

THE INFLUENCE OF LEAD ACETATE AT FAVORIT AND PR64A83 CULTIVARS OF *HELIANTHUS ANNUUS* L.

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Abstract: The analysis of some cytogenetic parameters shows that the lead acetate application on Favorit and PR64A83 cultivars of sunflower exercises a light mutagen effect on the cells of the root apex. At same time an intensification of the frequency of the ana-telophases with aberration takes place, especially of those with bridges, with lagging and expelled chromosomes, but also of those with fragments, demonstrating the perturbation action that substance exercises on the division axle. The presence of ana-telophases with fragments proves that this substance induces breaches at the chromosomal level (clastogenic effect)

INTRODUCTION

The lead acetate $Pb(C_2H_3O_2)_2 \cdot 3H_2O$ is a crystalline, toxic product, which is dissolved in water. It is prepared by dissolving lead oxide in acetic acid. It is astringent. It is a crystalline salt with a sweet taste. It is prepared from litharge.

It crystallises in prisms. It has a molecular weight of 379.43 and a density of 2.49.

It is used in medicine and in technical dye works. It is used for obtaining yellow of chromium and white of lead. It is used in medicine as a reagent for identifying the S anion, with which it forms a black lead sulphide precipitate. It crystallizes in monoclinic crystals which under the action of air become efflorescent (Beral E., Zapan M., 1955; Ifrim S., 2004).

MATERIALS AND METHODS

The biological material is represented by sunflower seeds belonging to two hybrid early cultivars: Favorit and PR64A83 proceeded from the Botanical Garden in Iași. The germination was ensured in Petri boxes with moistened filter paper at a temperature of $22 \pm 2^\circ C$. After germination when the little roots are between 10-15mm the treatment was made like this:

- the control variant –the seeds and the embryonic roots have been maintained in distilled water for 3 hours.
- the treatment variants were made by placing 25 germinated seeds in solutions of nitrogenous lead with the following concentrations: 0.10; 0.25 and 0.50. The dilutions were made in distilled water.

For removing the lead acetate traces, the little roots were maintained for 2 hours in distilled water at the environment temperature. The settlement of the vegetal material was made in absolute ethylic alcohol: glacial acetic acid (3:1) for 20 hours. Until the moment of processing the little roots were kept in refrigerator, in an ethylic alcohol solution of 70%. The microscopic preparations were made using the Squash method (Cimpeanu et al., 2002). For this the little roots were subded to hydrolysis in 50% HCl (v:v) for 8 minutes and after this were coloured with 10% Carr solution for 24 hours.

For each variant five preparations were analysed and the photos were taken with the Nikon Eclipse 600 microscope, the 100x objective with immersion, with the aid of Nikon Cool Pix 950 digital camera.

RESULTS AND DISCUSSIONS

The mitotic index

The reactivity (as seen in figure 1) of the two varieties to the lead acetate treatment is similar only at the medium concentration (0.25%). At the PR64A83 cultivar the mitotic index decreases at the medium (0.25%) and maximal (0.50%) lead acetate concentration the only exception being recorded with the minimal lead acetate dilution, where the value of this parameter is superior from that of the control variant for all the treated variants.

For the Favorit cultivar the mitotic index decrease at all treated variants in comparison with the control variant, but at the minimal lead acetate concentration (0.10%) the value of this parameter is close to that of the control variant (figure 1).

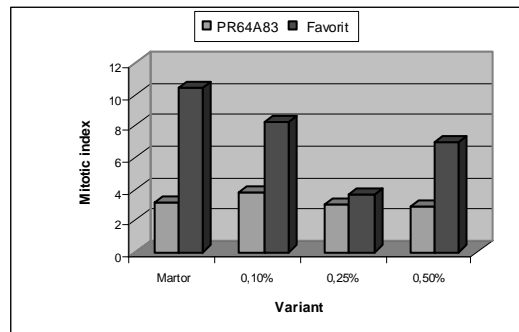


Figure 1. The mitotic index variation at the Favorit and PR64A83 cultivars after the lead acetate treatment

The acetate lead treatment application to the both cultivars determines the frequency of the cells that are in prophases to decrease. At the PR64A83 cultivar prophases weight is close to that of the control variant. At the Favorit cultivar, the treatment variants have resembling values, the only exception being recorded with the minimal lead acetate dilution, where the value of this parameter is inferior to that of control variant and for the all treated variants.

