to 500 - 800 meters wide.

## 2. Agropedological characterization of the mollic psamosol

***Climatic conditions in the researched area***

The climate with its component elements, precipitation, temperature, humidity, wind, is an active factor in soil formation, exerting both direct and indirect action. Direct action is manifested through the influence of the process of destruction of existing rocks, through physical degradation and chemical alteration, especially through climatic factors.

The southern area of Oltenia is characterized by a temperate-continental climate (C.f.a.x according to Koppen). The Mediterranean climate, which penetrates through the Danube gorge, has a strong influence on the southwestern part of the Romanian Plain, determining high average temperatures in the area, with milder winters and warmer summers. Thus, the multiannual average temperatures oscillate between 10.5-11.5°C, with higher values in the summer months (22-23°C) and lower values in the winter months, below 0°C (Table 1). It should be noted that in sandy areas, at the soil surface, the maximum temperatures increase significantly, reaching values of up to 50-60°C.

The physiological processes of plant organisms (respiration, photosynthesis, water and mineral circulation) are influenced at the same time by both air temperature and soil temperature. Temperature plays an overwhelming role on the development rate of different phases of plant vegetation. The multiannual average air temperature is 10.9°C in Craiova and 11.3°C in Bechet (Table 2).

Table 1. Multiannual and monthly average temperatures recorded at Craiova station

| Period | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1955-2023 | -2.6 | 0.2 | 5.4 | 11.6 | 17.0 | 20.3 | 23.0 | 21.9 | 17.3 | 11.5 | 5.4 | 0.4 | 10.9 |

Table 2. Multiannual and monthly average temperatures recorded at Bechet station

| Period | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1955-2023 | -2.9 | 0.6 | 5.6 | 12.2 | 17.8 | 21.0 | 23.1 | 22.3 | 17.8 | 11.6 | 6.3 | 0.7 | 11.3 |

Precipitation is a basic factor that ensures the accumulation of water reserves in the soil and a source of water supply for plants. The multiannual average is 545.4 mm at the Craiova meteorological station and 519.0 mm at the Bechet meteorological station. Calculating the moisture deficit and surplus for the localities of Craiova and Bechet, depending on the required precipitation, it resulted that in the months of July, August, September and October there is a moisture deficit ranging between 6.0 mm (July) and 20.1 mm (September), and the surplus is between 1.4 mm in April and 26.9 mm in December in Craiova.

The most frequent and strongest winds encountered in the Jiu meadow are those blowing from the west, the Austrul and from the east the Crivăţul. The Austrul is a dry wind that blows from the west and brings drought in summer and autumn. The Crivățul blows from the east and northeast, bringing snow and cold waves in winter, and rain in spring, sometimes dryness. Both winds, in spring when the land is not covered by vegetation, contribute to the scattering of sandy material from the dunes, forming real sandstorms.

Analyzing the climatic elements in the studied area as a whole, it can be seen that they fit into the general characteristics of the southern part of Oltenia, also preserving the microclimate aspect of the plain area. The regime of high temperatures and low precipitation combined with winds that blow frequently in this area throughout the year, especially in spring, summer and autumn, requires taking special measures in order to ensure optimal conditions for plant development.

***General data on the lithology of the sandy area***

The surface lithology is represented by the aeolian reworked sandy and sandy-loamy deposits on the terraces (Anastasiu, 1998). Also on the terraces are areas whose lithology is represented by loess and loessoidal deposits with a clay-loamy-sandy texture. The Jiu terraces, lithologically, are made up of Quaternary deposits 10-20 m thick, formed by loess or loessoidal materials, deposited over layers of sand and gravel of different thicknesses.

