THE EFFECT OF KxNP FERTILIZERS IN LONG TERM FIELD EXPERIMENTS, ON WINTER WHEAT YIELD AND IT'S QUALITY IN THE PRELUVOSOIL CONDITIONS FROM NORTH – WEST PART OF ROMANIA

Adrian VUŞCAN

University of Oradea, Faculty of Environmental Protection
Gen. Magheru Street, No. 26, Oradea, Romania
Corresponding author: adyvuscan@yahoo.com

Abstract: *The paper is based on the researches carried out in a long term trial placed on the preluvosoil from Agricultural Research and Development Station Oradea belong the network of the National Agricultural Research and Development Institute Fundulea. Long term field experiments are important tools for examining the soil fertility and its influence on the yield level. The 16 variants (N_0P_0, $N_{80}P_{40}$, $N_{80}P_{80}$, $N_{160}P_{80}$ x K_0, K_{40}, K_{80}, K_{120}) in 4 repetitions were studied. The preluvosoil from North – West part of Romania is a medium provide with the main nutritive elements, with a weak acid reaction in the ploughing horizon. The wheat importance in the panification industry is exclusive one and to obtain every year the big yield with good quality is very important for a region or a country. Oradea is included between the areas with very favorable conditions for wheat crop. The fertilizers sort, rates and time of application, determine the protein content and amino acids in plants. The paper present research results regarding the effect of potassium fertilizers applied on different NP background on winter wheat yield and quality in long term field experiment set up in 1974 at Agricultural Research and Development Station Oradea. The yield and gluten spores obtained are depending on the potassium rates applied and on the levels of NP backgrounds utilized. Potassium fertilizers have a significant influence on wheat yield. The best yield in preluvosoil conditions was obtained in the case of using $N_{160}P_{80}K_{80}$ rates. The lower potassium rates (K_{40} and K_{80}) influenced positive the dry gluten content of winter wheat. The best value of the dry gluten content in preluvosoil conditions was obtained in the variants fertilized with $N_{160}P_{80}K_{80}$.*

Key words: *potassium fertilizers, wheat, yield, quality, preluvosoil*

INTRODUCTION

For a better knowledge of application effect on time of chemical fertilizers, manure and lime on soil chemistry was set up in the network of Agricultural Research Stations from Romania, long term field experiments in different pedoclimatic conditions.

The research results obtained in long term experiments set up in network research of National Agricultural Research and Development Institute Fundulea presented in scientific papers by HERA et al (1984), CIOBANU (2006, 2007a), DOMUŢA (2006, 2008), SAMUEL A.D. (1998, 2008) has shown that long term fertilizers application strong influenced, but different, the main agrochemical indexes and this are reflected in the level and quality of yield. The fertilization determines the yield and the quantity of protein obtained per surface unit.

Long term fertilization with nitrogen determined the increase of the soil acidity (CIOBANU GH. 2007b) and low activity of microorganisms in soil (SAMUEL A.D. 2009).

This paper presents the results regarding the influence of potassium fertilizers applied on different NP backgrounds in long term field experiments on winter wheat yield and its quality.

MATERIAL AND METHOD

The research results presented in this paper was obtained in the period 2007 – 2009 in the long term field experiments set up in preluvosoil conditions from North-West part of Romania.

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).

The crop rotation used in the field experiments was sunflower - wheat - corn - wheat. In the field experiment the influence of fertilizers applied on wheat kernels yield was determined and a statistical interpretation of the yield differences obtained between different treatements was made.

The elements of technologies utilized was respected the most recent recommendations in this area.

RESULTS AND DISCUSSION

Influence of potassium fertilizers on winter wheat yield (2007 – 2009)

In the conditions of preluvosoil from North –West part of Romania, without application of NPK fertilizers, even if a crop rotation by 4 years was used, the level of yield it's about 1000 kg/ha. The application of P fertilizers in the N_0P_0 backgrounds determined a progressive increase of yield with 150 – 500 kg/ha depending on K rates used.

The yields level in the case of background N_0P_0 are taking values between 1000 kg/ha and 1500 kg/ha. The yield spores because of K rates application are ranged between 150 and 500 kg/ha.

In the case of background $N_{80}P_{40}$ the yield level is taking values between 2660 and 3720 q/ha. The higher yield spores was obtained through application of 80 kg/ha K_{120}.

