THE INFLUENCE OF THE LEVEL AND THE FORMS OF MICROELEMENT Zn IN THE SOIL OF LUSHNJE- FIER

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Abstract

In the soil such elements like Zn are in different forms, such as availability form, carbonate form, organic form, change form and unchanged form. The content level of one form or the other one is important for the micronutrient elements, or polluting levels in a given system. The level and the form of microelement Zn is influenced by some factors including kind of the agricultural soil, pH, sand, silt and clay. Chemical analyses for micronutrient Zn forms, pH, organic matter and mechanical analyses: sand, silt, clay have been done at thirty samples in Lushnje-Fier and two profile. Though have been studied the relation between pH with the changed fraction, carbonate fraction and the unchanged fraction of Zn in the soil. In a similar way it has been seen the impact of organic matter of soil in micronutrient forms of Zn, then it has been continued with the impact of clay, in micronutrient forms of Zn.
The available form has been 1.35 ppm, for the changed fraction 1.19 ppm and the organic fraction 0.98 ppm which has been considered poor soils for the above forms.
It has been observed that with the increase of pH in the soil, there has been a decrease of the carbonatic Zn, the changed Zn but an increase of the unchanged Zn. With the increase of the clay content fraction, increases the organic form of Zn.

Keywords: *micronutrient forms, soil analyses, changed form, clay fraction, pH*.

1. INTRODUCTION

The Zn element like the other micronutrients is valuated as very important for organisms. The total content in the solution is not as important as the form of their chemical bond, which in big rate determines the usefulness for the plants and animals but also environmental pollution.

2. MATERIAL AND METHODS

A. Getting the samples

Samples of two different profiles of agricultural soils have been chosen to study their pH. The profiles have been opened according to the general rule for opening them. Soil samples have been taken beginning from the end of the profile in vertical direction to the head. Except for these 2 profiles, 30 other samples have been taken to represent the soils of the area Lushnje-Fier in the first depth.

B. Processing and analysing samples in the laboratory

In the laboratory the samples were left to dry in natural conditions, in the shadow, for some days. Then, they were milled in the milling machine in about 2mm size. After they were grinded, with the framing method ,they had been reduced in an amount of about 200 g. Simultaneously, a part of this sample, about 30 g of it, was grinded more finely, in a separator, smaller than 1 mm, necessary for special analysis.

The following analysis were made:

1.The mechanical content with the pipe method
2.pH analysis, with aqueous extract by the pH meter.
3.The burning organic matter analysis with potassium chromat

All these analysis were made according to the methods which have been used in the Soil Study Institute.

The analyse of the micronutrient form of Zn was made according to the following extraction method:

1. With 1 N KCl solution, for the easily available forms.
2. With a compound of 0.005M DTPA; 0,01M $CaCl_2$ and 0,1M Thrietanol amine, all of it in pH = 7.3 for the changed forms.
3. With 1N NaOH solution, for organic forms of bonds
4. By 0,1M EDTA solution, for carbonate forms and easily reduced bonds
5. With a compound of $NaHCO_3$ + $Na_2S_20_4$ for the oxide forms which are also considered the unchanged forms.
6. Zn (assimilable) with a compound of KCl + EDTA

3. RESULTS AND DISCUSSION

3.1. The general characteristics of analysed soils

For this case study two soil profiles have been treated and also 30 agrochemical samples too, that belong to the soil fields of the area Lushnje- Fier, one of the most important and most developed agricultural areas of our country.

The general, physical and chemical indexes, are shown for 21 from 30, of the agrochemical samples in table 1.

Profile 1 has a basic character. The reaction expressed as water pH, varies, from 7.87-7.75 in the upper horizons, to 7.48-7.40 in its depth. The basic character of this profile is seen also in the low content of Al_2O_3 in all the analyzed samples (0.06-0.31%).

It is a profile, that from the mechanical composition, is dominated from the silt fractions (37,82 -47,71%) in all its length. Sand fractions are much more in the first depths (42.40 %) and gradually they are reduced in favour of adding the clay fractions in the depth (the clay fraction is increased from the first layer to the last one in the values from 18.15-33.65).

In a similar way the profile 2 has been analyzed, which is an acid profile. It is used only for specific referrals.

Sample Nr	pH	Sand %	Silt %	Clay %	Organic Matter %	R_2O_3 %
1	7,83	26,56	51,72	21,72	0.81	2.15
2	7,92	22,64	51,96	25,40	1.01	2.48
3	7,78	22,68	62,40	14,92	1.01	2.76
4	7,77	9,96	58,48	31,56	1.18	2.18
5	7,86	16,16	42,20	41,64	1.31	2.19
6	7,81	31,76	23,68	44,56	1.13	2.23
7	8,04	4,80	28,20	67,00	2.01	1.24
8	8,02	10,84	42,80	46,36	1.26	2.10
9	8,00	11,12	20,00	68,88	1.90	1.81
10	7,96	9,72	58,44	31,84	1.01	1.89
11	8,04	11,92	43,48	44,60	1.31	2.01
12	7,82	38,12	36,16	25,72	0.88	2.59
13	7,86	11,40	62,96	25,64	1.13	3.04
14	7,78	22,08	35,80	42,12	1.26	2.99

