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THE INFLUENCE OF KxNP FERTILIZERS IN LONG TERM FIELD EXPERIMENTS, OVER AGROCHEMICAL SOIL INDEXES IN THE PRELUVOSOIL CONDITIONS FROM ORADEA, ROMANIA

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Abstract: *Since 1968, in Romania was elaborated a long term field with fertilizers and lime in all the agricultural research stations that belong to National Agricultural Research and Development Institute of Fundulea. The experiments was set up using a unitary scheme for researching the evolution of soil fertility and the influence of fertilizers and lime rates and combinations on level and quality yield of different crops. The preluvosoil from Oradea, Romania, is a medium provide with the main nutritive elements, with a weak acid reaction in the ploughing horizon. The factors which have a negative influence on growing plants are: high level soil content in the H^+ and Al^{3+}, Fe^+ and Mn^+ and low level soil content in main nutrients, low activity of microorganisms, and stagnation of water because of unsatisfactory infiltration. In this paper are presented the results regarding the influence of potassium fertilizers applied on different NP background on main agrochemical indexes in long term field experiment set up in 1974 at Agricultural Research and Development Station Oradea. The main agrochemical indexes depend on the fertilizers' type and on the rates fertilizers level applied. The mobile potassium content of the preluvosoil has average values between 85.4 – 161.1 if K rates is applied and are increasing from 0 to 120 K_2O kg/ha in function with the NP background. The applications of potassium fertilizers on different NP backgrounds had a differentiated influence on humus level content, depending on K rates used and NP backgrounds. The mobile phosphorus content of preluvosoil has average values between 35.0 – 70.2 ppm if P rates applied are increasing from 0 to 80 P_2O_5 kg/ha in function with the NP background. Potassium application in rates of K_{40} – K_{80} determine a increasing of phosphorus mobile content with 20 – 22 ppm.*

Key words: *potassium fertilizers, mobile potassium, mobile phosphorus, humus, preluvosoil*

INTRODUCTION

In Romania acid ploughing soils are spread on 2.0 millions ha which represent 20% from total agricultural land.

High level soil content in the H^+ and Al^{3+}, Fe^+ and Mn^+ and low level soil content in main nutrients, low activity of microorganisms, and stagnation of water because of unsatisfactory infiltration are the factors which have a negative influence on growing plants. (HERA et al, 2008).

Many researches on preluvosoil (CIOBANU GH. 2006, 2007, DOMUŢA C. 2006, 2008, SAMUEL A.D. 1999, 2003, 2009a) have shown the negative effect of long-term application of nitrogen, as ammonium nitrate, on soil reaction. Soil's high acidity leads to growth of mobile aluminium and manganese soil content, which can determine phytotoxicity in the first part of vegetative period, with negative influence on yield and it's quality (CIOBANU GH. et al, 2008).

In connection with potassium fertilizers applied in long term field experiments there are a few published research data (SAMUEL A.D., 2009b).

This paper presents the results regarding the influence of potassium fertilizers applied on different NP backgrounds in long term field experiments on main agrochemical indexes.

MATERIAL AND METHOD

Experimental site

The research data was obtained at the Agricultural Research and Development Station Oradea, using a unique design in all research networks of National Agricultural Research and Development Institute Fundulea.

The investigation has been carried out beginning with the autumn of 1974 in Oradea, in a flat plain area on the third terrace of the Crisul Repede River.

Field experiment with potassium fertilizers was set up in 1974 using a crop rotation: pea – winter wheat – maize – sunflower.

The factors researched were the potassium and NP rates applied:

a. potassium rate : K_0, K_{40}, K_{80}, K_{120}

b. NP rates: N_0P_0; $N_{80}P_{40}$; $N_{80}P_{80}$; $N_{160}P_{80}$. (N was apllied like ammonium nitrate, in spring, P was aplied like superphosphate and K like KCl in autumn).

Sampling and analytical method

Soil samples from top soil (0-20cm) were collected from each experiment plot, in august 2009, after wheat harvesting.

All samples were taken to the laboratory and used for routine soil chemical analysis, pH was determined in water suspension.

RESULTS AND DISCUSSION

Data presented in Figure 1 show that in the case of all NP backgrounds application of potassium fertilizers determine decreasing of pH values. Even the main factor of pH decreasing is nitrogen application, is obvious negative effect on reaction values of potassium application. Decreasing of pH values is depending by potassium rate applied and by the level of NP background used.

In the case of N_0P_0 background the pH values are decreasing from 6.1 to 5.5 and in the case of $N_{200}P_{80}$ background the pH values are decreasing from 5.1 to 4.4.

