RESEARCH REGARDING THE INFLUENCE OF LEAD IN FODDER PLANTS

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Abstract

The biological material used was a mixture of fodder perennial plants of three species: Cocksfoot Grass or Orchard Grass (Dactylis glomerata), fescue (Festuca pratensis) and alfalfa (Medicago sativa). Analysis has been perfomed on fresh plants resulted from each harvest in order to determine the content of the lead poulluting element. This study was done on 12 experimental variants of three series each. Lead was incorporated in the soil before sowing through a solution.

Key words: pollution factors, perennial plants

INTRODUCTION

The analyses were carried out at the house of vegetation of UDAMV Bucharest. The biological material used was a mix of evergreen plant fodder composed of three specific species: graminaceae: orchard grass (Dactylis glomerata), meadow fescue (Festuca pratensis), and alfalfa or lucerne (Medicago sativa).

Lead was included before the plants in the form of a solution with 250 ml per dish, in concentrations of 100 ppm and 200 pm respectively lead acetate (CH3COOH)3.7H2O.

The experiments were carried out over a period of 2 years.

MATERIALS AND METHOD

The dose of soluble lead was added directly to the plant extract obtained earlier through using spectophotometric method of atomic absorption with PZE UNICAM. The method's selectivity is 0.02 µg/ml. The contents of the plants in the lead were dosed after the humid mineralization of the vegetal material.

Table 1
Plant content of lead (ppm) in soluble form in the first year of the experiment. (Variant: Series 1, Series 2, Series 3; nonfattened control)

	Variant	Series I	Series II	Series III
V1	Nonfattened control	1,25	1,25	1,25
V2	$N_{50}K_{200}$	1,25	1,25	1,25
V3	$N_{150}K_{200}$	2,50	1,25	1,25
V4	$N_{250}K_{200}$	2,50	2,50	2,50
V5	$N_0K_0Pb_{100}$	5,00	1,25	3,75
V6	$N_{50}K_{200}Pb_{100}$	3,75	3,75	3,75
V7	$N_{150}K_{200}Pb_{100}$	6,25	3,75	3,75
V8	$N_{250}K_{200}Pb_{100}$	5,00	5,00	5,00
V9	$N_0K_0Pb_{200}$	7,50	5,00	5,00
V10	$N_{50}K_{200}Pb_{200}$	8,75	5,00	6,25
V11	$N_{150}K_{200}Pb_{200}$	10,00	6,25	3,75
V12	$N_{250}K_{200}Pb_{200}$	7,50	6,25	5,00

The content of Pb in the first variants V1-V4 shows that it was absorbed from the soil in small quantities in the fodder plants between 1.25-2.50 ppm Pb at all times during the analysis. The variants V5-V8, to which 100 ppm Pb were added to the substratum,

show that this was absorbed by the plants in greater quantities, the content being greater in the first series, with variations of 3.75 ppm and 6.25 ppm Pb and yet keeping constant the other two series of analysis. With the variations with 200 ppm Pb added to the substratum can be observed an increase in the amount of lead, touching in the first period of analysis between 7.50-10 ppm Pb, while during the last period values between 3.75-6.25 ppm were recorded.

With all variations, the lead content dectected in the plants did not pass the allowed threshold of 14 ppm mentioned in the relevant specialized literature.

Table 2: The plant content of lead (ppm) in soluble form in the second year of the experiment.

	Variant	Series I	Series II	Series III
V1	Nonfattened control	0,626	0,626	1,25
V2	$N_{50}K_{200}$	0,625	0,625	1,25
V3	$N_{150}K_{200}$	0,625	0,625	1,25
V4	$N_{250}K_{200}$	0,625	0,625	2,50
V5	$N_0K_0Pb_{100}$	0,750	0,750	2,50
V6	$N_{50}K_{200}Pb_{100}$	0,875	0,750	2,50
V7	$N_{150}K_{200}Pb_{100}$	0,750	0,750	3,75
V8	$N_{250}K_{200}Pb_{100}$	0,875	0,750	3,75
V9	$N_0K_0Pb_{200}$	0,750	0,750	2,50
V10	$N_{50}K_{200}Pb_{200}$	0,750	0,750	3,75
V11	$N_{150}K_{200}Pb_{200}$	0,875	0,875	2,50
12	$N_{250}K_{200}Pb_{200}$	1,000	0,875	3,75

The content of Pb assimilated in the second year of the experiment has dropped compared to the first year through the fact that in this year there was no more polluting metal added to the substratum. Compared to plants that did not receive the initial lead (variants 1-4), which over the period of vegetation had a constant content level of 0.625 ppm Pb in all series of the analysis, with the exception of series II, the variations V5-V8 with 100 ppm Pb added to the soil varied between 0.750-0.875 ppm at the first harvest and gradually recorded the growth in the chart of the other harvests, with the maximum being 3.75 ppm Pb with variants 7, 8, and 10.

For the group of variants 9-12, which received 200 ppm Pb in series 3, it can be remarked there occurred an intensification of the lead absorption which reaches values between 2.50 and 3.75 ppm. These high values can be explained through the intensification of the plants' metabolism in the assurance of optimal conditions relating to the factors of vegetation (light, water, heat).

RESULTS AND DISCUSSION

The experiment desired to establish the behavior of fertilized plants that received during their growth period a charge of polluting lead in two specific concentrations, 100 and 200 ppm Pb. Added in the substratum of growth during the first year of the experiment this element was absorbed differently by plants from each variant. Thus, compared to the control variant in which the detected lead had a value of 1.25 ppm, in variants with 100 ppm added, the content grew to 3.30 ppm with variant V5, 3.75 with variant 6, 4.60 with variant 7, and 5 ppm with variant 8.

At a doubled concentration of lead (200 ppm) the plants absorbed a variable quantity of Pb between 5.80 ppm and 6.60 ppm with variants 10 and 11.

The values of the plant contents in Pb did not however pass the maximum allowable limits of 14 ppm Pb, mentioned in the relevant specialized literature.

In the second year of the experiment the lead quantity absorbed by the plants dropped because in the substratum new quantities of this element were not added.

The results obtained show that plants did not absorb through their roots quantities of lead added in concentrations of 200 ppm over LMA, the root structure constituting a biological barrier that impeded the

penetration of this element in a concentration of greater than 1.25 ppm absorbed by the plants from the control group, lead which is found among a multitude of other elements found naturally in soil.

The polluting danger represented by lead deposited by forage plant leaves cultivated in limitrophe zones near intense auto traffic arteries or in the neighborhood of industrial locations that can be a source of pollution.

CONCLUSION

1. The research followed the rhythm of absorption and assimilation of lead in forage plants, with the proposed objective that there is the danger of pollution with this element in pastures located near roads with intense auto circulation.

2. The presence of polluting lead during the time of growth in concentrations of 100 ppm Pb, influences the production of green mass, contained in the dry substance, of all of the variants and their values recorded in comparison to the control group were higher.

3. The shock dose of 200 ppm Pb applied during the growth period led to the accumulation of Pb in plants of 3.6 times more, compared to the control group.

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