Table 1

15	7,98	10,00	60,60	29,40	1.33	2.07
16	7,88	11,40	57,80	30,80	1.13	2.82
17	7,70	13,52	55,92	30,56	0.88	3.13
18	8,01	11,96	50,20	47,84	1.13	2.03
19	7,98	9,52	30,95	59,53	1.26	1.53
20	8,04	14,48	31,16	54,36	1.34	1.58
21	8,03	16,04	35,92	58,04	1.39	1.45

3.2. The analysis of the microelements in their main fraction content in the soil

The mineral forms in which the Zn microelement is found in the soil, are influenced from different factors, which easily change the balance in soluble forms in the soil solution, or the opposite direction can also happen.

The soils that have been analysed in this case study, have a value of pH=8, and this consists of a powerful factor, that the valuated fractions as very available (extracted with KCl), and also the easily changed forms (DTPA extracted), has been in very low levels compared to all the classifications which we have been consulting.

The analyzed fractions of microelement Zn, analyzed in profile 1, profile 2 and agrochemical samples are shown below:

Table 2 Profile 1

Sample	Zn_{KCl} ppm	Zn_{DTPA} ppm	Zn_{org}.ppm	Zn_{carb}.ppm	$Zn_{\Sigma 1-4}$ ppm	ZnO ppm
1	0,99	16,67	0,76	36,90	55,32	15,62
2	0,97	8,33	0,86	27,51	37,66	33,98
3	1,03	6,23	1,03	27,18	35,46	42,19
4	1,13	3,59	1,40	23,40	29,52	14,50
5	1,13	2,74	2,03	21,11	27,00	22,47

Sample	Zn_{KCl} ppm	Zn_{DTPA} ppm	Zn_{org}.ppm	Zn_{carb}.ppm	$Zn_{\Sigma 1-4}$ ppm	ZnO ppm

2

Table 3 profile

1	1,97	0,57	0,89	2,28	5,70	18,61
2	2,17	0,62	0,73	2,44	5,95	18,17
3	1,55	0,58	0,58	2,13	4,84	18,11
4	1,45	1,22	0,67	1,90	5,23	18,30
5	1,47	1,87	0,72	1,58	5,63	19,04

Table 4. Agrochemical Samples

Mostra Nr.	Zn $_{KCl}$ ppm (1)	Zn $_{DTPA}$ ppm (2)	Zn $_{org}$ ppm (3)	Zn $_{carb.}$ ppm (4)	Zn $_{\Sigma\, 1-4}$ ppm	ZnO ppm
1	1,46	1,41	0,78	2,16	5,80	12,88
2	1,50	0,95	0,61	1,97	5,03	12,76
3	1,42	1,55	0,49	2,69	6,14	9,32
4	2,07	1,08	0,56	3,29	7,00	12,70
5	1,26	1,66	0,67	2,31	5,90	13,13
6	1,41	1,93	0,84	1,79	5,97	11,94
7	1,93	1,44	1,76	2,08	7,21	13,87
8	1,31	1,59	0,64	1,61	5,15	13,19
9	1,38	1,12	1,67	0,94	6,11	16,32
10	1,40	0,83	0,56	1,62	4,41	12,14

3.3. Zn fractions

Analysing the relation between this fraction and the index of pH, fractions of mechanical content of the soil, but also humus content, has not certified any correlative link. Other factors as the mechanical content of soil, organic matter, etc are also factors that must be taken in consideration, in judging the expectations of elements availability in the soil solution, and most of all Zn micronutrient case. The low levels containing the Zn micronutrient in the studied fractions are thought to determine the fact that has not been clear correlative conclusions between their values and the physical-chemical indexes that are responsible for the amount in which these fractions are found in the soil. Even so, a special link, as the certified correlations between the relation of organic fraction and the silt- clay content, or humus in the analysed soils, the carbonate fraction etc, testify their mutual influence.

Table 5 Some Zn correlations

		R^2	Equation
pH - Zn	4) Zn_{carb} ppm	0.6227	y = -0.1127x + 8.1736
	$Zn_{\Sigma\ 1\text{-}4}$ ppm	0.0052	
	ZnO ppm	0.6150	y = 0.0461x – 7.3231
sand - Zn	$Zn_{\Sigma\ 1\text{-}4}$ ppm	0.0046	
	ZnO ppm	0.1549	
	3) Zn_{org} ppm	0.4309	y = -20.345x + 60.856
Silt - Zn	$Zn_{\Sigma\ 1\text{-}4}$ ppm	0.0539	
	1) Zn_{KCl} ppm	0.0147	