The percent of the cells that are in metaphases to both cultivars is different from that of the control variant. At the Favorit cultivar the number of cells that are in metaphases decreases at all the treated variants in comparison with control variant, at the PR64A84 cultivar, the metaphases frequency is superior only at minimal (0.10%) and medium (0.25%) lead acetate concentration to that of the control variant while at the maximal acetate lead concentration (0.50%) the value of this parameter is inferior to that of the control variant for all the treated variants (figure 2).

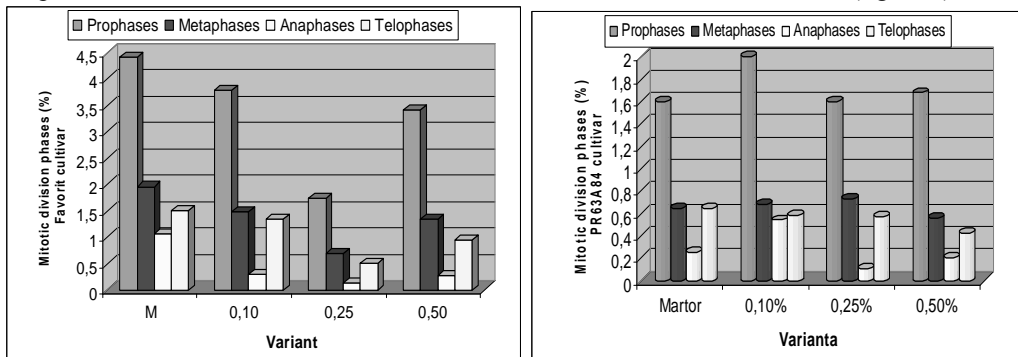


Figure 2. The frequency of cells that are in prophases at the Favorit (left) and PR64A83 (right) cultivars after lead acetate treatment

For the cells that are in anaphases, at the Favorit cultivar, are recorded bigger percents to that of the control variant at all the treated variants. In the case of PR64A83 cultivar the frequency of cells that are in anaphases decreases at the medium (0.25%) and maximal (0.50%) lead acetate concentration in comparison to the control variant, the only exception being recorded with the minimal lead acetate dilution, where the value of this parameter is superior to that of the control variant for all the treated variants.

The percent of cells that are in telophases to both cultivars is different to that of the control variant, At the Favorit cultivar the number of cells that are in telophases decreases at all the

treated variants in comparison with control variant. At PR64A83 cultivar the value of this parameter decreases proportionally to the increasing lead acetate concentration

At this variant the most important decrease of number of telophases is recorded to the PR64A83 cultivar at the maximal lead acetate dilution (0.50%) in comparison to the control variant and for all the treated variants which is in correlation with the decrease of the number of anaphases, being presupposed that this substance has a direct action on the well function of division axle and on the fragmoplast formation.

According to the results we can say that frequency intensification of cells in division at treated variants is realised mostly through the accumulation of prophases and more less of cells who are in metaphases

The frequency of cells with aberrations

Another cytogenetic parameter analysed was represented by the establishment of the frequency and main types of aberrations recorded in mitosis ana-telophases. Analysing figure 3 results that the weight of these is varying from one dilution to the other. Thus, at the both cultivars, the value of this parameter records an increase at all the treated variants in comparison to the control variant, the only exception being recorded at the Favorit cultivar at the maximal lead acetate dilution, where this value is inferior to that of the control variant for all the treated variants. At the minimal (0.10%) and medium dilution (0.25%) the frequency of cells with aberrations is close to both of the studied cultivars.