The psamosols on the left side of the Jiu River were formed on sand and sandy materials brought by the Jiu River, deposited in the meadow and reworked by the winds. The quartz-sandy material is resistant to alteration processes, frequently occurring in the form of grains and shiny flakes. The intensity of alteration depends, in addition to the mineralogical composition, on the degree of humidity (Coteţ, 1973; Dragoş, 1982; Florea, 2005). Thus, on dunes, the humidity being low, the alteration is barely noticeable, therefore the percentage of fine materials is low (below 5%). In interdunes, the humidity being higher, the alteration is more intense, and the percentage of fine material increases to 10-15%.

In general, the sandy parent material contains a percentage of 80-90% coarse material (sand) and a percentage of 10-20% fine material (dust and clay).

***Hydrography***

In the sandy area, the hydrographic network is extremely poor, and the groundwater is relatively deep. The sandy area on the left side of the Jiu River has practically no running water. The Jiu River, which receives a whole series of tributaries from the mountainous, sub-Carpathian and hilly areas, no longer has any tributary on the entire Craiova - Danube route.

The normal connection of the sands with the Jiu Meadow is interrupted by the sudden height of the terrace, which in the central part of the sands reaches over 50 meters above the Jiu River (Maxim, 1971). In the interval between Jiu and Olt, over 70 km long, the Danube does not receive any tributary from this sandy area. Within the mentioned area, however, there are some lakes formed from the water of coastal springs, such as the one from Bratovoieşti - Prunet. A series of such springs were captured in the Giorocului Valley and constitute one of the sources of water supply for the city of Craiova.

The lack of a hydrographic network determines low values of relative air humidity in the dry season.

***Hydrology***

As for groundwater, its depth shows seasonal fluctuations depending on the rainfall, the terrain orography and the distance from the Danube. The groundwater level increases in winter and spring, due to higher rainfall and lower evapotranspiration, and decreases in summer and autumn, due to lower rainfall, intense evapotranspiration, high water consumption by plants, etc.

By monitoring the groundwater level at a number of 26 wells located between Georoc and Dăbuleni, it was concluded that the average water level varies between 5-13 meters, and at most of them (16 wells) the groundwater level is below 10 meters deep (Maxim, 1971). The groundwater level is different in the interdunes compared to the dunes.

So, in the Northern half of the researched area the groundwater depth is 5-10 m in the interdunes and 10-20 m on the dunes, and in the southern half the groundwater depth is approximately 2-3 m in the wide interdunes and 0.5-1.5 m in low areas on the terraces, and on the dunes we have 7-8 m.

***Natural vegetation***

It has a restricted area, due to the expansion of agricultural crops. It is also found in natural forest patches, not cleared, in the vegetation of ponds in this area, of natural meadows, in protective curtains and especially in the form of weeds in agricultural crops. Natural herbaceous vegetation is represented by various xerophytic species, characteristic of dry areas that have a weak development, especially on dune tops. As natural plants with a greater spread we mention the following: *Digitaria sanguinalis, Bromus tectorum, Cynodon dactylon, Trifolium arvense, Agropyrum repens, Vicia vilosa, Tragus racemosus, Trifolium campestre*.

Among the weeds found in agricultural crops with higher frequency are: *Delphinium consolida, Convolvulus arvensis, Cirsium arvensis, Portulaca oleracea, Aristolochia* *clematis, Setaria viridis, Sorghum halepense, Lepidium draba, Chenopodium album, Tribulus terrestris, Sambucus ebulus, Xanthium strumarium, Anthemis ruthenica, Euphorbia virgata, Ranunculus arvensis, Solanum nigrum*.

Natural forests appear sporadically in this sandy area and are made up of acacia (*Robinia pseudacacia*) like those at Tâmbureşti, Mârşani, Malu Mare, Daneţi, or pedunculate oak (*Quarcus peduncullata*) and acacia like the forest at Ocolna. Among the shrubs, the following species appear: *Rosa canina* (rosehip), *Crataegus monogyna* (hawthorn), *Morus alba* (mulberry), *Pirus piraster* (forest pear), *Ligustrun vulgare* (dogwood).

