IMPROVEMENT OF BAMBARA GROUNDNUT PRODUCTION USING INDUCED MUTATIONS

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1. INTRODUCTION

Bambara groundnut (*Vigna subterranea* (L.) Verdc. syn. *Voandzeia subterranea* (L.)) is a fairly drought-tolerant, tropical crop which grows well in hot dry regions with poor soils regarded as marginal for other pulses [4,5]. It is cultivated in the coastal and Northern regions of Ghana where the low yield (not exceeding 300kg/ha) and the long cooking time [6] have made it a subsistence crop. It ranks third after groundnut (*Arachis hypogaea* L.) and cowpea (*Vigna unguiculate* L.) as a source of plant protein in the diet of Ghanaians. The crop has indeterminate flowering and fruiting habit which contributes significantly to its poor yield [1,3,6]. Desirable variation for this trait is not available in the popularly cultivated varieties. Mutagenesis has, therefore, been attempted as a means of creating the desired variation from which determinate-flowering types would be obtained to improve yield.

Induction of variation in bambara groundnut using gamma radiation has been tried before [2,6]. However, no mutants with the desired determinate flowering habit and synchronous pod maturity were obtained. Instead, highly aberrant phenotypes (albina, xantha, crinkled leaf, vegetative, dwarf and sterile types) were obtained in field-tested M_3 plants. Reasons that may be attributed to these are the use of a limited number of genotypes and application of too high doses of gamma radiation.

A number of under-exploited landrace varieties of the crop exist, some of which probably harbour this rare but desirable trait. In view of the results obtained by earlier workers [2,6], there is need to embark on an extensive field exploration exercise to assemble the available germplasm for incorporation in the breeding programme.

The project is aimed at: i. conducting a nationwide exploration exercise to collect germplasm of bambara groundnut for agronomic evaluation with respect to flowering and fruiting characteristics and their effects on yield. ii. applying the technique of mutation induction to create variability (if this is not found in the germplasm. to be collected) from which mutants with determinate flowering and fruiting habit may be selected for use in breeding.

2. MATERIALS AND METHODS

The following workplan is proposed for this project:

First year:
Germplasm collection and agronomic evaluation:

A nation-wide germplasm collection programme will be carried out to assemble as many genotypes as possible. Seeds collected will be multiplied and planted in the field to study flowering and fruiting behaviour of the various genotypes and their effects on yield.

Second year:
Radiosensitivity test:

Four varieties exhibiting flowering and fruiting characteristics together with high yield will be selected for radiosensitivity test. For this, fifty seed lots of each will be irradiated at the following doses using gamma radiation: 0 (control), 100,150, 200, 250 and 300 Gy. Plant height at full expansion of leaves and survival at 30 days after planting will be used to determine germination and LD_{50} respectively. Useful doses for mutation induction in the four varieties will be chosen based on results obtained from this test.

Mutation induction:

Five thousand seeds per variety will be irradiated at the selected dose and planted in the field. Following flowering and fertilization, M_1 plants will be observed for signs of early maturity. The 10 most mature seeds will be harvested from each surviving plant and bulked as M_2 seed. The bulked seed will be sown in the field as M_2 generation.

Third year:
Selection of desirable aberrant types:

A phenotypic appraisal of M_2 plants will be made with regard to plant architecture, synchronous flowering and prolonged grain filling. Desirable plants will be harvested individually for progeny testing in M_2. Seeds of normal looking M_2 plants will also be harvested and sown in plant progeny rows as M_3. Data on flowering date and duration, maturity pattern and yield will be collected in M_3. Selection of desirable plants will be continued in this generation, and they will be tested further during the next two generations and compared with parent cultivars.

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