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Original Article

Research Concerning the Effect of a Fertilization System on the Content of Potassium (K) in a Representative Soil in the Transylvanian Plain

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Abstract

The current research is based on the results obtained on soil analysis in long term experiments conducted on an argic chernozem soil at SCA Turda (representative for the Transylvanian Plain). The goal of this research is to agrochemically substantiate the differentiated fertilization systems involved in the evolution of nutritional elements in the soil, in the reference area, due to the application of complex fertilizers. In this study it was tracked the effect of the nitrogen and phosphorous application on the quantity of potassium in the soil. The research presents the stated results as annual (partial) values and it will continue with them as being reference values for further experimental years (as stages in long term experiments). The already existing and further research will enrich the study's utility in taking a rational fertilization decision based in the future also on the support of the suggested solutions. The presented data hold originality, according to which the suggested solutions through fertilization models become important and present a real efficiency in the fertilization practice and technologies applied to crops on this type of soil.

Keywords: potassium, nitrogen-phosphorus interaction, experimantal years, fertilization systems**.**

1. Introduction

In agriculture, the optimization of the soil-plant system includes a series of measures and factors that harnesses in a productive way the soil's capacity to produce biomass in great quantities and at qualitative parameters that are relevant for the consumers. In this context, an important scientific and practical role is played by the agrochemical optimization alternatives that harmonize the fertilizing components of the soil with the demands of the vegetal species that can exploit better the production capacity of the soil and genotypes cultivated in order to obtain high vegetal productions that are consumable in large quantities, having superior quality indices, in terms of maintaining an equilibrium in the environment and determining food safety and security [6].

The stationary mineral fertilizations, in a long term regime (more than 45 years) determine essential modifications of the relevant indicators of soil's fertility, which are fraimed and hold in their quantifications significant dependencies in comparison to the initial indicators of the soil and the sum of the factors involved [1, 4, 2].

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This research represents a beginning of an important approach that will agrochemically sustain a more productive and economic use of potassium that represents an important fertilizing element in cereal crops.

In case of an argic chernozem soil in the Transylvanian Plain, the fertilizations applied during long term and stationary nitrogen-phosphorous experimets lead to essential modifications [5].

2. Material and Method

Soil from the nutrient experiences: according to soil mapping, pedological and agrochemical study and from the soil quality monitoring results, this soil fits the argic chernozem type, in the pedological class of cernisoils [1].

Fertilizer used in the experiments: complex fertilizer 20-20-0 is a solid, granulated nitrophosphate, which holds when applied, the effect of the interaction of the two elements from its composition (N·P), here in balanced concentrations and reports (1:1:0) [4]. Argic chernozem from SCA Turda is a representative type of soil for the agricultural areas in Transylvania and it holds the next pedological and agrochemical attributes (Table 1).

Table 1. Pedological and agrochemical attributes for argic chernozem from SCA Turda

Physical and chemical analysis			
Horizon	Am	Bt	Cca
Depth (cm)	40-60	60-160	160-180
pH	5.24	5.51	6.80
Humus %	2.46	1.88	0.70
N-total	0.133	0.124	0.050
P ppm	278	120	10
K ppm	420	127	68
Ca me	10.2	10.7	18.2
Mg me	1.2	0.9	0.7
Granulometric analysis			
Coarse sand 2-0.22 mm	0.2	0.2	0.1
Fine sand 0.2-0.02 mm	16.2	14.0	19.8
Dust 0.02-0.002 mm	42.0	37.8	41.9
Clay 0.002 mm	41.6	48.0	38.2

In achieving the results presented in this research, agrochemical research methods were used taking into consideration the laboratory potassium determinations through Egner-Riehm-Domingo method on soil samples harvested from long term NP experiments [3].

The analytical results are expressed in mg. K/1 kg soil (ppm).

3. Results and Discussions

Mobile potassium reserves are essentially modified in time due to the practicing, in a long term and stationary regime, of a nitrogen-phosphorous fertilization, without any potassium. The soil's potassium supply exhibits essential modifications that are tied, even statistically, to the applied doses of nitrogen fertilizers or phosphorous fertilizers (Fig. 1 and Fig. 2).

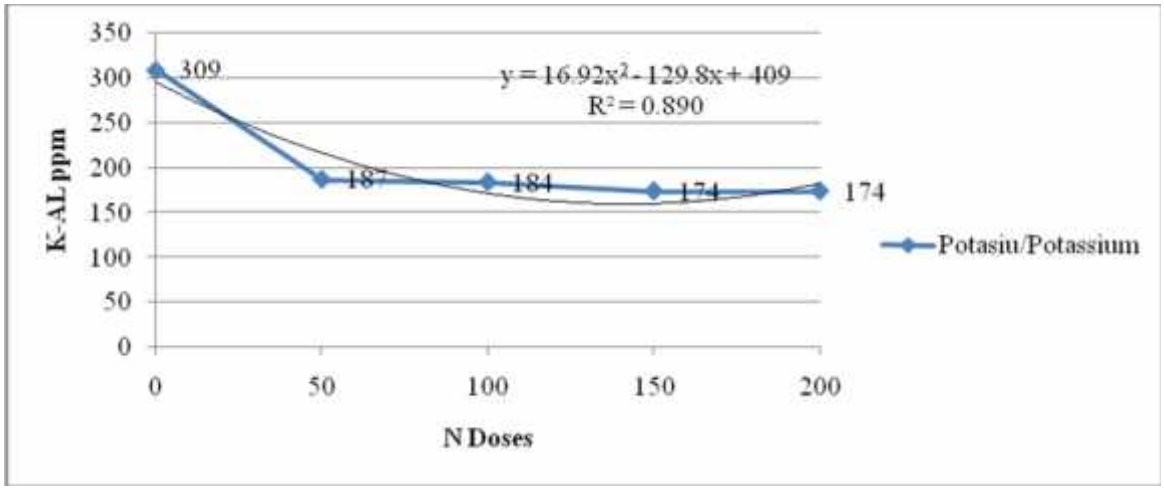

Figure 1. The change of K content in the soil under the impact of N fertilization