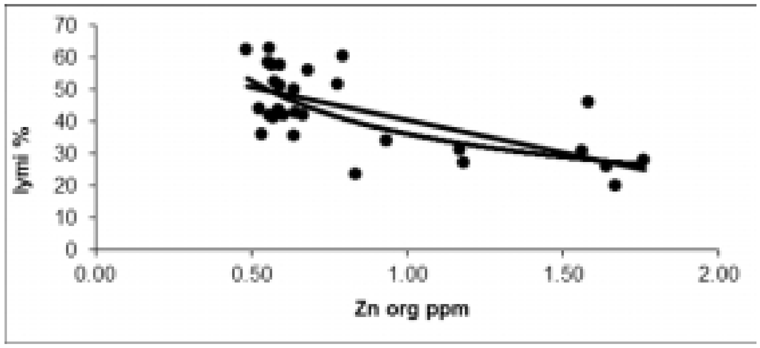
The whole content of Zn microelement in the soils of Lushnje- Fier has been also difficult to analyse, not only because of its environmental pollution but also food and crops. The need of using fertilizers containing Zn microelement in them , has been a necessity.

Easily available fractions (KCl extracted) have two very low levels. In profile 1 they change from 0.99-1.13ppm,in profile 2 from 1.45-2.17 ppm but in the agrochemical fractions with the other analysed indexes, there has not been found in our study.

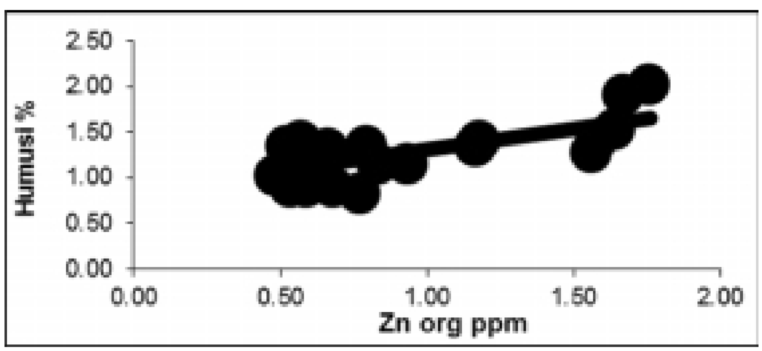
Changed fraction(DTPA extracted) has also generally low levels. Except for the first profile where it changes from 2.74-16.67 ppm , whereas in the agrochemical samples from 0.42-2.44 ppm. No correlative dependence, has been found in the case of our study.

Organic fraction (NaOH extracted) has also two very low levels. In profile 1 it changes from 0.76-2.03 ppm, in profile 2 from 0.58-0.89 ppm whereas in agrochemical samples from 0.49-1.76 ppm. There have been certified correlative links between this fraction and the silt-clay content percentage that has been found in the soil. As a conclusion, it might be said that the content of the organic fraction in the studied soils, has the tendency of increasing the amount of humus in this fraction.

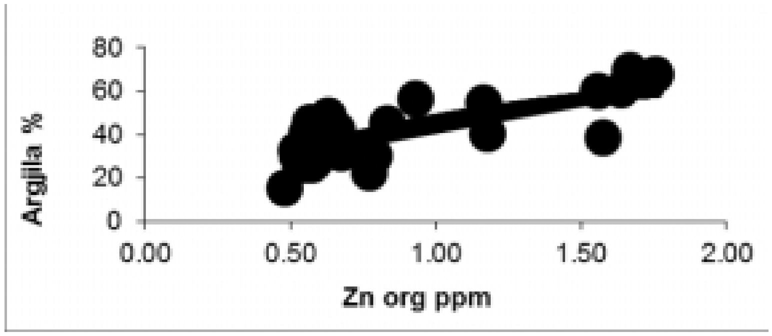
Graphic 1



Graphic 2



Graphic 3



Carbonate fraction (EDTA extracted) has levels that in the first profile change from 2.11- 36.90 ppm, in the second profile from 1.58-2.44 ppm, whereas he agrochemical samples from 0.87-3.71 ppm. Even so, in this fraction are included the easily reduced forms, their levels may be considered law or very low.

Unchanged fraction($NaOH+Na_2SO_4$ extracted) has levels that in its profile change from 14.50 to 42.19 ppm, in profile 2 from 18.11-19.04 ppm, whereas in the agrochemical samples from 8.14-17.01 ppm. Representing forms that are practically valuated unchanged, again it is accepted that the levels are low.

4. CONCLUSION

Organic fraction (NaOH extracted) : It have been certified correlative links between this fraction and the silt-clay content percentage that has been found in the soil. As a conclusion, it might be said that the content of the organic fraction in the studied soils, has the tendency of increasing the amount of humus in this fraction.

Carbonate fraction (EDTA extracted) has levels that may be considered law or very low.

Unchanged fraction($NaOH+Na_2SO_4$ extracted) representing forms that are practically valuated unchanged, again it is accepted that the levels are low.
Certified links result between this fraction and the changing soil reaction, because to the basic reaction soils, the reaction increases.
It is also certified that the increase of the organic substances in the soil, also affects the increase of this fraction.

There is a strong correlative relation between the easily available fraction and that other one which is named ‘assimilable fraction’ according to the method in use years ago in Soil Science Institute, Tirana.

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