

## **English Abstract**

**University:** King Saud University

**College:** Faculty of Science

**Department:** Botany and Microbiology

**Branch /Track:** Genetics Plant

**Title of Thesis:** " Mutagenic Effect of Gamma Irradiation on the Cytological and Physiological Aspects of *Pisum sativum* L.

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## Summary

*Pisum sativum* L. plants were used in this investigation to test the genotoxic effects of gamma rays. Also, germination vigour, vegetative growth and biochemical parameters such as photosynthetic pigments, nucleic acids and proteins at the cellular level were used to test the effect of gamma rays on *Pisum* Plant.

To study the cytotoxic effects, the meristem cells in root tips of *Pisum sativum* L. treated with different gamma ray doses (1, 2, 5, 7, 10, 15, 20, 30, 40, 50, 80, 100, 150 and 200 Gy) were tested on growth of seeds of *Pisum sativum* L. compared with control at different times of growth between 24,48,72 and 96 hrs. The LD50% was evaluated using Probit tables where, lethal concentration LD50% was decreased with the increase in time which caused an increase in percentage of mortality.

In all the above treatments, feulgen stain was used to prepare the slides for scanning by squash method. The results obtained can be summarized as the following:

-All the above treatments have been shown to decrease the mitotic index. (Inverse relation with doses).

The above treatments used have caused a decrease of normal mitotic phases, and an increase of percentage of abnormal mitotic phases, when compared with control.

-Also, all treatments used have caused different kinds of mitotic abnormalities and chromosomal aberrations, which were generally as follow: disturbed , stickiness, breaks and fragments, laggard and bridges, multipolar and ring chromosome, micronucleic and binucleat cells. These abnormalities occurred in treated cells due to the possible interference of gamma rays with the mechanism of formation of mitotic spindle. The

retardation of the gamma rays for Matrix material, means genotoxicity and clastogenic effect of the gamma rays.

This indicated that, there is significance differences between the mean results that were determined according to the T-test and ANOVA at the different gamma doses when compared with the control.

-Also, our study showed that, gamma rays decreased fresh and dry weight of shoot and root systems as compared with the respective controls, these results thus indicate that the effect of gamma rays might be a consequence of physiological and biochemical disturbances resulting from an induced status of stress. The inhibition of growth directly resulted from the disruption of electron flow in photosystem II during the light reaction of photosynthesis, which resulted in cessation of carbon incorporation and carbohydrate production.

-In addition, the gamma rays induced a decreased in the pigments contents because gamma rays inhibited the chlorophyll synthesis inducing lethal photooxidation reactions and the inhibition of carotenoid synthesis leads to chlorophyll degradation in the light as a result of the loss of the photoprotection that carotenoids are considered to provide.

-The protein content in root and shoot systems were significantly and high significantly decrease by gamma rays and the reduction of root growth may be correlated to the metal-induced inhibition of protein synthesis in root. The electrophoretic analysis of protein extracts from treated and untreated shoots and roots of *Pisum sativum* after 24hr from treatment using discontinuous SDS-PAGE gel showed qualitative and quantitative changes and that could be illustrated by the appearance of new bands, disappearance of some bands, changes in band intensity, changes in band relative mobility .

-The content of DNA and RNA has been decreased below the control level while the correlation between inhibition of nucleic acids and reduced tissue ATP and the reduce ATP were strong inhibitors of RNA and protein synthesis.