***Morphological description***

Mollic psamosols are found in the interdunes and in the lower part of the dune slopes, where the humidity is higher. The more favorable humidity regime makes the vegetation develop better and leaves a greater amount of organic residues on the surface and inside the soil.

The presence of humidity over a longer period of time and in a greater amount determines more intense alteration and humification processes, therefore these soils are richer in humus and fine material (dust and clay). Mollic psamosols have a deeper profile, darker color, and the horizons are better differentiated from each other.

To characterize this soil, the morphological description and analytical data of a profile located in Dăbuleni are presented. The soil has an Am-AC-C type profile (Figure 2):

- Horizon Am: 0-55 cm thick, dark brown (10 YR 3/3) when wet and grayish brown (10 YR 5/3) when dry; sandy-loamy texture; glomerular structure, very friable; porous; loose; frequent filiform roots; gradual transition.
- Horizon AC: 55-87 cm thick; dark yellowish brown (10 YR 3.1/4) when wet, light yellowish brown (10 YR 4.5/4) when dry; sandy-loamy texture, unstructured, porous; medium compacted, rare filiform sprouts; gradual transition.
- Horizon C: under 87 cm thick: light yellowish brown color (10 YR 6/3) when wet and light yellow color (10 YR 7/3) when dry; sandy texture; unstructured; porous; medium compact; moist.


Figure 2. Soil profile

***Physical-mechanical properties of soft psamosols***

Interpreting the laboratory results (Table 3) it is found that the soil has a very high coarse sand content of 69.4% in the C horizon and varies along the profile, reaching 66.1% in the Am horizon. The fine sand content is lower and varies along the profile from 15.4% in the first horizon to 18.3% in the C horizon. The dust content decreases from 9.3% in the Am horizon to 5.8% in the C horizon. The clay content is also low, ranging between 9.2% in the Am horizon and 6.5% in the C horizon. Depending on the determined granulometric fractions, the soil texture is sandy-loamy throughout the soil profile.

The bulk density shows values that increase with depth, from 1.37 g/cm$^3$ in the first horizon reaching 1.50 g/cm$^3$ in the C horizon.

The density increases from 2.61 at the soil surface to 2.65 g/cm$^3$ in depth, this is due to the fact that at the soil surface the amount of organic material is higher. These values determine a lower porosity, varying on the profile from 48% at the soil surface to 44% in depth, which shows that the soil is strongly compacted.

Table 3. Physical-mechanical properties of mollic psamosols

| Horizon | Depth (cm) | Granulometric composition, % | | | | Textural class | BD | D | TP, % |
|---|---|---|---|---|---|---|---|---|---|
| | | Coarse sand (2-0.2 mm) | Fine sand (0.2-0.02 mm) | Dust (0.02-0.002 mm) | Clay (<0.002 mm) | | g/cm$^3$ | | |
| **Am** | 0-55 | 66.1 | 15.4 | 9.3 | 9.2 | NL | 1.37 | 2.61 | 48 |
| **AC** | 55-87 | 67.2 | 16 | 8.1 | 8.7 | NL | 1.46 | 2.63 | 45 |
| **C** | 87+ | 69.4 | 18.3 | 5.8 | 6.5 | NL | 1.50 | 2.65 | 44 |

BD - Bulk density; D - Soil density

***Hydrophysical properties of mollic psamosols***

The hydrophysical indices (Table 4) show low values, which correlate very well with the humus and clay content. The hygroscopicity coefficient (HC) has high values in the first two horizons (1.8%) and very low values in the C horizon of only 0.7%.

