CHEMICAL CHARACTERIZATION OF SOME AGRICULTURAL LAND OF THE ARGES COUNTY SUB-CARPATHIAN AREA

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Abstract

The High Plain of Pitesti in the south of Arges county is an excellent location for food production. However, Arges county is experiencing a significant decrease in productivity due to the acidity of its soil. This acidity is related to the behavior of certain soil properties essential for plant growth. The present work aims to study the pH behavior according to certain chemical parameters such as: exchangeable aluminum. To achieve this goal, forty-four soil samples were taken in the Costesti locality and sent to the soil laboratory where physical-chemical analyzes were performed. High concentrations of Al3+ in the nutrient solution cause harmful effects on the roots, which undergo morphological changes, turn black, reduce their growth in length and thickness, and fundamental changes in the capacity to absorb and retain cations occur. Thus, Al3+ ions cause a desorption of Ca2+, K + and Mg2+ ions and other species of cations from the pectocellubasic layer of root hairs, worsening nutrition, the absorption of these cations decreasing and increasing that of Al3+. It also reduces phosphorus nutrition, which precipitates as aluminum phosphates on the root surface. The risks of aluminum toxicity should not be overlooked. The rate of ammonia fertilizer use in the study area should be reduced, especially in soils with a pH below 5.4. It is recommended that strong bases input be used in these slightly acidic or acidic soils.

***Key words**: **exchangeable aluminum, soil analysis, slightly acidic soils**.*

INTRODUCTION

The Argeș Plarform territory covers the NUTS 3 region (county) with the same name, located in the southern part of Romania. This territory is characterised by various relief units, from plain in the south of the county (160 m altitude), going through a hilly area (the median part of the county), to reach a mountain area (highest altitude 2544 m, Moldoveanu Peak) in the northern part (see Map1). Even though the economy of Argeș County is well-developed and diversified, with industry playing an important role, the county's rural economy mainly depends on one branch – agriculture (ADR, 2020). In Argeș County, the favourable natural conditions create development possibilities for all agricultural sub-sectors. The potential of agriculture is unlocked by large plain areas with fertile soils in its southern part, by natural pastures and hayfields in the plateau area and Subcarpathian hills favourable (for the development of fruit and wine growing), and by mountain pastures favourable to livestock raising in the north. The existence of a large number of small-sized farms in parallel with the few large farms reveals a structural imbalance that influences agriculture and its competitiveness (ADR, 22013). Aluminum is an important element in the case of soil analyses, the high concentration determining the acidity of the soil and the decrease of its

productivity. Although there are no mountain areas in our country where aluminum can be found in large quantities, through the analyzes carried out in the laboratory of the institute, we found in the area of Arges County in the High Plains of Pitestilor, by analyzing two areas close to Costesti, a small amount of aluminum in ground.

The soils with small amounts of aluminum described in this paper are from the High Plain of Pitestilor in an area with great agricultural potential which, monitored through analyzes and making calcium amendments, can reach a maximum productivity potential. Comparing the results with the general ones from Table 1, the amount of exchangeable aluminum found is at a maximum of 1.09, so it is in the area of 0.9-2.0, that is, a small amount of aluminum. The quantity of aluminum being in small limits, amendments can be made with calcium so that in a short period of time the agricultural productivity of the area increases rapidly. A better advising of farmers on the benefits of cooperation in agriculture, alongside with examples of good practice, could boost adherence to the cooperative movement.

Map 1. Location of Argeș county in Romania

MATERIALS AND METHODS

Determination of exchangeable acidity extractable in solutions of neutral salts, not buffered from soils (exchangeable aluminum) after A.V. Sokolov. The described procedure is applicable to soil samples from group A, soils unsaturated in basic cations, which contain exchange acidity and which have a pH (in aqueous suspension) lower than 5.8 (STAS 7184/12-88, Annex A4). The extractable acidity in solutions of neutral, unbuffered salts (As) is the acidity due to exchangeable H^+ ions from strong acids and acidoids and H^+ ions resulting from the hydrolysis of exchangeable Al^{3+} ions (STAS 7184/12-88, point 1.1.6)

