

## THE INFLUENCE OF THE MINERAL AND ORGANIC FERTILIZERS ON SOIL REACTION IN THE APPLE TREE PLANTATION OF THE TIMISOARA DIDACTICAL STATION

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### Abstract

*The purpose of this paper is to observe and reevaluate the influence mineral and organic fertilizers have on soil reaction. Various dosages of fertilizer have been applied, chemical as well as natural (manure) and comparisons were made regarding their influence, depending on the culture system (intensive and superintensive) without changing the dosage, but taking fruit tree density per hectare into account. Research in this paper was carried out on an experimental field at the Didactic Station of the U.A.S.V. M. B. in Timișoara during 2016-2017 and later in the research laboratories of the Departments of Soil Science and Agro-chemistry of the Faculty of Agriculture in Timișoara. The soil on which the experiment is placed, is a chernozem, moderate gleized cambic, weakly decarbonated, clayey, on medium fine loss layers. The experiment is polyfactorial, type 2 x 6: factor A – the crop system:  $a_1$  – the intensive system;  $a_2$  – the superintensive system. Factor B – doses of fertilizer. The experiment includes 12 alternatives. Each alternative includes 4 trees, between the alternatives have been left two trees for insolation, between the repetition have been left four trees. In conclusion, a slight soil acidifying was accounted for, with the intensive system as well as with the superintensive one, on applying a combination of mineral + organic fertilizers. Also, the soil pH shows lower values in both culture systems when a higher dosage of mineral fertilizer is applied.*

**Key words:** soil, field, soil reaction, crop system, Timisoara

### INTRODUCTION

Researches over the cambic chernozem from Didactic Station of the U.A.C.V.M. in Timișoara have been prosecuted by I. Rusu, Dorina Sâmpăleanu, V. Ștefan, L. Niță in 1997 and by L. Niță, I. Rusu, V. Ștefan, in 1999 from the viewpoint of the influence of the organic and chemical fertilizers, as cited by [5].

Similar research was carried out by Rusu I. and Mihut Casiana during 2003-2004, but on three depths, taking into account the horizon thickness, respectively 0-25 cm; 25-51 cm and 51-70 cm. This work is a continuation of the research carried out in 2003-2004, with respect to the same doses of fertilizers in order to better observe the pH values and the changes that occur through the long application of the mineral and organic fertilizers. [7]

The tree growing measures a surface of 7 ha

and the apple tree culture occupies 4 ha, from which a surface of 1 ha in being occupied by the soil taken for study Generous de Voinești. The planting distance of trees in a row, in the intensive system is two metres and between rows the distance is four meters 4 x 2. In the superintensive system the planting distance of apple trees is one meters on a row and four meters between rows 4 x 1. [8]

The soil on which the experiment is placed, is a chernozem, cambic gleized moderated, weakly decarbonated, clayey, on medium fine loss layers. [1]

The soil reaction in the intensive system and superintensive system, is placed between certain limits, depending of the horizon and implicitly on the depth of the soil. [3]

### MATERIALS AND METHODS

The researches took place on the apple plantation within the framework of the

Didactical Station Temeswar. The soil on which the experiment is placed, is a chernozem, moderate gleized cambic, weakly decarbonated, clayey, on medium fine loss layers. [2]

The experiment is polyfactorial, type 2 x 6:

Factor A – the crop system:

a<sub>1</sub> – the intensive system;

a<sub>2</sub> – the superintensive system.

Factor B – doses of fertilizer

The experiment includes 12 alternatives.

Each alternative includes 4 trees, between the alternatives have been left two trees for insolation, between the repetition have been left four trees. [4]

The planting distance of trees in a row, in the intensive system is two meters and between rows the distance is four meters (4 x 2). In the superintensive system the planting distance of apple trees is one meters on a row and four meters between rows (4 x 1). [9]

The soil reaction has made based on the potentiometric method, in water extract 1:2.5. The samples of the soil have been taken from different depth as follow: 0-20 cm; 20-40 cm.

## RESULTS AND DISCUSSIONS

The soil reaction in the intensive system is placed between certain limits, depending of the horizon and implicitly on the depth of the soil: 0-20 cm; 20- 40cm, as it can be seen in Table 1 and Figure 1.