The high rates of potassium fertilizers lead to pH values modification and this can increase the maximum yield level in the case of some crops sensitivity at soil reaction.

The application of potassium fertilizers on different NP backgrounds had a differentiate influence on humus level content depending on K rates used and NP backgrounds.

It's obviously that the highest values of soil humus content were determined in $N_{100}P_{80}$ backgrounds in the variants fertilized with K_{40} and K_{80}. In this variants were registered the highest level of yield and a high quantity of roots and remaining plants which determined the increasing of soil humus content (Figure 2).

It is noticed that in the variants fertilized with higher rates of K (K_{120}), it was registered a lower level of humus content because of the negative effect of lower Ph values on this agrochemical indexes.

The main mobile phosphorus content depends on P and N rates used, the higher level of P was determined in the case of $N_{100}P_{80}$ background. The increasing of N rates to N_{200} (in the case of N_{200} background) determined a decreasing of soil mobile phosphorus level content because of increasing of soil acidity and mobile aluminum content which immobilized a part of phosphorus fertilizers in an inaccessible forms.

In the case of $N_{100}P_{40}$ and $N_{100}P_{80}$ backgrounds it is noticed a slow positive influence of potassium fertilizers used on soil mobile phosphorus content and registered an increase of 20-22 ppm in the case of K_{40} and K_{80} rates used (Figure 3).

The higher rates of N and P fertilizers applied in absence of K application, determined the increase of mobile potassium content because of supplementary export of K^+ cations and a higher level of yields.

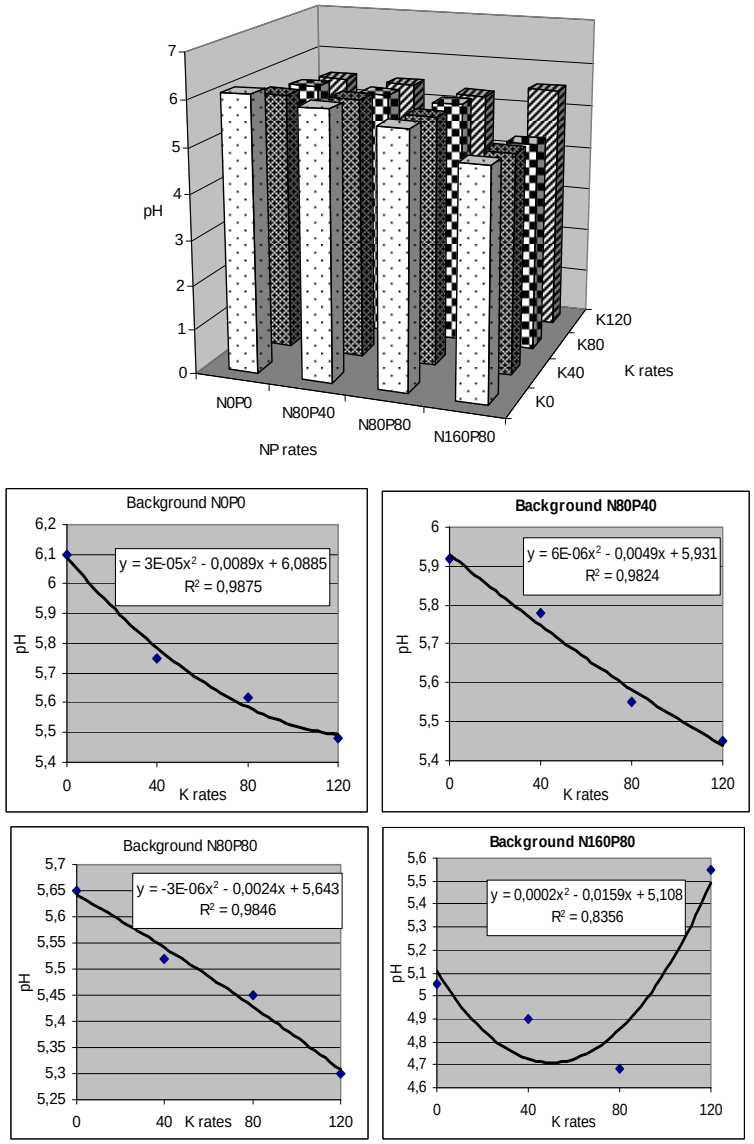

Figure 1. The influence of the KxNP fertilizers applied in long term field experiments on the reaction of the preluvosoil from Oradea

In all of the NP backgrounds which used the application of K fertilizers, determined a decrease of mobile potassium content proportional to rates applied.

