

THE DEBIT INFLUENCE OF THE IRRADIATION SOURCE ON SOME CYTOGENETIC PARAMETERS AT *ECHINACEA PURPUREA* (L.) MOENCH.

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Abstract: The treatment with gamma radiations has determined the decrease of the mitotic index and the increase of the frequency of division aberration proportionally to the increase of the irradiation dose.

INTRODUCTION

The species which are pharmaceutically important belonging to *Echinacea* genus are well-known for their therapeutic qualities being some of the fewest herbs with immunostimulative and antiviral effects.

These species are from North America where the Indians used them especially in healing wounds, in snake bites or bee stings but they have not been known as medicinal herbs till 1982, in our country, when they were cultivated and it began their pharmacobotanical study (Tămaș and Hodișan, 1984).

This study has demonstrated the influence of gamma radiation on some cytogenetic parameters taking into consideration the studies on the improvement of *Echinacea purpurea* L. species having as a starting point the interest in using the radiation in the improvement of some medicinal herbs and the stimulants effect of the low doses of radiation on herbs (Ghiorghită, 1990; Ghiorghită et al., 1992; Floria, 1990; Floria et al., 1997).

The purpose of researches

Emphasize the effect of gamma radiation on the mitotic division in the cells of the root apexes of *Echinacea purpurea* L.

MATERIALS AND METHODS

The seed of *Echinacea purpurea* L. species, from the Agricultural and Zootechnic Research Centre of Secuieni Neamț, the 2003 harvest were irradiated in the Department of Medical Oncology and Radiotherapy, the laboratory of high powers – Cobaltotherapy, of the County Emergency Hospital “St. Spiridon” Iassy.

The flow of the source of irradiation was 19,26cGy/min and the doses of irradiation were: 3Gy (35 min, 17 sec - period of irradiation), 7Gy (35 min 39 sec), 10Gy (50 min 55 sec), 20Gy (101 min 51 sec), 30Gy (152 min 0.6 sec).

The germination was achieved in Petri plated, on filter paper soaked in distilled water to the 24°C (in the thermostat). When the little roots were 1-1.5 cm they were fixed in Clark fixing solution (ethanol:glacial acetic acid 3:1) at room temperature for 12-15 hours.

The hydrolysis were realized in a solution of HCl 50% (v:v) at room's temperature for 10 min and the Carr dye was used as a colorant. The examination of the slides was achievement with 20x objective being counted all the cells that were in interphase and mitotic division and also the ones with division aberrations (Cîmpeanu et al., 2002).

The photos of the cells were realised by means of Nikon Eclipse microscopy, using Nikon Cool Pix digital camera at 100x objective, with immersion oil.

RESULTS AND DISSCUSIONS

The treatment with gamma radiation determined the decrease of the mitotic index, proportionally to the increase of the irradiation dose (Fig. 1).

The value was a low one to a small dose of irradiation (3Gy) but it was related to control (3.69% comparatively with 1.73%). One can record the lowest mitotic index (1.71%) at the 30Gy variant, a half value comparatively to control (3.73%).

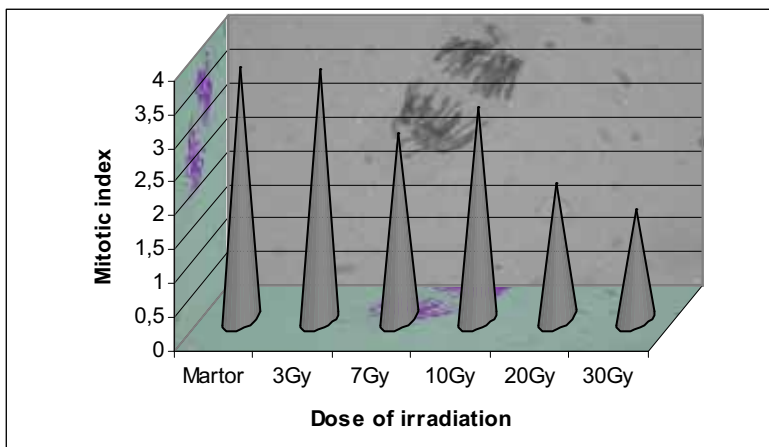


Figure 1. The mitotic index variation at *Echinacea purpurea* L. after the treatment with gamma radiation at the flow of the source of 19,26cGy/min

As it concerns the division on the phases of mitosis there were recorded cells in all the four phases of division.

One can see on analysing the Figure 2 that the frequency of the cells in prophase has been higher in all the studied variants and it was followed by the frequency of cells in telophase, metaphase and anaphase.