Table 1. The influence of mineral and organic fertilizer on the soil pH in the intensive crop system

Horizon/ Depth cm	Year	Alternatives						Mean	Dif. %
		N <sub>0</sub> P <sub>0</sub> K <sub>0</sub>	N <sub>30</sub> P <sub>30</sub> K <sub>30</sub>	N <sub>100</sub> P <sub>50</sub> K <sub>20</sub>	N <sub>15</sub> P <sub>100</sub> K <sub>50</sub>	G. g.	G.g. N <sub>30</sub> P <sub>30</sub> K <sub>10</sub> <sup>+</sup>		
Amp (0-20)	2016	6.19	6.16	6.14	6.0 9	6.0 5	6.00	6.10	-0.17
	2017	6.17	6.15	6.12	6.0 7	6.0 3	5.91	6.07	-0.10
Am (20-40)	2016	6.48	6.46	6.42	6.3 8	6.3 6	6.34	6.40	-0.04
	2017	6.49	6.46	6.43	6.3 9	6.3 4	6.31	6.40	-0.08

Source: Own calculation.

In intensive crop system, in 2016, at the 0-20 cm depth, the lowest pH values were 6.00 at the 6th variant and the highest, respectively, 6.19 in the variant 1.

In 2017, the lowest values of 5.91 were recorded in variant 6 and the highest, of 6.17

in variant 1.

At 20-40 cm deep, pH values ranged between 6.31 and 6.49. The lowest values were found in variant 6, respectively 6.34 and the highest in variant 1, respectively 6.48 in 2016 and 6.49 respectively in 2017.

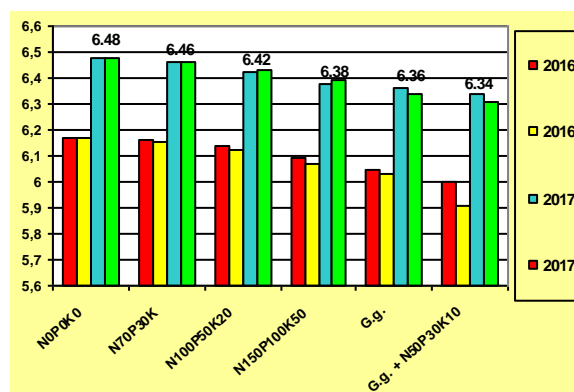


Fig. 1. The influence of mineral and organic fertilizer on the soil pH in the intensive crop system  
 Source: Own calculation.

In the unfertilized alternative (witness alternative), not only there was not recorded any acidification of the soil solution, but there is a tendency of maintaining the same values of the pH level as the values the experimentation.

The differences between the pH values of those three depth (0-20 cm; 20-40 cm) are small and they are between the limits of experimental errors.

The pH values, in the year 2016, in Amp horizon (depth 0-20 cm) were between 6.19 for the witness alternative and 6.00, for the + NPK manure alternative; in Am horizon (depth 20-40 cm) between 6.49 for the witness alternative and 6.34, for the + NPK manure alternative in the year 2017 and 6.48 in the year 2016.

In the year 2017 in the Amp horizon (depth 0-20 cm) the pH values were between 6.17, for the witness alternative and 5.91, for the + NPK manure alternative, in Am horizon (depth 20-40 cm) between 6.48, for the witness alternative and 6.50, for the + NPK manure alternative.

In the superintensive crop system given the intensive system were not recorded changes of the soil pH during those two years of research (2016–2017) under the influence of

mineral and organic fertilizer as it can be seen in Table 2 and Figure 2.

Table 2. The influence of mineral and organic fertilizer on the soil pH in the superintensive crop system

Horizon/Depth (cm)	Year	Alternatives						Average	Difference %
		N <sub>0</sub> P <sub>0</sub> K <sub>0</sub>	N <sub>70</sub> P <sub>30</sub> K <sub>0</sub>	N <sub>100</sub> P <sub>50</sub> K <sub>50</sub>	N <sub>150</sub> P <sub>100</sub> K <sub>50</sub>	G.g.	G.g. + N <sub>50</sub> P <sub>30</sub> K <sub>10</sub>		
Amp (0-20)	2016	6.14	6.12	6.10	6.06	6.02	5.97	6.06	-0.08
	2017	6.14	6.10	6.08	6.04	6.00	5.92	6.04	-0.10
	2017	6.40	6.38	6.35	6.31	6.27	6.24	6.32	-0.08
Am (20-40)	2016	6.40	6.37	6.34	6.29	6.27	6.20	6.30	-0.10
	2017	6.40	6.37	6.34	6.29	6.27	6.20	6.30	-0.10
	2017	6.40	6.37	6.34	6.29	6.27	6.20	6.30	-0.10

Source: Own calculation.