Obviously a decreased of mobile potassium content (80- 110 ppm) was registered on N_0P_0 and $N_{160}P_{40}$ backgrounds and in the $N_{100}P_{40}$ and $N_{200}P_{80}$ backgrounds was registered a decrease by 60-80 ppm (Figure 4).

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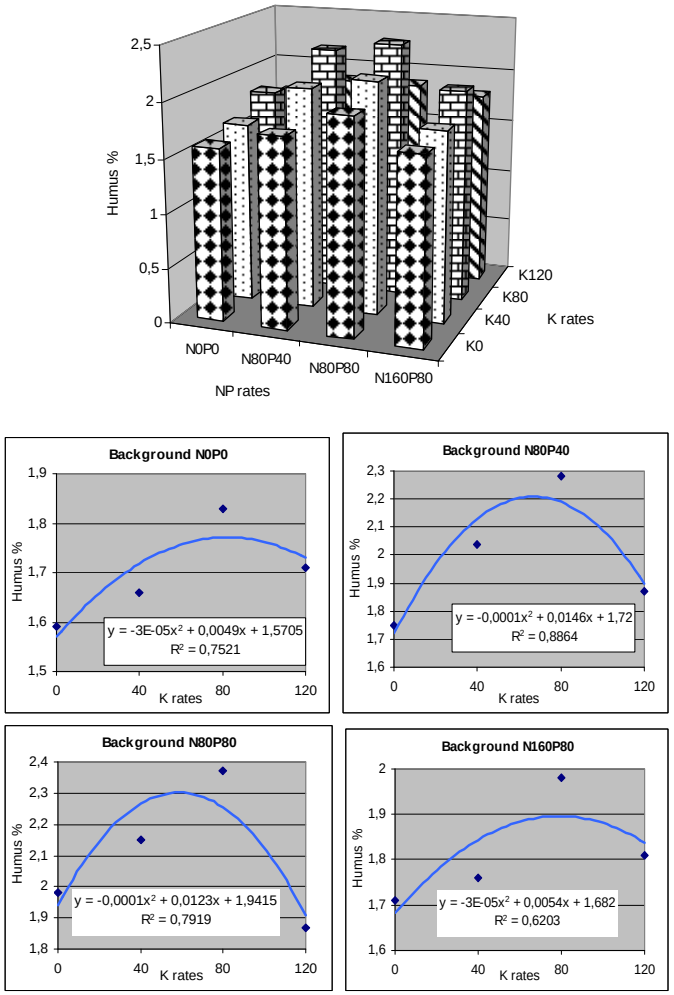


Figure 2. The influence of the KxNP fertilizers applied in long term field experiments on humus (%) content on the preluvosoil from Oradea

CONCLUSIONS

Long term field experiments are important tools for examining the soil fertility and its influence on the yield level.

The main agrochemical indexes depends on the fertilizers' type and on the rates fertilizers level applied.

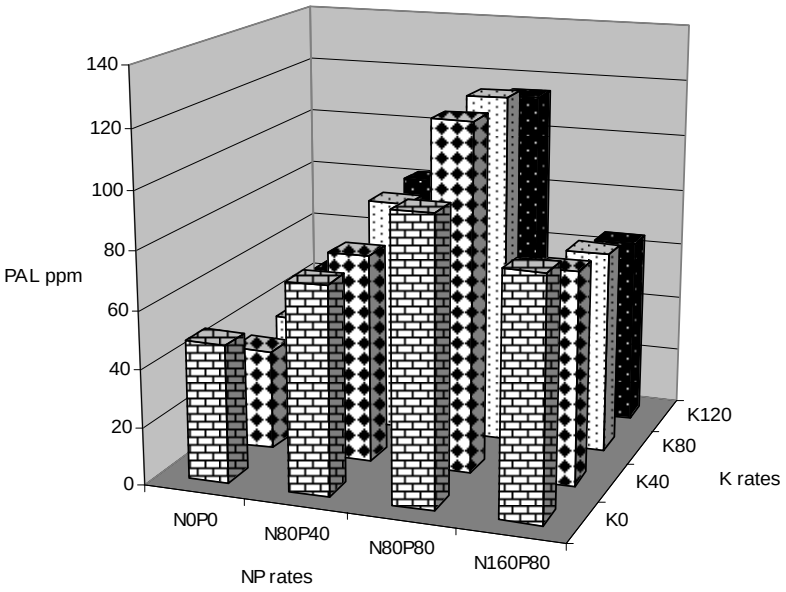
The nitrogen and the potassium fertilizers influenced the soil reaction in an unfavorable way: the pH values decreased with 0.2 – 1.05 units when N was applied and with 0.13 – 0.62 units when K was applied, as a function of rate and background used.