From the soil profiles described above, disturbed soil samples were taken from various parts of the soil horizons to collect average horizon samples in order to determine particle-size distribution and some chemical analyses (pH-in 1:2.5 water suspension using SR 7184-13:2001 PTL04 method, mobile forms of phosphorous (PAL) and potassium (KAL) as plant available extracted in ammonium acetatelactate using STAS 7184/19-82 PTL19 and STAS 7184/18-80 PTL 22 methods), respectively, and othercurrent analyses described by Florea et al., (1987). Methods for unsaturated soils in basic cations, which also contain exchange acidity (STAS 7184/12-88, PTL-15) and unsaturated soils in basic cations that also contain exchange acidity (STAS 7184/12-88, PTL13).

The experiments carried out in 2020 aimed at knowing the chemical particularities of the soils.

RESULTS AND DISCUSSIONS

The total alumimium content in soil

Aluminium is an element commonly occurring in nature, the third most abundant in the earth's crust after oxygen and silicon. It forms

numerous mineral and organic complexes, characterized by different degrees of hydration. In soil, aluminum is mainly found in the mineral form as aluminosilicates and aluminum oxides and this aluminium is in stable inactive form. In addition, Al can be found as precipitates or in very minute quantities appear in soluble forms such as conjugated organic and inorganic, and molecular ions (Al^{3+}, $AlOH^{2+}$, $Al(OH)^{2+}$ and $Al(OH)^{4-}$).

Aqueous Al also forms inorganic complexes with F^- and $SO4^{2-}$, the formation of which also varies with pH, the concentration of the inorganic ligands, ionic strength and temperature. It's easy transition from solid to liquid phase and high solubility in acid environment are decisive factors for its important function in the environment. The total alumium content in soil showed insignificant variations in the plants grown on irrigated land. First, after analyzing the pH, it can be taken into account if the pH is lower than 5.8 to analyze the amount of aluminum in the soil samples. The results can be seen in figures 1 and 2. After the analyzes carried out in the laboratory, it was observed that the exchangeable aluminum values vary from 0.05 to 1.09 for all forty-four samples in which exchangeable aluminum content appeared. So the quantities of exchangeable aluminum fall under the low aluminum content in the soil. As can be seen in the two figures, the pH values vary from a minimum of 4.80 to a maximum of 5.42.

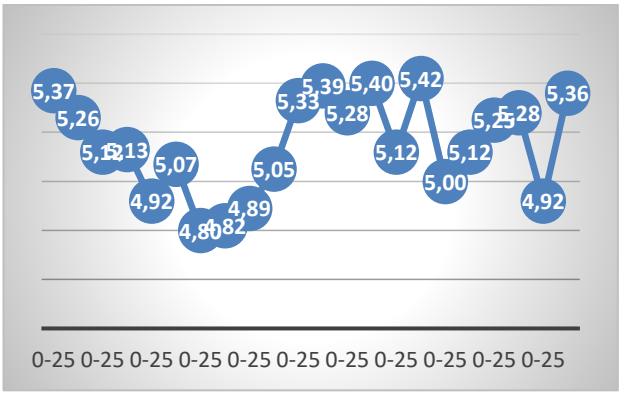

Figure 1. The pH values in the first sampling

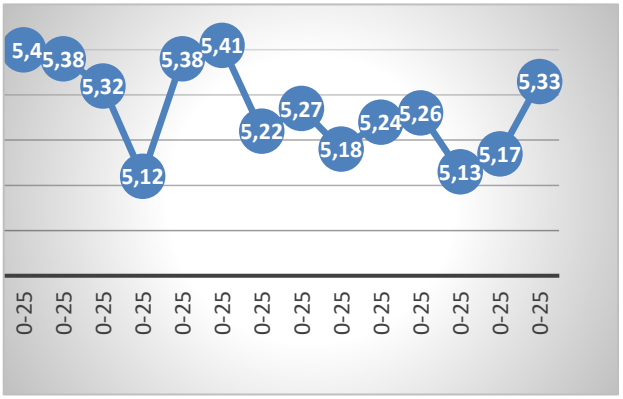

Figure 2. The pH values in the second sampling

Table 1. ***Changeable Al content classes (from Florea et al. (ed.) 1987)***

Al value 3+ changeable, me/100g	*Appreciation of content*
≤ 0,3	*extremely small*
0,4-0,8	*very small*
0,9-2,0	*little*
2,1-4,0	*middle*
4,1-6,5	*big*
6,6-10,0	*very big*
≥ 10,1	*extremely big*