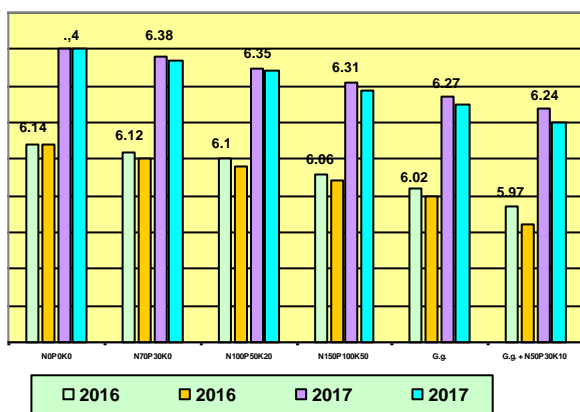


Fig. 2. The influence of mineral and organic fertilizer on the soil pH in the superintensive crop system  
 Source: Own calculation.

In the superintensive crop system in 2016, at the 0-20 cm depth, the lowest pH values were 5.97 at the 6th variant and the highest, respectively, 6.14 in the variant 1.

In 2017, the lowest values of 5.92 were recorded in variant 6 and the highest, of 6.14 in variant 1.

At 20-40 cm deep, pH values ranged between 6.20 and 6.40. The lowest values were found in variant 6, respectively 6.20 and the highest in variant 1, respectively 6.40 in 2016 and 2017.

The pH values in the year 2016, in Amp horizon (depth 0-20 cm) were between 6.14, for the witness alternative and 6.97, for the + NPK manure alternative; in Am horizon (depth 20-40 cm) between 6.40, for the witness alternative and 6.24, for the + NPK manure alternative.

In the year 2017, the pH values were in Amp horizon (depth 0-20 cm) between 6.14, for the witness alternative and 6.92, for the + NPK manure alternative; in Am horizon (depth 20-

40 cm) between 6.40, for the witness alternative and 6.20, for the + NPK manure alternative.

## CONCLUSIONS

Following the researches which took place on the apple plantation within the framework of Timisoara Didactical Station, were drawn the following conclusions:

-in the intensive crop system, in the year 2016, the pH values had been between 6.00 in Amp horizon (0-20 cm).

-in the year 2017, the value of the soil reaction were 5.91 in Amp horizon, for the + N<sub>50</sub>P<sub>30</sub>K<sub>0</sub> manure alternative.

-the average of soil reaction for different depth was between 6.07 at 0-20 cm in 2016 and 6.10 in 2017;

-in the superintensive crop system, in 2016 the values at the depth of 0-20 cm, were between 5.97, for the + N<sub>50</sub>P<sub>30</sub>K<sub>0</sub> manure alternative.

-in the year 2017, the values of soil reaction were 5,91 in Amp horizon, for the + N<sub>50</sub>P<sub>30</sub>K<sub>0</sub> manure alternative and 6.62, for the witness alternative and in the year 2017 between 5.92 in Am.

-the average of soil reaction was as it follows 6,04 for a depth of 0-20 cm, in 2016 and 6.10 in 2017.

In intensive crop system, in 2016, at the 0-20 cm depth, the lowest pH values were 6.00 at the 6th variant and the highest, respectively, 6.19 in the variant 1.

In 2017, the lowest values of 5.91 were recorded in variant 6 and the highest, of 6.17 in variant 1.

In superintensive crop system in 2016, at the 0-20 cm depth, the lowest pH values were 5.97 at the 6th variant and the highest, respectively, 6.14 in the variant 1.

In 2017, the lowest values of 5.92 were recorded in variant 6 and the highest, of 6.14 in variant 1.

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