

INFLUENCE OF LIME RATES APPLIED ON DIFFERENT NP BACKGROUND ON PH-VALUES OF BROWN LUVIC SOILS FROM ORADEA

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Abstract

In Romania was elaborated since 1968 a stationary long term experiments with fertilizers and lime in all the Agricultural Research Stations belongs to Research Institute from Fundulea.

The experiments was set up using a unitary schem for knowing the evolution of soil fertilizers and the influence of fertilizers and lime rates and combinations on level and quality yield of different crops.

The brown luvic soil from North-West part of Romania is a medium soil, provide with the principale nutritive elements, with a weak acid reaction in the ploughing horizon.

In this paper are presented the results regarding the influence of lime rates and combinations with NP rates on pH values of brown luvic soil from North-West part of Romania.

Lime application determined the increase of pH values and the decrease of mobile aluminium content obtaining positive effects on yield.

Key words: lime, nitrogen, phosphorus, pH

INTRODUCTION

In Romania acid ploughing soils are spread on 2,0 millions ha which represent 20% from total agricol land.

The factors which has a negative influence on growing plants are: high level concentration by H^+ and Al^{3+} , high level soil content in Fe^+ and Mn^{2+} and low level soil content in principal nutrients elements, low activity of microorganisms, stagnation of water, because of unsatisfactory infiltration.

Much research on white luvic soil and brown luvic soil conditions (Bedo and Lang, 1977, Ciobanu and Nagy 1978, Nemeth 1996, Stefanescu 2003) has shown the negative effect of long-term application of nitrogen as ammonium nitrate on soil reaction, which became more acidic and led to growth of mobile aluminum and manganese soil content, which can determine phytotoxicity in the first part of vegetative period, with negative influence on yield level and quality.

For a better knowledge of application effect on time of lime rates on soil chemistry was set up in the network of Agricultural Research Stations

from Romania, long-term field experiments in different pedoclimatic conditions.

This paper presents the results regarding the influence of lime rates on evolution of brown luvic soil acidity.

MATERIAL AND METHOD

Experimental site

The research data was obtained at the Agricultural Research and Development Station Oradea, using a unique design in the all research network of Research Institute from 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, whose geographical coordinates are: 21°56' Eastern longitude, 47°03' Northern latitude and 136 m altitude.

The solidification rock consists of clay loam. The ground water is located at a depth of 6-8 m. the soil is a brown one with horizon disposition and the main physical and chemical characteristics are shown in table 1. The presence of clay migration, B horizon is to be remarked noticed on the thickness of the soil profile, with high and very high values of the bulk density and compaction level and low or very low total porosity and hydraulic conductivity.

The soil reaction is acid in the ploughing A horizon, then slightly acid. The lack of CaCO_3 in the soil profile is underlined. The mobile Al content in the A horizon may cause poor growth of some crops (clover). The soil is well provided with mobile potassium and phosphorus. The soil humus medium content may not cause distortions to the neutronic determination of the soil moisture.

Sampling and analytical method

Soil samples from top soil (0-20cm) were collected from each experiment plot, in august 2000, after wheat harvesting.

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

Table 1.

The main properties of the brown luvic soil from Oradea, Romania

Soil depth cm	Sand	Silt	Clay	OC	Humus %	Ca CO ₃ %	Al mobile mg/100g soil	pH 1:2 H ₂ O	N Total %	P mobile ppm	Kmobile ppm
0 - 5	43,5	28,3	28,2	1,25	2.32	0.00	3.68	6,3	0.12	21.8	83.0
5 - 15	41,8	28,4	29,8	1,12	2.28	0.00	2.32	6,4	0.11	22.7	102.1
15 - 30	40,0	28,5	31,5	1,02	1.91	0.00	0.52	6,3	0.09	5.7	112.1
30 - 60	32,0	28,0	40,0	0,99	1.93	0.00	0.77	6,6	0.09	6.1	117.9
60 - 90	24,1	36,7	39,2	0,29		0.00	0.32	6,6			
90 - 150	35,1	27,3	37,6	0,17		0.00	0.59	6,5			

Field experiment with lime was set up in 1974 using a crop rotation: pea, winter wheat, maize, alfalfa.

The lime rates were: 0, 3, 6, 9 to/ha applied once at 6 years.