The highest yield spores obtained, because of K rates application is 800 – 1000 kg/ha, were realized in the case of $N_{80}P_{40}$ respectively $N_{80}P_{80}$ backgrounds used. The highest level of yield (4780 kg/ha) was realized in variants were used $N_{160}P_{80}K_{80}$ fertilizers (Figure1).

The research data has shown that potassium application reduced the negative effect on yield of high nitrogen rates, which in this type of soil are decreasing pH values and plant sensibility to diseases.

The use of higher rates of potassium fertilizers (K_{120}) determined an insignificant yield spores and it is not justified by economical viewpoint.

Influence of potassium fertilizers on dry gluten content of winter wheat crop

Although the main fertilizers which had a good influence on wheat grain content is the nitrogen fertilizer, from the research dates presented was established that lower and middling rates of potassium (K_{40}) had a favorable effect on this indexes, the yields spores obtained were different because of the NP backgrounds used. In this case, on the $N_{80}P_{40}$ background the dry gluten content is increasing from 11.24% to 12.50%, respectively to 12.87% when K_{40} or K_{80} was applied and on the $N_{160}P_{80}$ background the dry gluten content increased from 12.71% to 14.37% respectively to 14.73% when K_{40} or K_{80} was applied (Figure 2).

The highest rates of potassium fertilizer, K_{120}, lead to a decreasing of gluten content from wheat grain. This negative effect was established by the potassium fertilizer because it is stimulating a good synthesis of glucides better than synthesis of nitrogen substances. That is why when higher rates with K fertilizers were applied, the synthesis and moving of glucides to the grain were much more accumulated and the protein content decreased.

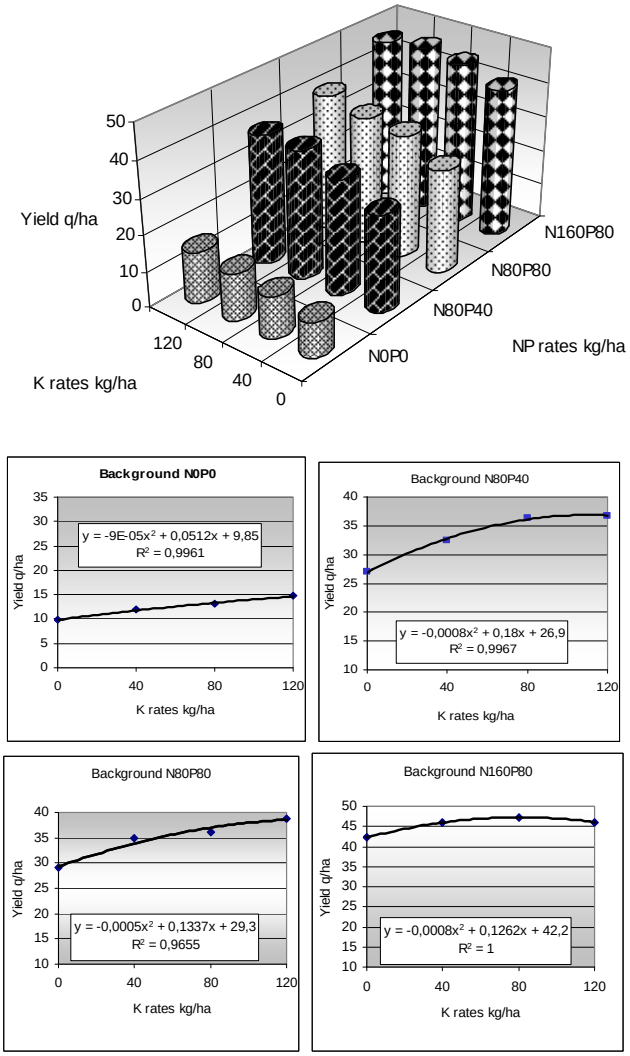

Figure 1. The influence of KxNP fertilizers on winter wheat yield in preluvosoil conditions from Oradea 2007 – 2009

CONCLUSIONS

The research results obtained in long term field experiments from Agricultural Research and Development Station Oradea has brought scientific arguments for a rational fertilization with N, P and K.

Potassium fertilizers have a significant influence on wheat yield and dry gluten content.

The best yield in preluvosoil conditions (4780 kg/ha) was obtained in the case of using $N_{160}P_{80}K_{80}$ rates.

