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Irradiation-Dose Optimization for Mutation Induction in Coffee

Coffee, a perennial tropical crop, can be grown from seeds or cloned plants in the form of cuttings, grafts or tissue cultured plants. Arabica coffee is most commonly grown from seeds while canephora is mostly grown vegetatively from cuttings and other propagules. Improving coffee through conventional breeding is seriously limited by the availability of genetic variation. Mutation breeding provides great potential to induce the novel genetic variation needed for coffee improvement. The process of optimizing dose involved dose-response experiments where the pattern of reduction in germination or growth rate is determined in relation to increasing absorbed doses. From these experiments, the LD/GR50 and LD/GR30 are calculated. In coffee after adjustment trials on seeds and vegetative parts using our in-house gamma and X-ray irradiators, we came to a range of: 0, 50, 100, 150, 200, 400 Gy for C. arabica seeds and: 0, 5, 10, 15, 20, 30 and 40 Gy for seedlings and cuttings of C. arabica and C. canephora. The protocol for seed treatment follows the general procedure which starts with sorting clean and viable seeds, moisture equilibration in a desiccator with 60% glycerol, irradiation treatments, planting the treated material in suitable set-up such as moist filter papers in petri-dish, soil in trays or pots and incubate at appropriate condition under warm condition 28-30℃. Germination or growth rates after 30 days are recorded and plotted relative to the untreated seeds over the series of the doses and from the blotted graph the doses for LD50, GR50 and LD30, GR30 estimated. The estimated dose can be used for bulk treatment. The same follows for vegetative propagules (cuttings, seedling, embryo etc) except that the applied doses here are relatively low in the order of 0 to 40 Gy. The protocols will be reviewed for dissemination and wide adoption by member states.

Country or International Organization

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