NPK rates were differentiated:

Pea: N₀P₈₀, N₃₀P₈₀, N₁₂₀P₈₀, N₆₀P₈₀, N₉₀P₈₀, N₉₀P₈₀K₈₀,

Winter wheat: N₀P₈₀, N₃₀P₈₀, N₁₂₀P₈₀, N₁₆₀P₈₀, N₁₆₀P₈₀K₈₀,

Maize: N₀P₈₀, N₈₀P₈₀, N₁₆₀P₈₀, N₂₄₀P₈₀, N₂₄₀P₈₀K₈₀,

Alfalfa: N₀P₁₀₀, N₄₀P₁₀₀, N₈₀P₁₀₀, N₁₂₀P₁₀₀, N₁₂₀P₁₀₀K₈₀,

RESULTS AND DISCUSSION*Influence of lime application on brown luvic soil reaction (figure .1)*

Neutralization of soil acidity and completion of calcium reserve (and magnesium) through lime application is an essential measure for increasing yield capacity of acid soils.

In the case of brown luvic soil application of lime in the rate of 3, 6 and 9 to/ha once at six years lead to increasing of pH values depending on NP background utilized.

When the lime is applied alone pH values are taking values between 6,22 and 7,08 when the lime rates are increasing from 0 to 9 to/ha.

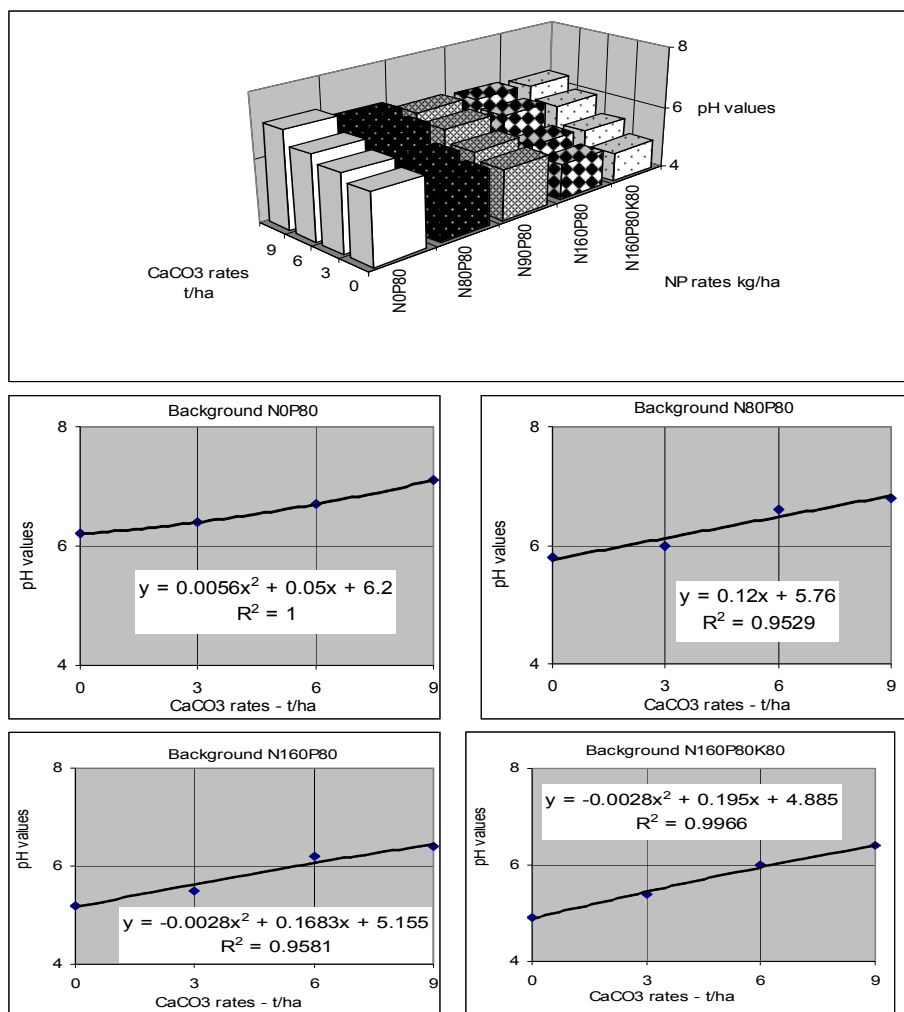


Figure 1. Influence of lime on brown luvic soil reaction from Oradea

On the other NPK backgrounds the increasing of pH values are taking values between 0,9-1,42 pH units.

Lime application in brown luvic soil conditions is a necessary measure in the case of using NP fertilizers in high rates.

CONCLUSIONS

The results presented above let us come to the following conclusions:

1. Long term experiments are important tools for examining soil fertility

2. The soil reaction evolution is depends by fertilizers type and by the rates level applied
3. For to avoid the decreasing pH values due to chemical fertilizers applied in brown luvic soil conditions is necessary lime application for acidity neutralization
4. Lime application once at six years in the rate of 9 to/ha maintain pH values between 6.4-7.0, which ensure optimal growing and developing condition for plants

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