The mobile potassium content of the preluvosoil has average values between 85.4 – 161.1 if K rates is applied and are increasing from 0 to 120 K_2O kg/ha in function with the NP background.

In this soil conditions, for an increasing fertility potential is necessary cyclic lime applications.

The applications of potassium fertilizers on different NP backgrounds had a differentiated influence on humus level content, depending on K rates used and NP backgrounds.

The mobile phosphorus content of preluvosoil has average values between 35.0 – 70.2 ppm if P rates applied are increasing from 0 to 80 P_2O_5 kg/ha in function with the nitrogen background. Potassium application in rates of K_{40} – K_{80} determine a increasing of phosphorus mobile content with 20 – 22 ppm.



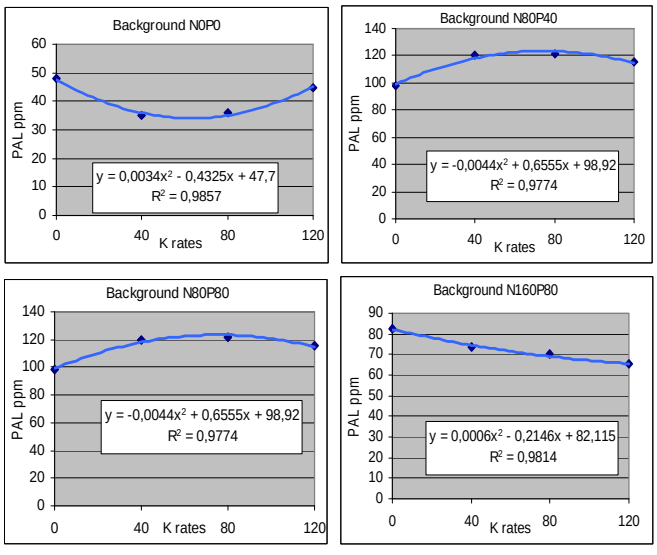


Figure 3. The influence of the KxNP fertilizers applied in long term field experiments on mobile phosphorus content on the preluvosoil from Oradea

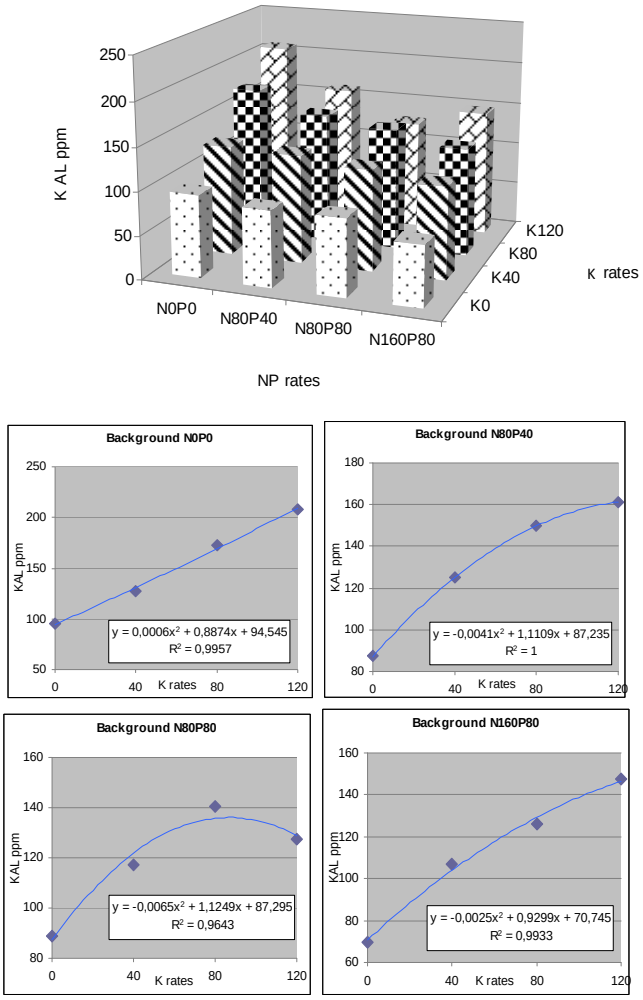


Figure 4. The influence of the KxNP fertilizers applied in long term field experiments on the mobile potassium content of the preluvosoil from Oradea

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