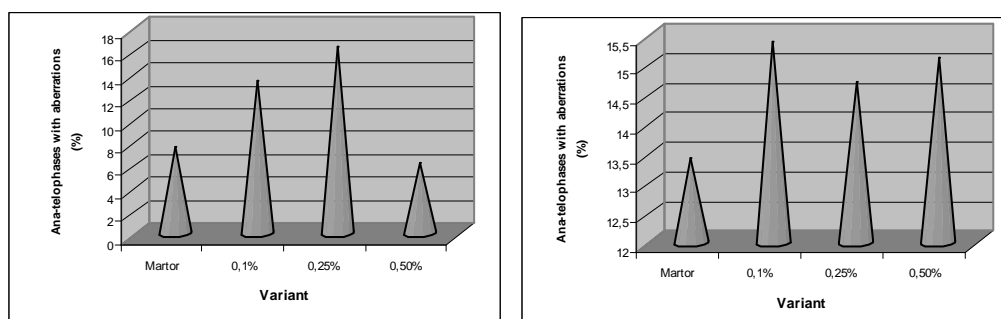


Figure 3. The frequency of ana-telophases with aberrations Favorit (left) and PR64A83 (right) cultivars

The spectrum of signalled aberrations is large enough, being represented by the ana-telophases with simple and multiple bridges, interrupted bridges, fragments, and a reduced number of the complex aberrations (ana-telophases with bridges and fragments) For the two cultivars it was revealed one aberration category which is not found to other cultivar Thus the ana-telophases with double bridges are shown at Favorit cultivar and ana-telophases with interrupted bridges only at PR64A83 cultivar (figure 4).

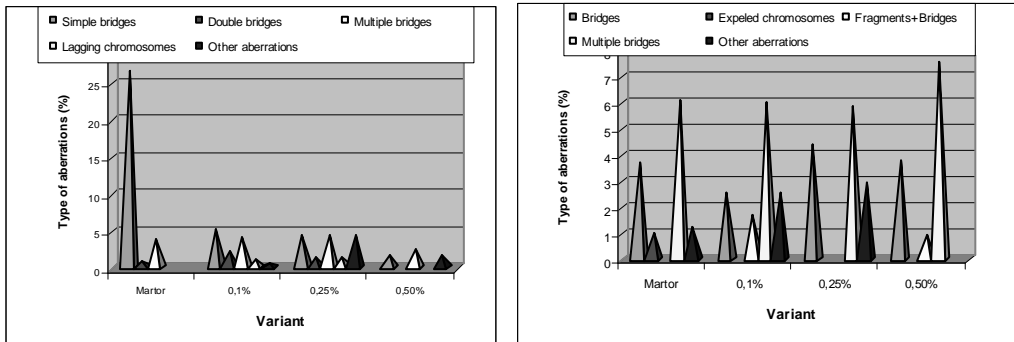


Figure 4. The main types of aberrations and their frequency at Favorit (left) and PR64A83 (right) cultivars

At the both studied cultivars the biggest weight had ana-telophases with bridges (simple and multiple) these being in enough numbers at the control variant, followed by the lagging chromosomes and ana-telophases with fragments (figure 5 and 6).

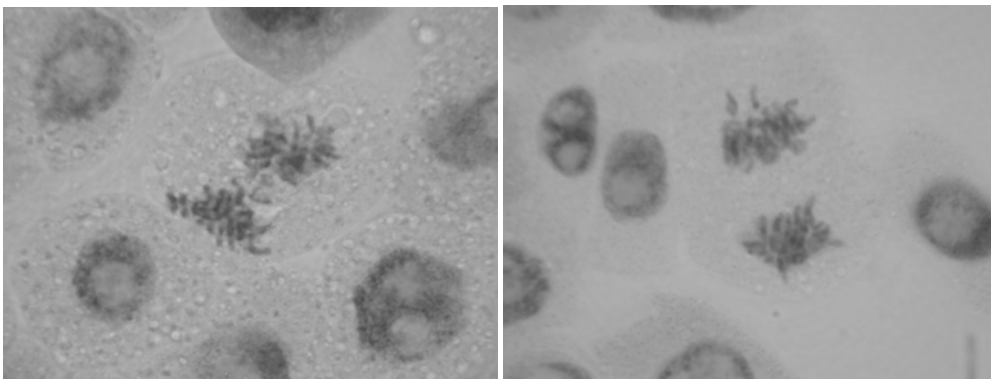


Figure 5. The lagging (left) and expelled (right) chromosomes at Favorit cultivar, after lead acetate treatment (0.25%).

