THE INFLUENCE OF NITRATE OF LEAD ON MITOTIC DIVISION AT *TRITICUM AESTIVUM* L.

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key words: nitrate of lead, *Triticum aestivum* L., root meristem,, cells in mitotic division, chromosomial aberrations.

Abstract: The paper presents the influence of nitrate of lead upon the mitotic division of *Triticum aestivum* L. The treatment with nitrate of lead has determined the lessening of the mitotic index and the chromosomial mutations. The experiment prowed that nitrate of lead, known as a polluting agent has a mutagenic potential on the plants.

INTRODUCTION

It is known that the lead is polluting agent very toxic for plants and animals (Ciplea, Ciplea,1978; Heggestad,1968; Kihlman,1966; Natarajan, Ahnström,1969).

At plants, action of the lead demonstrated on various chromosomial aberrations (Pădureanu, 2004; Pădureanu, 2005; Pădureanu, 2005).

THE AIM OF INVESTIGATIONS

Our investigations focused the determination of the mitotic index, the determination of the frequency of the types of chromosomial aberrations from metaphases and aberrant ana-telophases.

MATERIAL AND METHODS

The biological material used in the experiment, was represented by seeds of *Triticum aestivum* L., *Rubin* variety, cultivated at the Experimental Didactic Station from the University of Agricultural Sciences and Veterinary Medicine, Iaşi.

The seeds were put to germination in laboratory conditions. When the roots reached 15 – 17 mm in length, they were treated with nitrate of lead.

Nitrate of lead was used in the form of watery solutions in three concentrations: 5%, 1%, 0.1%.

The time of action of the respective solutions on the radicular meristems was 4 hours and 2 hours.

Taking into account the concentration and the time of action of the solutions 6 variants have resulted.

Besides these six experimental variants, there was also used a control plot and in this case no treatments were applied to the radicular meristems.

For further cytogenetic investigations, the treated and non/treated roots (control) were fixed in Carnoy fixing solution for 24 hours at 4°C then hydrolised with HCl and coloured with the basic colouring matter Carr.

The radicular meristem was displayed using squash technique.

15 preparations and 10 microscopical fields/preparation were examined for all the variants and control.

The microscopical examination was carried out using the optic microscope Nikon Eclipse 600.

The microphotographies were made with the camera from the endowment of the microscope.

RESULTS AND DISCUSSIONS

The analysis of the mitotic index

The first aspect investigated, correlated with the mutagenic capacity of the treatments by nitrate of lead on the wheat it was represented by the effect of nitrate of lead on mitotic division’s stages.

The number of cells in division diminish correlated with the increase the concentrated and time of action of nitrate of lead (fig.1,2).

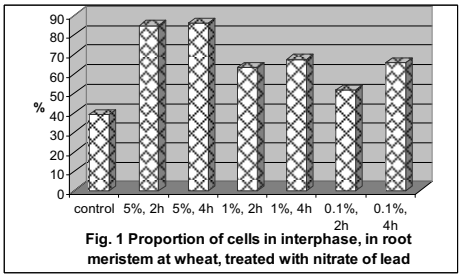

Fig. 1 Proportion of cells in interphase, in root meristem at wheat, treated with nitrate of lead

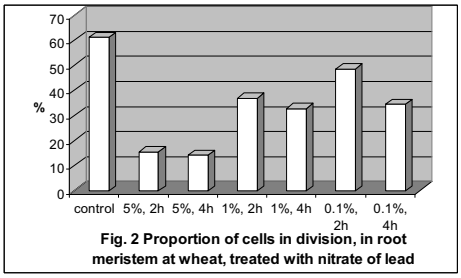

Fig. 2 Proportion of cells in division, in root meristem at wheat, treated with nitrate of lead

The situation for each phase of mitotic division is represented in figures 3, 4, 5 and 6. The percentage of the cells in prophase at all variants is small by comparison with control (fig.3).

