INDUCED MUTATION BREEDING IN CASSAVA (*Manihot esculenta* Crantz) CULTIVAR 'Bosom Nsia'

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1. INTRODUCTION

Cassava is one of the most important staple food crops in the lowland tropics. In most cassava producing countries, it is mainly utilized for human consumption. It is used for 'fufu', 'banku', 'yakayake', and dried for use. Cassava remains a valuable source of energy and is cheaper in economic terms than many alternative foods. Cassava leaves are a good source of protein and vitamins, and are used as food in Africa [4]. In Ghana, 'Bosom Nsia' is one of the most widely grown cultivars probably because of its good cooking quality and fast maturation in six months. However, this cultivar is highly susceptible to cassava mosaic virus disease (CMV), hence the need to improve its resistance to the disease.

Various *in vitro* techniques have been developed for cassava research [1, 2, 5, 6]. Klu and Lamptey [3] reported irradiation doses of 25 and 30 Gy to be ideal for *in vitro* mutagenesis of cassava. These doses were applied to *in vivo* and *in vitro* mutation for breeding CMV resistance in the cultivar 'Bosom Nsia'.

2. MATERIALS AND METHODS

2.1. *In vitro* techniques

Two batches of 150 shoot tips each were irradiated with 25 and 30 Gy gamma rays.. Meristems were isolated and cultured on a two-stage media. Plantlets (M_1V_1) were hardened and transferred to field conditions for selection. Preliminary studies were made to generate somatic embryos from meristematic tissues and young leaf-lobes.

2.2. *In vivo* techniques

Three batches of 350 stakes of cassava, 15 cm long with about 20 axillary buds were irradiated at 20, 25 and 30 Gy, and planted in a field to observe and select resistant variants. Eleven local cultivars were collected for future studies.

A system based on 0-9 score was used to assess disease incidence. 0 = no symptoms; 2 = 1/4 of plant showed symptoms; 4 = 1/2 of plant showed symptoms; 6 = 3/4 of plant showed symptoms; 8 = whole plant infected; 9 = dead plant.

3. RESULTS AND DISCUSSIONS

Field performance of plants in relation to disease incidence is as shown:

	In vitro		*In vivo*	
Irradiation dose (Gy)	(25)	30	(20)	25 30
Score	No. of plants	% plant population	No. of plants	% plant population
0	-	-	-	-
2	(1) 2	(0.47) 0.68	-	-
4	(6) 9	(2.87) 3.0	-	-
6	(36) 44	(17.22) 15.0	(14) 10 6	(5.3) 3.9 3.14
8	(88) 163	(42.10) 55.82	(162) 110 64	(61.8) 43.833.50
9	(61) 52	(29.18) 17.80	(53) 56 68	(20.2)22.3135.50
10	(17) 22	(4.7) 7.5	(33) 75 53	(12.59) 29.88 27.74

Preliminary studies on cassava somatic embryogenesis using meristem and adaxial portions of young leaf-lobes showed that both explants have the potential of somatic embryogenesis, but meristem explants were found to be more consistent in generating somatic embryos.

4. CONCLUSIONS

In vitro mutagenesis seems to have a better potential for generating resistant or tolerant variants than *in vivo* mutagenesis. Other aspects of *in vitro* techniques need to be exploited in the search for a genotype which would be resistant to CMV. Irradiated somatic embryos are potential explants that could generate the desired genotypes.

REFERENCES

[1] ADEJARE, G.O., COUTTS, H.A. (1981) Eradication of cassava mosaic disease from Nigerian cassava clones by meristem tip culture. Plant Cell, Tissue and Organ Culture 1: 25-32.

[2] KARTHA, K.K., GAMBORG, O.L. (1970) Cassava tissue culture principles and applications.pp.711-25. In: Plant Cell and Tissue Culture: Principles and applications, (W.R. Sharp, P.O. Larsen, E.F. Paddock and V. Raghavan Eds.) pp. 892. Ohio State Univ. Press, Columbus.

[3] KLU, G.Y.P., LAMPTEY, T.V.O. (1989) Gamma-radiation sensitivity and methodology for mutant isolation in Cassava (*Manihot esculenta*). GAEC Tech. Report Series (In Press).

[4] LANCASTER, P.A., HIGRAM, J.S., LUIN, M.Y., COURSEY,D.G. (1982) Traditional cassava based foods: Survey of processing techniques. Econ. Bot. 36: 12-45.

[5] STAMP, J.A., HENSHAW, G.G. (1987) Somatic embryogenesis in cassava. Z. Pflanzenphysiolog. 105: 97-102.

[6] STAMP, J.A., HENSHAW, G.G. (1987) Somatic embryogenesis from clonal leaf tissues of cassava. Ann. Bot. 59: 445-450.