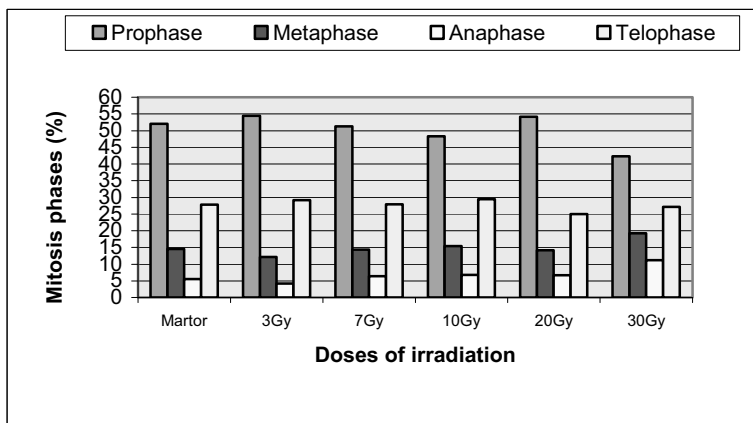


Figure 2. The frequency of the mitotic phases in *Echinacea purpurea* L. after gamma radiation treatment at the flow of the source of 19,26cGy/min

The physical treatment used has not determined important changes in the division phases induced just a slight increase or decrease in the frequency of cell in different phases of division, varying with the doses used

It was recorded an increase of the frequency of ana-telophases with aberrations after gamma radiation treatment proportionally to the increase of the irradiation dose (Fig. 3).

The exception is represented by the lower dose of 3Gy where the percentage of the division aberrations was closely enough to that of control (24.52 comparatively to 24.71).

A maximum value of the aberration percentage has been recorded to the highest dose used/ that of 30Gy (81.46% higher than to control) followed by the 20Gy variant (78.64% high that to control).

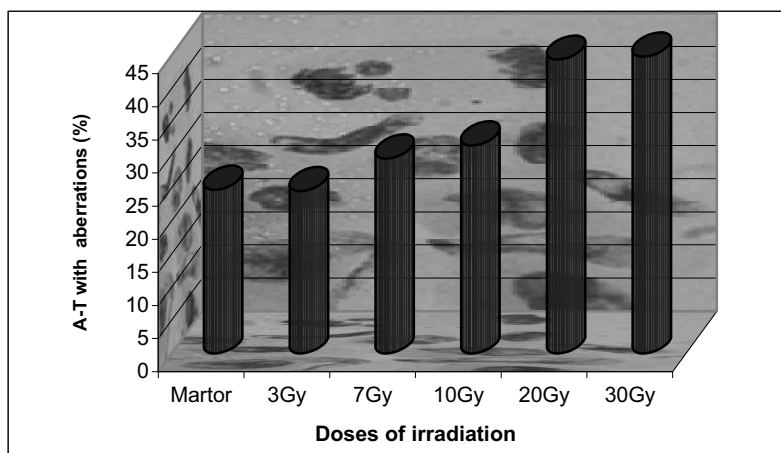


Figure 3. The frequency of ana-telophases with aberrations to *Echinacea purpurea* L. after gamma radiations treatment at the flow of the source of 19,26cGy/min.

The mutagenic treatment has induced the presence of a wide spectrum of division aberrations both simple and complex ones. The simple ones prevailed in all variant studied (Fig. 4).

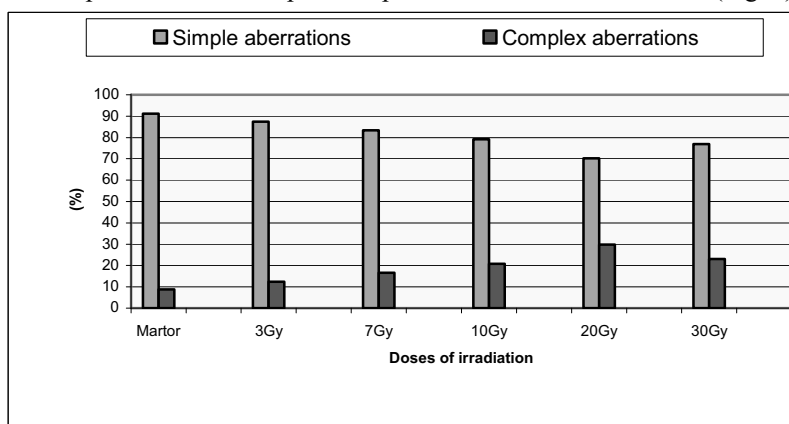


Figure 4. The frequency of division aberrations both simple and complex in the mitosis of *Echinacea purpurea* L after gamma radiations treatment at the flow of the source of 19,26cGy/min

The spectrum of the simple ones has been widely enough and it comprises: bridges, expelled chromosomes, lagging chromosomes, tripolar ana-telophases, micronuclei.

The spectrum of complex aberrations both control and to the variants of treatment has been widely enough: lagging chromosomes with expelled ones, bridges and expelled chromosomes, bridges-lagging chromosomes, bridges-lagging chromosomes-expelled chromosomes, bridges and micronuclei, bridges-lagging chromosomes-expelled fragments.

Trying to explain to cytogenetic effects to gamma radiation in *Echinacea purpurea* L., we consider that low flow allowed the improvement phenomena which happened between the events produced by irradiation.

The dose of irradiation used for a longer period of the time has determined that the breaks of chromosomes may appear asynchronously, thus implying the recombination of the fragments and it supported their rejoining (Băra, 1999; Băra et al., 2003).

CONCLUSIONS

The frequency of division aberrations has increased proportionally to the dose used.

The stimulation of the production of division aberration in ana-telopases is realized at highest dose used.

The treatment with gamma radiation induced a wide spectrum of aberrations and do not show specificity in the production of the types of aberrations depending on the dose used.

Gamma radiations have demonstrated a mutagen effects, excepting the Gy dose.

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