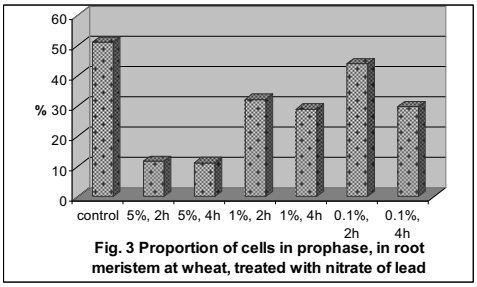

Fig. 3 Proportion of cells in prophase, in root meristem at wheat, treated with nitrate of lead

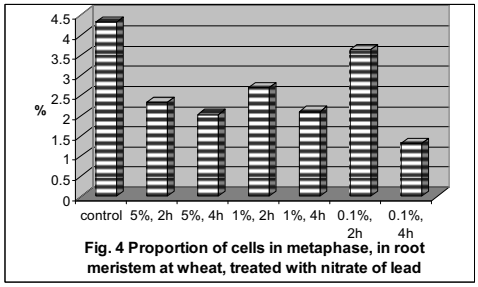

Fig. 4 Proportion of cells in metaphase, in root meristem at wheat, treated with nitrate of lead

Also, in metaphase, the percentage of the cells at all variants is low. The high percentage of cells in metaphase at the variants with 0.1% concentration (4 hours) is surprising (fig.4).

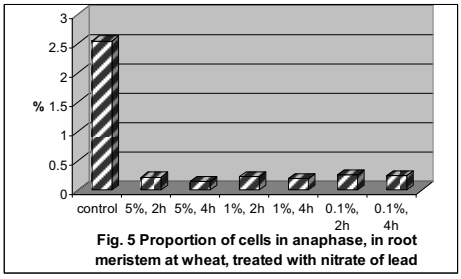

Fig. 5 Proportion of cells in anaphase, in root meristem at wheat, treated with nitrate of lead

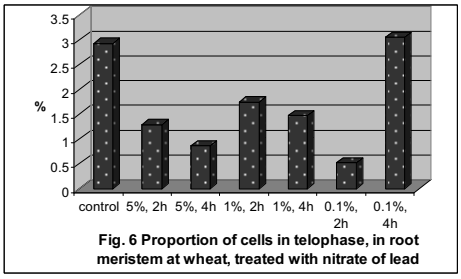

Fig. 6 Proportion of cells in telophase, in root meristem at wheat, treated with nitrate of lead

The proportion of cells in anaphase is very small at all experimental variants by comparison with control (fig. 5). In telophase, the percentage of cells remain low by comparison with control, but at variant with 0.1%, 2 hours, exceed control (fig. 6).

The analysis of the cells in aberrant metaphase and aberrant ana-telophase

In figure 7 is notice that the highest proportions of aberrant metaphases were induced by 5%, 4 hours and 1%, 2 hours. Aberrant ana-telophases were produced in high percentages at 1%, 4 hours and 0.1%, 2 hours (fig. 8).

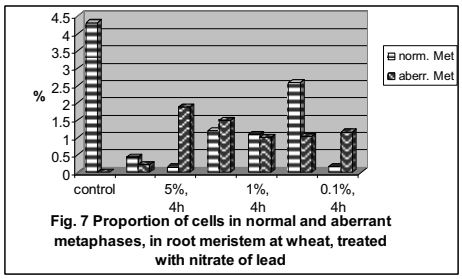

Fig. 7 Proportion of cells in normal and aberrant metaphases, in root meristem at wheat, treated with nitrate of lead

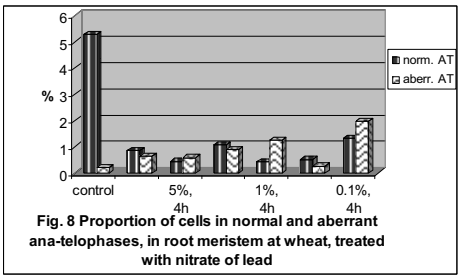

Fig. 8 Proportion of cells in normal and aberrant ana-telophases, in root meristem at wheat, treated with nitrate of lead

The analysis of the types of chromosomial aberrations

The proportion of the types of chromosomial aberrations induced by nitrate of lead on wheat root meristem is graphically represented in figure 9.