The lower potassium rates (K_{40} and K_{80}) influenced positive the dry gluten content of winter wheat. The best value of the dry gluten content (14.73%) in preluvosoil conditions was obtained in the variants fertilized with $N_{160}P_{80}K_{80}$.

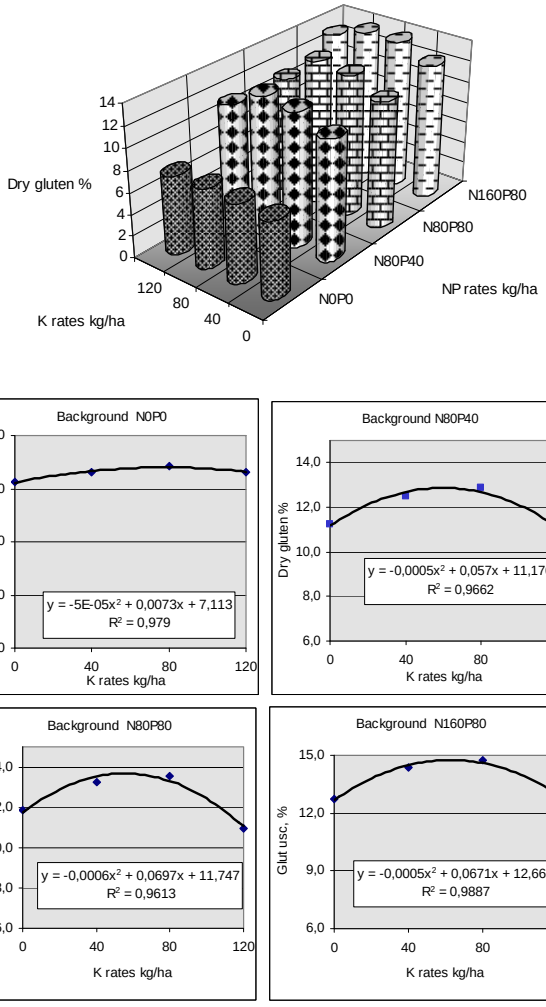

Figure 2. The influence of KxNP fertilizers on dry gluten content (%) of winter wheat yield, Oradea 2007 – 2009

BIBLIOGRAFY

1. CIOBANU GH., CORNELIA CIOBANU, C. DOMUȚA, A. VUȘCAN, 2006, Influence of lime rates applied on different NP background on pH values of brown luvic soil from Oradea, The 4th International Symposium "Natural Resources and Sustainable Development University of Oradea- University of Debrecen, RO ISBN 973-613-898-4, HU ISBN 963-9274-887, pp.195-201.
2. CIOBANU GHEORGHE, 2007a, Agrochimia îngrășămintelor. Editura Universitatii din Oradea.
3. CIOBANU GH., CORNELIA CIOBANU, CORINA COSMA, A. VUȘCAN, RODICA MADAR, 2007b, Influence of lime rates applied on different NP background on protein content of wheat in preluvosoils condition from North – West of Romania. Simpozion Internațional „Factori de risc pentru agricultură", pp 95-100.
4. DOMUȚA CORNEL, 2006, Agrotehnică diferențiată. Editura Universității din Oradea.

5. DOMUȚA CORNEL (COORDONATOR), BANDICI GH., CIOBANU GH., CIOBANU CORNELIA, SAMUEL ALINA, CSEP N., BUCUREAN ELENA, BORZA IOANA, ŞANDOR MARIA, BUNTA GH., ARDELEAN ILEANA, DOMUȚA CR., 2008, Asolamentele în sistemele de agricultură. Editura Universității din Oradea.
6. HERA CR., ELIADE GHE., GHINEA L., POPESCU ANA**,** 1984 **-** Asigurarea azotului necesar culturilor agricole. Ed. Ceres Bucureşti.
7. SAMUEL ALINA DORA, 1998, Influența fertilizării minerale, organice şi complexe asupra microorganismelor şi enzimelor din sol. Analele Universității din Oradea, Fascicula Biologie, Tom V, pp. 281-294.
8. SAMUEL A.D., DOMUTA C., CIOBANU C., SANDOR M., 2008, Field management on soil enzyme activities. Romanian Agricultural Research, Nr.25, pp. 61-68.
9. SAMUEL ALINA DORA, 2009, Biologia solului din Câmpia de Vest a României. Editura Universității din Oradea.