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EFFECTS OF ^{60}Co GAMMA RADIATION ON THE GROWTH AND YIELD OF *Raphanus sativus* (RADDISH)

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ABSTRACT

Gamma radiation exposure can induce genetic changes in plants, leading to the emergence of a plant variety that exhibits enhanced efficiency in physiological and biochemical activities. This can result in enhanced productivity and improved appearance. Gamma radiation has been used by scientists in mutation breeding that generates exceptionally efficient plant varieties. As a first step, it is essential to identify the optimum range of radiation that might result in favourable genetic alterations. Therefore, an experiment was conducted to assess the effects of gamma radiation on the growth and yield of radish var. Ceeta. The seeds were subjected to different doses of gamma radiation using a ^{60}Co research irradiator located in HORDI, Gannoruwa, Sri Lanka. Two successive experiments were conducted, seeds in the initial experiment were exposed to gamma irradiation levels of 0 Gy, 20 Gy, 40 Gy, 60 Gy, 80 Gy, and 100 Gy, respectively. The second experiment was conducted by increasing the levels of radiation exposure to 0 Gy, 100 Gy, 200 Gy, 300 Gy, 400 Gy, and 500 Gy, based on the observations of the previous experiment. The treated seeds were planted in trays and after ten days, they were transplanted in farm field at the University of Colombo Institute for Agro-Technology and Rural Sciences in Hambantota. The planting was done using a Randomized Complete Block Design (RCBD), with four replications and twenty seedlings in each replication. The study was designed to assess morphological changes, germination, survival percentage, leaf length and width, root length, girth and weight of raddish. The data collected was analyzed using SAS 9.1.3 software and the treatment

means were compared using the DMRT at a significance level of 0.05. It was observed that doses of radiation ranging from 20 Gy to 100 Gy did not have any significant impact on the germination and survival of the plants. Therefore, there was an opportunity to increase the dosage beyond 100 Gy. In addition, increasing the radiation dosage to 500 Gy did not exceed the LD50 threshold. Plants exposed to a radiation dose of 500 Gy exhibited the flowering during the fourth week. There was significant difference among the treatments in terms of leaf length, width, weight, root girth, and root weight. Doses below 300 Gy did not produce any significant results, and as the gamma radiation dose increased, there was a gradual decrease in the parameters. It is possible to apply radiation stress above 500 Gy, however yield components should be taken into account. In conclusion, exposure to radiation levels of up to 300 Gy has a potential to enhance the development and productivity of radish.

KEYWORDS: Crop improvement, Mutational breeding, Radiation dose effects, Variation.

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