RESEARCHES REGARDING THE EFFECT OF NP FERTILIZERS IN LONG TERM FIELD EXPERIMENTS ON MAIZE YIELD IN THE PRELUVOSOIL CONDITIONS FROM NORTH – WEST PART OF ROMANIA

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Abstract
Since 1968, in Romania was set up a stationary long term field experiments with fertilizers and lime in all the Agricultural Research Stations that belong to Agricultural Research and Development Institute of Fundulea. The paper presents research results obtained in stationary experiments, carried out at Agricultural Research and Development Station Oradea, regarding the influence of nitrogen and phosphorus fertilizers, on maize yield. The research results obtained in long term experiments bring scientific arguments regarding necessity of rational application of nitrogen as a function of soil phosphatic potential in preluvosoil conditions. The kernel yield maize is strong influenced by the N rates level and by the level of phosphatic potential. The higher yield level can be obtained only in the case of high potential phosphatic level. These levels can be obtained through annual P rates applied bigger than 80 kg P_2O_5/ha and N rates higher than 150 kg/ha.

Key words: maize, yield, nitrogen rate, phosphatic potential

INTRODUCTION

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

Many researches on preluvosoil at the Agricultural Research and Development Station in Oradea (Ciobanu Gh. 2003, 2006, 2007, Domuţa C. 2004, 2005, 2006, Samuel A.D. 1999, 2003, 2009) have shown the negative effect of long-term application of nitrogen, as ammonium nitrate, on soil reaction.

The long term NP fertilizers application in the preluvosoil conditions determine in the case of some rates and combinations appears of nutrition unbalance of progressive decreasing of soil reaction and of increasing of mobile aluminium and manganese soil content which starting the molybdenum deficiency, factor which lead to phytotoxicity phenomenon (Ciobanu, 2007).

This paper has proposal to present the long term nitrogen and phosphorus application on maize yield in preluvosoil conditions from Oradea.

MATHERIAL AND METHODS

The research data was obtained at Agricultural Research and Development Station Oradea and represent the results from long term field experiments set up in 1974 after the same design in the whole research network belong National Agricultural Research and Development Institute Fundulea.

The experimental factors were:

- Phosphorus: 0, 40, 80, 120, 160 kg P_2O_5/ha (rates annual applied which lead after 30 years to phosphorus potential levels)
- Nitrogen: 0, 50, 100, 150, 200 kg N/ha (in the case of maize)

The fertilizers utilized were ammonium nitrate and concentrate superphosphate.

The crop rotation was: bean – winter wheat – sunflower – maize – wheat.

The long term experiments were set up on the preluvosoil with follow chemical properties:

- acid reaction in A horizon, the weak acid in the rest of profile
- medium provided with humus, N, P and K
- the mobile aluminium content in A horizon may cause severe damage for some crops

RESULTS AND DISCUSSION

In the paper is presented the yield results obtained in 2006 – 2008 period in long term yield experiments regarding the effect of different phosphorus level potential on maize yield in the year of 2008.

Analyzing the influence of N x P interaction on yield in 2006 – 2008 period, we can see that the yield level obtained is different as a function of phosphorus potential determined and by the nitrogen rates applied (Figure 1).

If in the first stationary application period of chemical fertilizers the effect obtained are very positive in the case of fertility indicators evolution and of yield level obtained and later was registered yield stagnation and even an increasing of yield because of unbalanced nutrition created in some variants.

The appears of phytotoxicity is due the nitrogen accumulation in plants because of molybdenum deficiency determined by the increasing of soil acidity.

This phytotoxicity effect manifested in the first vegetation stage is the principal cause of yield stagnation in the case of high rates nitrogen application.

