

Research Article



Investigation of Genotoxic Effect of Extreme Doses (Low and Higher) of X ray in Onion Roots

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ABSTRACT

The genotoxic effects of four different X-rays doses (100, 200 – low doses, and 2000, 2100- higher doses) on allium plant were evaluated by measuring chromosomal aberration : micronucleus formation, anaphase bridges and apoptotic cells. The results show the higher number of chromosomal aberration at onion root. According to obtained results we can conclude that by increasing the irradiation increasing and number of chromosomal aberrations: micronucleus formation, anaphase bridges and apoptotic cells, compared with low doses and control group.

Keywords: Genotoxic, effect, x ray, onion.

INTRODUCTION

Exposure of cells to ionizing radiation produces an extremely wide range of DNA damaging and mutational events. Chromosomal aberrations and phenotypic mutation induced by types of ionizing radiation like: neutrons, gamma rays, X-rays, electron stream, protons and carbon ion beams in both plants and animals such as: lentil, tomato, maize, barely, broad bean, wheat, rice, onion, *Trichosan thesanguina*, Tradescantia, African *Solanum in canum* L, mice, Lymphocytes and human hepatoma cells⁷. For evaluating genetic hazards of environmental mutagens, and /or carcinogens, Chromosomal aberrations induction and alteration of genetic material are the sensitive and important tests, because there is a clear association between chromosomal aberrations and certain types of cancer. The objective of this study is to evaluate the mutagenic effects of X-rays on *Vicia faba* root tip meristems by cytogenetic and molecular assays³.

MATERIAL AND METHODS

This experiment was carried out at the laboratory of Genetics Department of Biology, Faculty of Natural Science, while the treatment with radiation is done at the private radiology clinic "Devaja", at Gjilani city.

Onions (*Allium cepa* L.) were used throughout this study. The onion bulbs were obtained from the agricultural pharmacy, in city Gjilan.

Relatively big onion bulbs (sapling, or young plant), were divided into four groups, each group contained 10 of sapling, or young plant of onion. These groups were exposed to four x-rays doses: 100, 200 (low doses), 2000 and 2100 rad (higher doses) and un-irradiated group was added to the experiment as a control group.

After radiation the sapling, or young plant of onion cultivated for 7 (seven) days in laboratory conditions. After cultivation of young plant of onion, we have made the slides. From each onion we have done 2 slides.

Radiations treatments, X-ray treatments

Sapling of onion were exposed to four different X-rays doses: two lower doses (100 and 200 rad) and two higher dose (2000 and 2100 rad), by X-rays machine.

Staining

Staining of slide is done by giemsa.

RESULTS AND DISCUSSION

The results are presented at Table 1, as it show in table Chromosome aberration, such as: micronucleus formation, anaphase bridges and apoptotic cells, compared with control group.

Chromosome aberration which is dominant is by anaphase bridges with 42 anaphase bridges, where at higher doses registered 40 anaphase bridges, while in low doses registered 2 anaphase bridges.

Apoptotic cells registered 33, where 2 apoptotic cells registered at low doses and 31 apoptotic cells registered at higher doses.

The last is micronucleus formation with 19 micronucleus/ 200 cells, in low doses 3 micronucleus, while in higher doses registered 16 micronucleus.

As a whole the total number of DNA damage are registered at onions exposed to higher doses of radiations (2100 rad), where registered the 49DNA damage.

At doses 2000 rad of radiations, where registered the 38 DNA damage.



Table 1: Chromosome aberration of roots of onions, exposed to lower x-rays doses (100 and 200) and higher doses (2000 and 2100 rad)-irradiated group as a control group, counted in 200 cells).

Type of DNA damage	The lower x-rays doses expressed in rad			The higher x-rays doses expressed in rad			Control group
	100	200	Total number at lower doses	2000	2100	Total number at higher doses	
micronucleus formation	2	1	3	7	9	16	2
apoptotic cells	0	2	2	14	17	31	0
anaphase bridges	1	1	2	17	23	40	0
Total number of DNA damage	3	4		38	49		2

DISCUSSION

Aberrant chromosomal structures such as micronucleus formation, anaphase bridges and apoptotic cells as well as large cells were detected in most x-irradiation doses.

It was important to notice that the x-irradiation dose of 2100 rad which caused the significant increase of number of chromosomal aberrations: micronucleus formation, anaphase bridges and apoptotic cells, compared with low doses and control group.

Our results are in accordance to other authors, which works with different plants such as: *Allium*, *Vicia*, *Capsicum*, *Phlox*, in *Allium*^{8,1,2,4,6}, *Allium* and *Vicia*⁵, in *Capsicum annum*.

This investigation gives good evidence to the ability of X-rays to induce chromosomal aberrations as a result of deletion compromises at least few nucleotides as revealed by the appearance or disappearance of many bands as compared with the control⁴.

X-rays may generate free radicals which are interacted with DNA to account for the observed deletions as suggested by many workers in different plants after chemical or radiation treatments⁶.

CONCLUSIONS

According to obtained results we can conclude that by increasing the irradiation increasing and number of chromosomal aberrations: micronucleus formation, anaphase bridges and apoptotic cells, compared with low doses and control group.

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