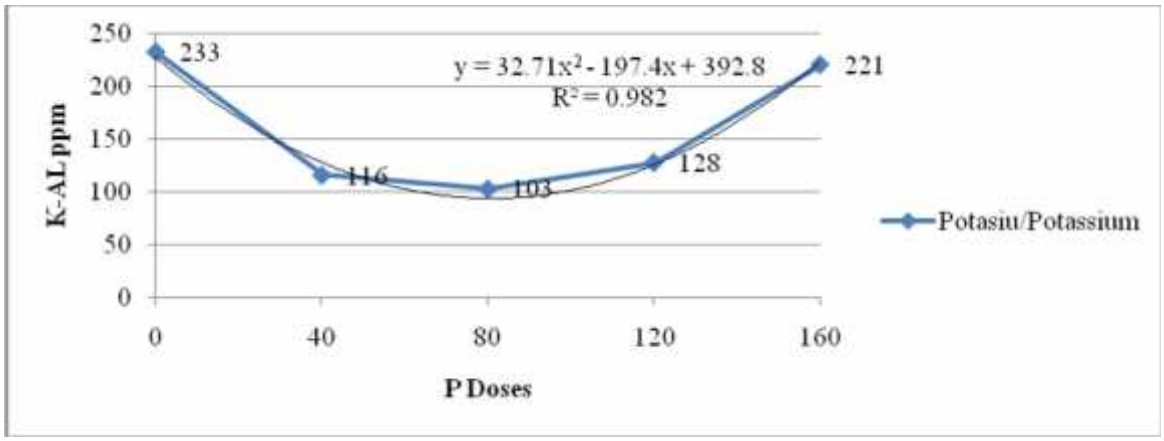

Figure 2. The change of K content in the soil under the impact of P fertilization

The two figures above exhibit the evolution of potassium under the influence of nitrogen fertilization, respectively phosphorous fertilization. In case of nitrogen fertilization, as the nitrogen doses increase (from 0 to 200) the quantity of potassium in the soil decreases (from 309 to 174). In case of phosphorous fertilization it can be noticed a different trend of the potassium in the soil related to P doses.

The potassium in the soil hold the highest values for the lowest (0 to 40) P doses and also for the highest (120, 160) P doses.

The sistematic reduction of the soil's potassium supply on account of N doses applied and also P fertilization, actually imposes periodic interventions with potassium fertilizers or NPK complex fertilizers that hold the ability to compensate the potassium losses in the soil (through crops or levigation).

The prevention of this phenomenon of potassium reserves reduction or even the accumulation through sistematic application of this element, sustains at the same time also the effect of NPK interaction or of the quality of the vegetal production.

4. Conclusions

In order to keep the potassium reserve in the soil at a high level it is necessary to apply very low doses of nitrogen or no nitrogen at all and very high doses of phosphorous or no phosphorous at all.

It ir required the highlighting of the agrochemic impact states on the soil that can be determined through the implementation of the optimum reccomende doses.

In the conext of agrochemical monitorization of soils, it is appropriate also another essential, analitical activity regarding the tracking of the evolution of potassium reserves in the soil.

During long term experimets, it is sistematically manifested during the first 20-30 years from their setup and if it is also respected the compliance of fertilizer treatments application from exclusively mineral sources, that these essential indicators (also K) of the organic matter in the soil are reduced.

It is considered that in this case, it is possible that through normal vegetal productions and through vegetal remanenet remains in and on the soil, to be maintained in time and even to correct the orgainc reserves in the soil.

References

[1] Borlan Z., Cr. Hera, D. Dornescu, P. Kurtinecz, M. Rusu, I. Buzdugan, Gh. Tănase, 1994, Fertility and Fertilization of Soils (Agrochemistry Compendium), Ceres Publishing House, Bucureşti.

[2] Davidescu V., D, Davidescu, 1999, Agrochemical Compendium, Publishing House of the Romanian Academy, Bucureşti.

[3] Hera C., Borlan Z., 1980, Guide For Developing Fertilization Plans, Ceres Publishing House, Bucureşti.

[4] Hera C., 2008, Fertilizers and Sustainable Agriculture, Proceditura of the Int. Symp. Ciec, Pretoria, South Africa.

[5] Poruţiu A.R., 2014, Phd Thesis, The Economical Optimization of the Fertilizing System for Wheat and Corn in the Transylvanian Plain, USAMV, Cluj-Napoca.

[6] Rusu M., M. Mărghitaş, I. Oroian, T. Mihăiescu, A. Dumitraş, 2005, Agrochemistry Treaty, Ceres Publishing House, Bucureşti.