This polluting agent induced the chromosomial bridges at all variants, especially at variants with 5%, 2 hours and 0.1%, 4 hours.

The chromosomial fragments were present at variant with 5%, 4 hours.

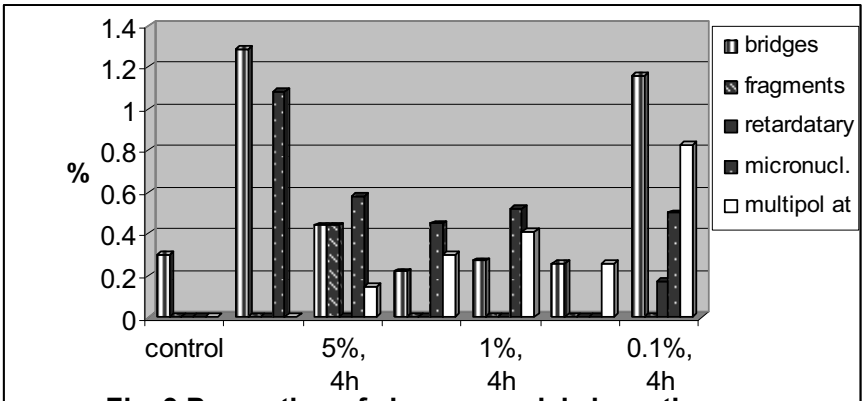

Fig. 9 Proportion of chromosomial aberration types in root meristem at wheat, treated with nitrate of lead

Retardatary chromosomes appeared only at variant with 0.1%, 4 hours.

Micronuclei appeared in interphases, were registered at majority variants excepting the variant with 0.1% concentration, 2 hours.

Multipolar ana-telophases were registered at all three concentration of the polluting (excepting variant with 5%, 2 hours), especially at variant with 0.1%, 4 hours.

A special effect constated at the polluting consist in the presence of many metaphases with picnotic chromosomes sparse in all mixoplasma. Such aberrant metaphase appeared at majority variants.

Different aspects of chromosomial aberrations induced by nitrate of lead are presented in figures 10-17.

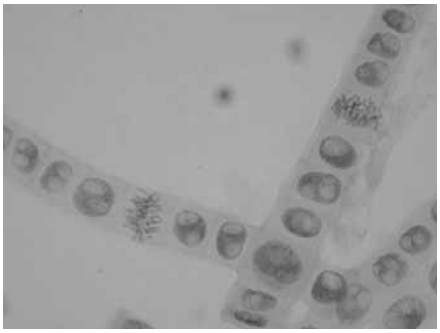

Fig. 10 Normal interphases and metaphases in root meristem at wheat (40X)

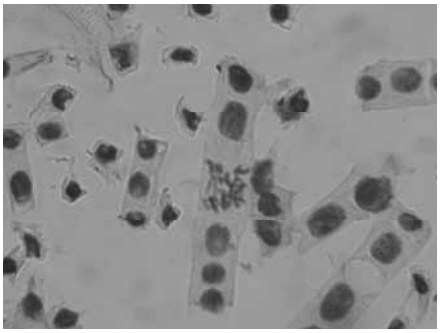

Fig. 11 Metaphase with picnotic chromosomes, in root meristem at wheat, treated with nitrate of lead 5%, 4h (40X)