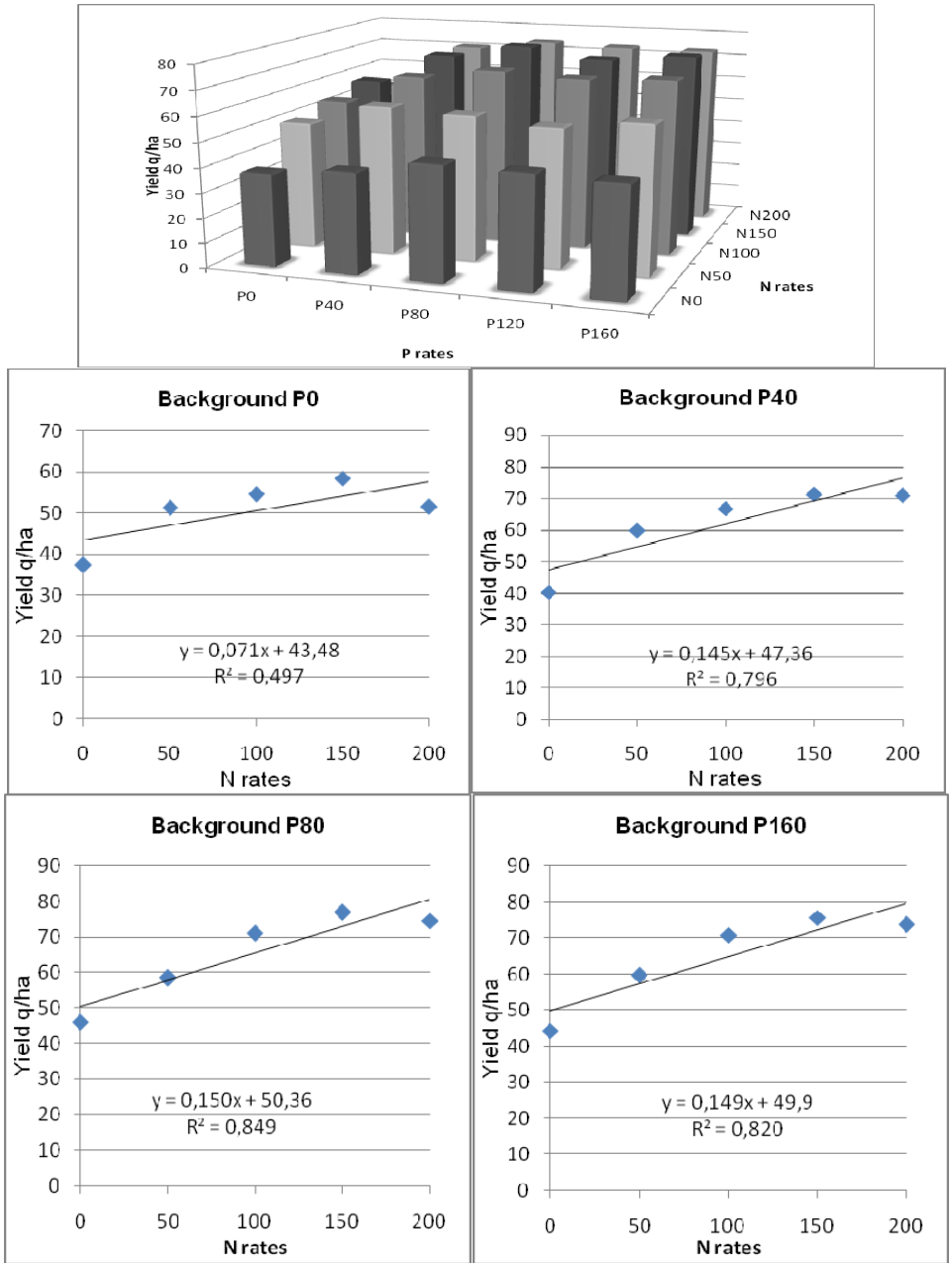

Fig. 1. The influence of NP fertilizers on maize yield in preluvosoil conditions from Oradea (2006 - 2008)

The level of yield and the nitrogen rate which determine yield stagnation is a function of phosphorus background utilized.

In the case of background annual fertilized with 80 kg P_2O_5/ha the yield level is 76.9 q/ha when 150 kg N/ha was applied. In the case of background annual fertilized with 160 kg P_2O_5/ha.

This research data has shown that in the case of unfertilized background with phosphorus or than fertilized with small phosphorus rates (40 kg P_2O_5/ha) the maximum yield level is not higher 71.4 q/ha and this level is obtained with N rates smaller than 150 kg N/ha.

The higher yield level (75.6 – 76.9 q/ha) can be obtained only in the case of high potential phosphatic level. These levels can be obtained through annual P rates applied bigger than 80 kg P_2O_5/ha and N rates higher than 150 kg/ha.

The smaller maize yield level obtained in the preluvosoil conditions even in the case of increasing of P and K rates is due the soil acidity increasing with the all implications which came from cations antagonism and decreasing of microbiological life of soil.

CONCLUSIONS

- The research results obtained in long term field experiments from Oradea has brought scientific arguments for a rational fertilization with N and P.
- Nitrogen fertilizers applications on different P backgrounds determine progressive increasing of maize yield when the N rate level is under 100 kg/ha.
- The increasing of N rates after these level is decreasing the yield especially in the case of smaller P backgrounds

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