World Academy of Science, Engineering and Technology
International Journal of Biomedical and Biological Engineering
Vol:14, No:09, 2020

Radioprotective Efficacy of Costus afer against the Radiation-Induced Hematology and Histopathology Damage in Mice

Authors : Idowu R. Akomolafe, Naven Chetty

Abstract : Background: The widespread medical application of ionizing radiation has raised public concern about radiation exposure and, thus, associated cancer risk. The production of reactive oxygen species and free radicals as a result of radiation exposure can cause severe damage to deoxyribonucleic acid (DNA) of cells, thus leading to biological effect. Radiotherapy is an excellent modality in the treatment of cancerous cells, comes with a few challenges. A significant challenge is the exposure of healthy cells surrounding the tumour to radiation. The last few decades have witnessed lots of attention shifted to plants, herbs, and natural product as an alternative to synthetic compound for radioprotection. Thus, the study investigated the radioprotective efficacy of Costus afer against whole-body radiation-induced haematological, histopathological disorder in mice. Materials and Method: Fifty-four mice were randomly divided into nine groups. Animals were pretreated with the extract of Costus afer by oral gavage for six days before irradiation. Control: 6 mice received feed and water only; 6 mice received feed, water, and 3Gy; 6 mice received feed, water, and 6Gy; experimental: 6 mice received 250 mg/kg extract; 6 mice received 500 mg/kg extract; 6 mice received 250 mg/kg extract and 3Gy; 6 mice received 500 mg/kg extract and 3Gy; 6 mice received 250 mg/kg extract and 6Gy; 6 mice received 500 mg/kg extract and 6Gy in addition to feeding and water. The irradiation was done at the Radiotherapy and Oncology Department of Grey's Hospital using linear accelerator (LINAC). Thirty-six mice were sacrificed by cervical dislocation 48 hours after irradiation, and blood was collected for haematology tests. Also, the liver and kidney of the sacrificed mice were surgically removed for histopathology tests. The remaining eighteen (18) mice were used for mortality and survival studies. Data were analysed by one-way ANOVA, followed by Tukey's multiple comparison test. Results: Prior administration of Costus afer extract decreased the symptoms of radiation sickness and caused a significant delay in the mortality as demonstrated in the experimental mice. The first mortality was recorded on day-5 post irradiation, and this happened to the group E- that is, mice that received 6Gy but no extract. There was significant protection in the experimental mice, as demonstrated in the blood counts against hematopoietic and gastrointestinal damage when compared with the control. The protection was seen in the increase in blood counts of experimental animals and the number of survivor. The protection offered by Costus afer may be due to its ability to scavenge free radicals and restore gastrointestinal and bone marrow damage produced by radiation. Conclusions: The study has demonstrated that exposure of mice to radiation could cause modifications in the haematological and histopathological parameters of irradiated mice. However, the changes were relieved by the methanol extract of Costus afer, probably through its free radical scavenging and antioxidant properties.

Keywords : costus afer, hematological, mortality, radioprotection, radiotherapy
Conference Title : ICABMPHT 2020 : International Conference on Applied Biophysics, Medical Physics and Healthcare Technologies
Conference Location : Toronto, Canada
Conference Dates : September 21-22, 2020