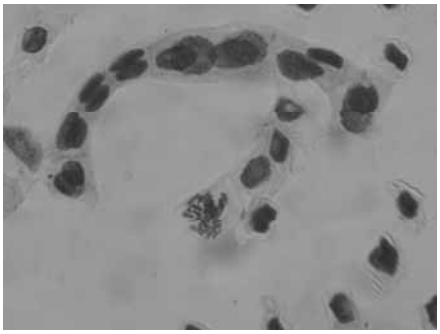

Fig. 12 Metaphase with picnotic chromosomes, in root meristem at wheat, treated with nitrate of lead 1%, 4 h (40X)

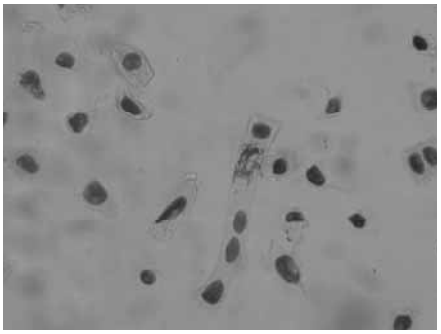

Fig. 13 Multipolar ana-telophase in root meristem at wheat, treated with nitrate of lead 0.1%, 2 h (40X)

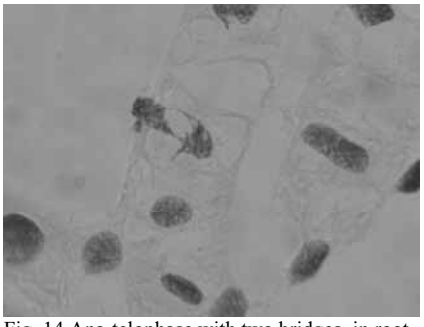

Fig. 14 Ana-telophase with two bridges, in root meristem at wheat, treated with nitrate of lead 1%, 4 h (40X)

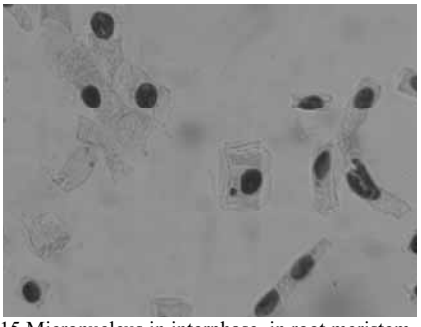

Fig. 15 Micronucleus in interphase, in root meristem at wheat, treated with nitrate of lead 0.1%, 4 h (40X)

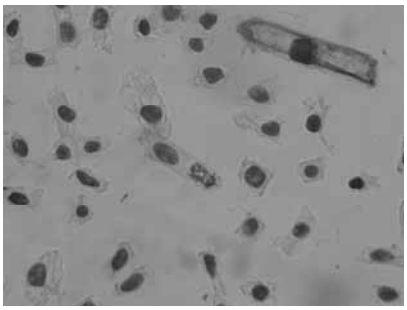

Fig. 16 Multipolar ana-telophase in root meristem at wheat, treated with nitrate of lead 0.1%, 2 h (40X)

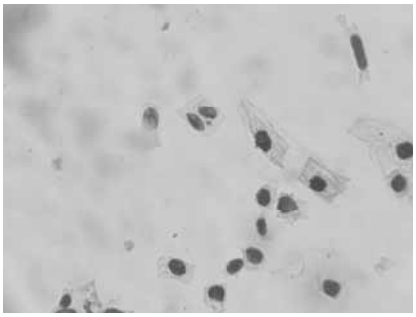

Fig. 17 Telophase with micronucleus, in root meristem at wheat, treated with nitrate of lead 5%, 2 h (40X)

CONCLUSIONS

Nitrate of lead, known as a polluting agent has a strong inhibitory effect on mitotic division of *Triticum aestivum* L.

Nitrate of lead has a real mutagenic potential, proof is diverse chromosomial aberrations by type: bridges, fragments, retardatary chromosomes, micronuclei, multipolar ana-telophases.

By beside the habitual chromosomial aberrations, nitrate of lead induced metaphases with picnotic chromosomes.

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