

ABSTRACT

Soybean is a legume plant that serves as a major source of protein and vegetable oil worldwide. The increasing demand for soybeans has not been matched by domestic production due to the still low yield of local soybean varieties. Technological innovations can boost soybean productivity, one of which is the development of superior varieties through mutation breeding. Mutation breeding offers benefits by inducing genetic changes in plants. Gamma irradiation, produced from nuclear decay, causes mutations in plants when exposed to gamma rays. This study aimed to determine the effect of gamma irradiation on the morphological and agronomic variation of M.1.1.3 soybean line in the M2 generation. The research was conducted from December 2024 to March 2025. Field experiments took place in Cot Putoeh Street, Meunasah Alue Village, Nisam Sub-district, North Aceh District, and laboratory work was carried out at the Agroecotechnology Laboratory, Faculty of Agriculture, Malikussaleh University. The irradiation doses used were 0 Gy (G0 = control), 150 Gy (G1), 250 Gy (G2), and 350 Gy (G3). Observations included morphological variation, germination percentage, plant height, number of branches, flowering time, harvest time, number of filled pods, number of empty pods, dry seed weight, 100-seed weight, and total yield. A total of 704 seeds were planted. From the control group, 30 plants were sampled; 45 plants were sampled from the 150 Gy and 250 Gy groups; while G3 samples were selected from all surviving plants. Data were statistically analyzed using paired t-tests in Minitab 14 with a 1% significance level. The results showed morphological changes such as leaf color, stem shape, pod length, and sterility. Agronomic changes included reduced plant height and germination rate. Proper irradiation doses increased branching, filled and empty pods, 100-seed weight, and yield, while extending flowering and harvest time.

Keywords: Gamma Irradiation, Genetic Diversity, Mutation Breeding, Soybean