Table 4. Hydrophysical properties of mollic psamosols

| Horizon | Depth, cm | HC, % | WC, % | ME, % | UWC, % |
|---|---|---|---|---|---|
| **Am** | 0-55 | 1.8 | 2.8 | 6.2 | 3.4 |
| **AC** | 55-87 | 1.7 | 2.6 | 5.4 | 2.8 |
| **C** | 87+ | 0.7 | 1.9 | 4.8 | 2.9 |

HC - Coefficient of hygroscopicity; WC - Wilting coefficient; ME - Moisture equivalent; UWC - useful water capacity

The wilting coefficient (WC) being calculated indirectly according to the hydroscopicity coefficient, presents the same variation on the profile from 2.8% in the Am horizon, up to 1.9% in the C horizon. The moisture equivalent (ME) determined in the laboratory by the configuration method, shows us that it decreases from 6.2% in the first horizon to only 4.8% in the last horizon.

The useful water capacity (UWC) has values ranging between 3.4% in the Am horizon and 2.9% in the C horizon.

***Chemical properties of mollic psamosols***

The data obtained from laboratory analyses (Table 5) indicate a much lower organic matter content in depth (0.34%) than at the surface (1.60%).

Table 5. Chemical properties of mollic psamosols

| Horizon | Depth, cm | Humus, % | Nt, % | $P_2O_5$ | $K_2O$ | pH ($H_2O$) | HEC | SBs | CEC | BS, % |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | me/100 g soil | | | me/100 g soil | | | |
| **Am** | 0-55 | 1.60 | 0.070 | 7.1 | 11.1 | 6.2 | 1.0 | 8.3 | 9.3 | 89 |
| **AC** | 55-87 | 0.85 | 0.039 | 5.4 | 6.3 | 6.7 | 0.6 | 6.7 | 7.3 | 91 |
| **C** | 87+ | 0.34 | 0.028 | 3.2 | 4.5 | 6.9 | 0.5 | 5.2 | 5.7 | 91 |

HEC - hydrogen exchange capacity; SBs-Sum of bases; CEC-Cation exchange capacity; BS- Percentage of base saturation

The total nitrogen content (Nt) is low, oscillating along the profile from 0.070% in the first horizon to 0.028% in the C horizon. The mobile phosphorus content ($P_2O_5$) decreases from 7.1 in the Am horizon to 3.2 me/100 g soil. The potassium content is higher compared to phosphorus, namely in the first horizon, registering 11.1 me/100 g soil.

The pH value being 6.2 at the surface and 6.9 in depth shows that the soil reaction is weakly acidic. The sum of cations retained by the colloidal complex is low. The cation exchange capacity has values between 9.3 and 5.7 me/100 g soil. The percentage of base saturation (BS) is between 89 and 91%.

## CONCLUSIONS

The sandy area on the left bank of the Jiu covers an area of approximately 80 thousand hectares and extends from Craiova to the Danube meadow. In the western part, the sandy area is delimited by the Jiu meadow and in the eastern part it is delimited by the Leu-Rotunda high field.

The sands on the left bank of the Jiu were formed by the erosion action of the waters of the Jiu River in the high area (mountainous and hilly) and the deposition of eroded materials in the meadow after which these deposits were rearranged by winds on the left bank.

The mollic psamosols are found in the interdunes where the humidity regime is better for plant cultivation and fruiting. They are better supplied with humus and nutrients and have a medium to low productive capacity. They have an Am-AC-C type profile, sandy-loamy texture and weakly acidic reaction.

Recommendations for agricultural practice:

- Psamosols are generally poor soils, so in order to be successfully cultivated, it is recommended to apply an agricultural technology specific to these soils.

- To complete the moisture deficit, it is recommended to apply irrigation. Since they retain little water, watering rates must be lower, applied at shorter intervals. In this way, water loss through infiltration is avoided and plants can benefit from a greater amount of moisture.
- Being poorly supplied with humus and nutrients, psamosols require permanent organic and mineral fertilization. Organic fertilizer is recommended to be buried at a depth of 20-40 cm to create a protective layer at this depth against the loss of water and nutrients in depth. It is also recommended to apply mineral fertilizers in more batches and at shorter intervals, to avoid their loss through leaching.