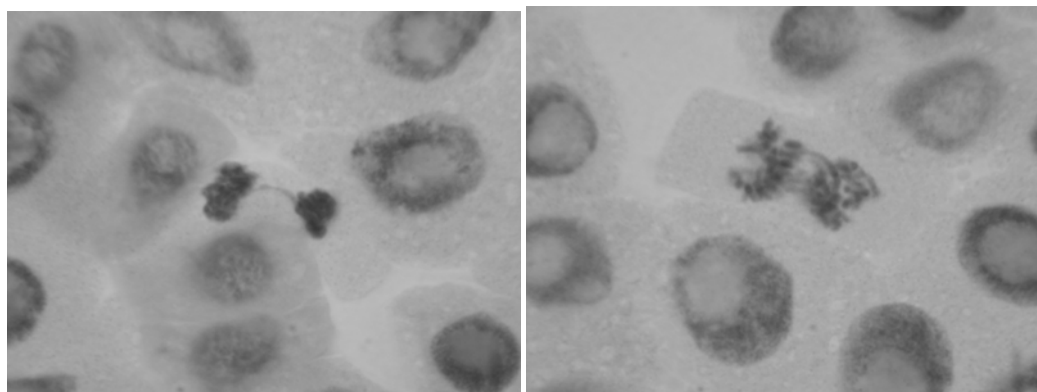


Figure 6. Ana-telophases with one bridge (left) and multiple bridges (right) PR64A83 cultivar, after lead acetate treatment

In accordance with the data from figure 7, representing the total frequency of chromosomal aberrations at the short lead acetate treatment at the two cultivars, we observed that this treatment in all of the used concentrations induces the growth of the total chromosomal aberrations. Also we observed that at the Favorit cultivar the greatest aberration frequency is registered with the medium lead acetate concentration (0.50%), and the minimum frequency value with the greatest lead acetate concentration, meanwhile at the PR64A83 cultivar the greatest frequency (15.38%) is registered at the minimal lead acetate concentration (0.10%) and the minimum value is registered at the control variant (13.41%).

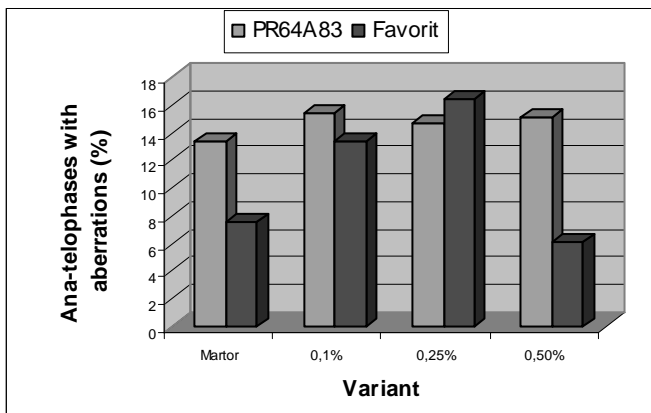


Figure 7. The total chromosomal aberration frequency in mitosis ana-telophases, Favorit and PR64A83 cultivars after lead acetate treatment

CONCLUSIONS

The mitotic index as a result, of lead acetate treatment application registers different values to all the realized treatments. The reactivity at this substance is varying from one cultivar to another that means that at the Favorit cultivar the greatest value is registered at the minimal lead acetate concentration, in comparison to the other treated variants, at the PR64A83 cultivar the greatest

value is registered at the same lead acetate concentration (0.10%) in comparison to the other treated variants.

The biggest weight of cells with aberrations at both cultivars it was recorded at the minimal and medium lead acetate concentration.

The aberrations spectrum in mitosis ana-telophases is large enough and is getting larger at the same time with the lead acetate treatment application. The most important aberrations types were: bridges (simple and multiple), ana-telophases with lagging chromosomes, and a reduced number of complex aberrations.

The lead acetate in all the used concentration induced the growth of the chromosomal aberration frequency at the both cultivars, the chromosomal aberration frequency from the treated variants exceeding the control variant.

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