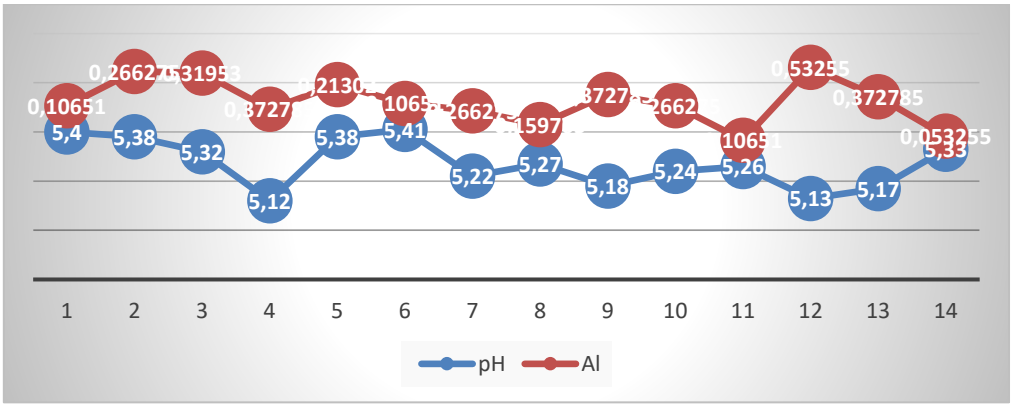

Figure 3. Changeable Al content in Costesti second sampling (me/100g)

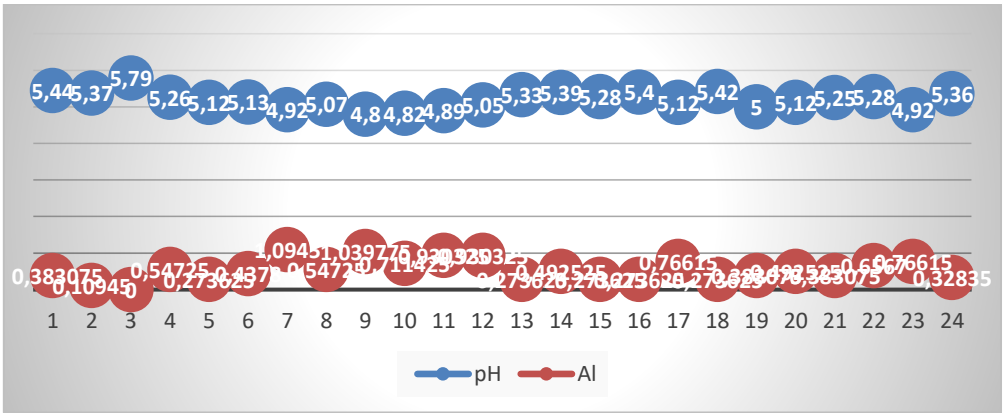

Figure 4. Changeable Al content in Costesti first samplig (me/100g)

CONCLUSIONS.

From the results of the laboratory analyzes made for the soil in the Costesti area, the need to correct calcium deficiencies in the soil and to correct the acidity of the soil can be observed. Farmers in the area must use fertilizers according to a clear plan so that productive areas of the country do not become agriculturally inactive due to changes in properties over time. Soils become acidic due to the excessive use of fertilizers and other chemical solutions that have the effect of lowering the PH. However the release of the Aluminium from soil due to soil acidity or salinity can affect the content ofmobile Aluminium in ground water and this can cause health problems to humans, plants and animals.

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