Nile Valley University Publications
ile Journal for Agricultural Sciences (NJAS
(ISSN: 1585 – 5507)
Volume 10, NO. 02, 2025
nilevalley.edu.sd

Effects of Gamma Radiation on Germination, Plant Height and Seed Viability of Okra (*Abelmoschus esculentus*)

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Received : 1. Jul. 2025 **Accepted :25. Oct. 2025** **Published : 23. Nov. 2025**

Abstract

This experiment was conducted to evaluate the effects of different doses of gamma radiation on germination at 15 days after sowing, plant height at 15 and 30 days after sowing, and seed viability in okra. Seeds were exposed to 0 (control), 200, 300, 400, and 500 Gy of gamma rays. Significant differences ($P \leq 0.01$) were observed in plant height at 15 days after sowing, and highly significant differences ($P \leq 0.001$) in germination and plant height at 30 days after sowing. However, high gamma doses of 400 and 500Gy markedly decreased the number of viable seeds while increasing unviable seeds. Low doses (200 and 300Gy) had no significant effects on seed viability compared to the control. A strong linear relationship was found between radiation dose and seed viability ($R^2 = 0.94$) and between dose and seed unviability ($R^2 = 0.95$). Increasing radiation doses significantly ($P \leq 0.05$) reduced and delayed seed viability, resulting in a 27% decline (from 100% in the control to 73% at 500 Gy). The results indicate that low doses of gamma radiation are non-detrimental to seed viability, while higher doses substantially impair germination and early growth in okra. Overall, these findings suggest that high gamma doses (≥ 500Gy) are detrimental to germination and growth, while moderate doses (200-400Gy) maintain viability and can even enhance growth through hormetic effects. Such information is valuable for optimizing gamma irradiation in mutation breeding programs aimed at generating variability without severely compromising seedling performance.

***Keywords**: Gamma radiation, hormetic effects, linear relationship, mutation breeding, okra, seed viability*