Radiation induced mutants in cassava (Manihot esculenta Crantz)

Stem cuttings and true seeds of three promising cultivars of cassava were exposed respectively to 1 to 5 kR and 10 to 50 kR acute gamma rays from a ^{60}Co source. Treatments of stem cuttings beyond 5 kR and seeds beyond 50 kR were lethal. One mutant each in the cultivars M4, H-165 and H-2304 was obtained from the stem irradiated populations. Another mutant was found in the seed irradiated progeny of H-2304. The mutant of M4 is characterised by light green (chlorina) leaves. The mutant of H-165 shows significantly shorter petiole (22,5 against 35.2 cm) and narrow leaf lobes, while the H-2304 mutant shows speckled leaves, branching and early flowering. The mutant found in the seed irradiated progeny of H-2304 is having yellow tuber flesh indicating the presence of carotene.

The mutants may be useful in studies related to basic information as well as in practical breeding. The chlorina mutant in M4 showed slow growth and high HCN content in leaves. Late branching may be a useful trait in the traditionally non-branching clones of cassava to maintain the desirable leaf area index during high leaf fall period. Early flowering could be useful in a recombinant breeding programme. The tuber yield of the short petiole mutant in H-165 increased by 20% - 25% through closer planting. The narrow leaf lobes of this mutant permit better light penetration to lower leaves.

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In vitro techniques for mutation breeding of tropical root and tuber crops

To assist IAEA Technical Co-operation projects, the Agricultural Section of the IAEA Laboratory in Seibersdorf is developing techniques for in vitro mutation breeding of cassava (Manihot esculenta) and yam (Dioscorea alata, D. rotundata). The first aim was to induce morphogenesis (plant regeneration) in tissue culture and establish techniques for in vitro propagation. Subsequently, the in vitro mutation breeding technology is being developed.

(i) Cassava is one of the important staple food crops of tropical countries. Pest and disease resistance as well as low toxic cyanide content are among the objectives for genetic improvement. For in vitro mutation induction we use shoot-tip and node culture.

Shoot apices (1 and 2 mm long) are aseptically dissected from cassava buds and cultured on MS medium with 1 mg/l thiamine, -naphthalene acetic acid, 6-benzyladenine and gibberelic acid. Elevated concentration of 6-benzyladenine is used for multiple shoot formation. The rapid multiplication was induced in liquid medium, when flasks were placed on a gyratory shaker with 60 rpm at 28°C during 16/8 light/dark photoperiod. Nodes with axillary buds from in vitro growing plantlets were irradiated with gamma rays. Doses of 30 to 45 Gy allowed the survival of approx. 50 percent of explants and subsequent shoot proliferation from axillary buds. Radiosensitivity of cassava genotypes may be different and this will be investigated in future experiments.

(ii) Yams are likewise important tuber crops, particularly in West Africa, South-East Asia and the Caribbean. The main breeding objectives are improved yield, shortened growth period, improved storability (resistance of tubers to fungal attack), shoot tip cultures have been utilized for