Sands and sandy soils, being non-cohesive soils, are permanently subject to the process of wind deflation. To reduce scattering, protective curtains, wetting irrigation, parasands, protective screens, etc. are used. Psamosols are soils with a coarse texture, do not retain water, are strongly aerated, poor in colloidal complex, therefore they require a specific cultivation technology for these soils.

In conclusion, mollic psamosol has somewhat better relations with water and air, is richer in colloidal complex, in humus and nutrients, for this reason it has somewhat higher fertility compared to other sandy soils. To improve mollic psamosols, a series of measures must be taken, including: deep loosening, enrichment in humus and clay, application of organic and chemical fertilizers, replenishment of moisture deficit through irrigation.

## REFERENCES


Anastasiu, N. (1998). *Sedimentology and sedimentary petrology*. University of Bucharest Publishing House.

Beek, B. (2000). *The Handbook of Environmental Chemistry*. Vol. 2, Part J, Bioaccumulation, Berlin Heidelberg, Springer-Verlag Publishing House, 3-17.

Blaga, Gh., Bunescu, V. (1994). *Land quality (and productivity) assessment*. Cluj-Napoca, RO: Agronomia Publishing House.

Canarache, A. (1990). *Physics of agricultural soils*. Bucharest, RO: Ceres Publishing House.

Călina, A., Mustață, I., Călina, J., Iagăru, R. (2000). *Brown-reddish soils between Jiu and Olt and their main agroproductive properties*. Sitech Publishing House, Craiova.

Călina, A., Călina, J., Iancu, T. (2017). Research regarding the implementation, development and impact of agritourism on Romania's rural areas between 1990 and 2015. *Environmental Engineering and Management Journal*, *16*(1), 157-168.

Călina, A., Călina, J., Croitoru, A. (2023). Research on the evolution of the morphological, physical, hydro-physical properties of chromic luvisoil from Dolj County, in the period 1995-2021. *Scientific Papers. Series A. Agronomy*, *LXVI*(2), 13-22.

Coteț, P. (1973). *Geomorphology of Romania*. Bucharest, RO: Academy Publishing House.

Dragoș, V. (1982). *General and Stratigraphic Geology*. Bucharest, RO: Didactic and Pedagogical Publishing House.

Florea, N., Ilie, L., Răducu, D. (2005). *Soil morphology and genesis*. Bucharest.

Florea, N. și colab. (1987). *Methodology for the development of agrochemical and pedological mapping studies and the systematization of pedological data*. Bucharest.

Florea, N., Munteanu, I. (2003). *The Romanian System of Soil Taxonomy*. Estfalia Publishing House, Bucharest.

González-Moreno, A., Díaz-García, C., Saez-Martinez, F. J. (2016). Environmental responsibility among SMEs in the Hospitality Industry: performance implications. *Environmental Engineering Management Journal*, *15*(7), 1527-1532.

Griesbach, J. C., Sanders, D. (1998). Soil and Water Conservation Strategies at Regional, Sub-regional and National Levels. *Advances in GeoEcology*, 31.

Maxim, I. (1971). *Pedologie*. Reprographics of the University of Craiova

Mihalache, M. (2006). *Pedology: genesis, properties and taxonomy of soils*. Bucharest, RO: Ceres Publishing House.

Mihalache, M., Ilie, L. (2009). *Bonitarea terenurilor agricole*. Bucharest, RO: Publishing House Domino.

Mihalache, M., Ilie, L., & Madjar, R. (2014). Translocation of heavy metals from sewage sludge amended soil to plant. *Rev. Roum. Chim*, *59*(2), 81-89.

Pop, I. E. (1971). *General geology*. Bucharest, RO: Didactic and Pedagogical Publishing House.

Șorop, Gr. (1990). *Pedology*. Reprography University of Craiova.

***International Organization for Standardization, ISO 11464/2010, Soil Quality - Pretreatment of samples for physico-chemical analysis. Geneva, Switzerland.

***https://icpa.ro/harti-sol/.