

Determination of lethal (LD) and growth reduction (GR) doses on acute and chronic gamma- irradiated Bambara groundnut [*Vigna subterranea* (L.) Verdc.] varieties

ABSTRACT

Bambara groundnut is a highly nutritious underutilized legume with enormous potential to sustain food security in resource-poor countries. However, its potential for improvement through conventional breeding (< 2% success rate) limitation due to the nature of the flowers. Thus, the most viable method of improving this crop is by creating genetic variability through induced mutagenesis. The present study was conducted to evaluate the radiosensitivity of two Bambara groundnut varieties irradiated with acute and chronic gamma irradiations to determine the lethal dose (LD) and growth reduction dose (GR). Healthy seeds of both varieties were exposed to acute gamma irradiation using Cesium-137 at 0, 25, 50, 75, 100, 125, 150, 175, 200, 250, and 300 Gy. For chronic irradiation, two-week-old seedlings of the two genotypes were exposed to accumulated doses of 0, 8.52, 17.04, 35.56, 34.09, 42.61, 59.65, 93.74, 144.87, 255.64, and 570.94 Gy, respectively, in Gamma Green House (GGH) for 60 days. The result from the variance analysis indicated highly significant differences ($P < 0.01$) for all evaluated traits except for internode length. A linear regression model was developed to determine the mean LD and GR of both genotypes. The established lethal doses (LD₂₅, 50, 75) for acute gamma irradiation on Ex-Sokoto variety were 75, 160, and 250 Gy while 68, 148, and 227 Gy were recorded for Karo variety, respectively. For chronic irradiation, the established growth reduction doses for Ex-Sokoto were 47, 250, and 444 Gy, whereas 70, 264, and 452 Gy were observed in Karo. Variations were observed between the gamma-irradiated genotypes and the methods of irradiations. Generally, the growth, development, and survival rate of Bambara groundnut increase with a decrease in gamma-irradiation doses. The established LD and GR doses from this study can be utilized in large-scale mutagenesis breeding programs for generating a wide range of mutants in Bambara groundnut.

Keyword: Bambara groundnut; Acute irradiation; Radiosensitivity; Chronic irradiation; Gamma rays