3. Identifying the Physiological and Genetic Traits that Make Cassava One of the Most Drought Tolerant Crops

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Mid-year Report
Activities accomplished:

1. *In vitro* micropropagation of drought tolerant cassava contrasting varieties at Embrapa, Brazil. The *in vitro* plants imported from CIAT were not able to go directly to the field due to the lost of many plants during delayed importing process.

2. Establishment of a field trial with 56 drought tolerant contrasting cassava varieties in Petrolina, Brazil, to evaluate drought tolerance related traits.

3. Establishment of a crossing block at CIAT, Colombia, for pair-wise crosses between the contrasting genotypes to produce segregating populations for genetic mapping of traits associated with drought tolerance.

4. Establishment of a trial with 36 and 34 drought tolerant genotypes in ICA-Nataima and El Guamo (Department of Tolima), Colombia, respectively to evaluate drought related traits

5. Field establishment of a trial with 10 contrasting cassava genotypes in Tamale, Ghana. These varieties were selected from the SARI current germplasm and from farmers who indicated the drought tolerant genotypes. Growth analysis data were collected.

6. Field establishment of a trial with 9 drought tolerant contrasting cassava varieties at Hombolo, Dodoma, Tanzania. These 9 varieties were identified in two previous field evaluated trials. Preliminary data on sprouting (establishment), disease (cassava mosaic disease-CMD and cassava brown streak disease-CBSD) and pest (cassava green mites-CGM) incidence have been collected.

7. Preliminary studies to assess the genetic distance amongst contrasting drought tolerant cassava varieties at IITA, Nairobi, Kenya. Ten varieties, selected from IITA drought tolerant mapping population, were screened at eight SSR loci and data analysed using NTSYS and the algorithm of Nei's similarity.

Tangible outputs delivered:
1. Drought tolerant contrasting cassava varieties identified
2. *In vitro* plants of the drought tolerant contrasting varieties produced
3. Crossing blocks of drought constrasting cassava varieties established
4. Field trails in the target sites (Brazil, Colombia, Ghana, and Tanzania), to evaluate drought tolerance related traits, established

Deviations from the work plan:
The following constraints have been faced in this project: 1) Delay for releasing the plant materials (imported from CIAT) from Brazilian Ministry of Agriculture to CENARGEN (for quarantine); 2) Delay from CENARGEN to CNPMF; 3) Damages occured in the imported *in*

vitro plants; and 4) Delay for acquisition of equipments for evaluation of physiological parameters in the field.

These constraints have caused significant delay of the original workplan and can be minimised by an extension of the project's activities.

4. An Eco-physiological – statistical Framework for the Analysis of GxE and QTLxE as Occurring in Abiotic Stress Trials, with Applications to the CIMMYT Drought Stress Programmes in Tropical Maize and Bread Wheat

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Mid-year Report

The planned tasks for the period December 2005 - May 2006 were (continuation of):

1. Data base construction
2. Genotypic and environmental characterisation
3. Single cross GxE and QTLxE analyses

Close by deliverables (planned for the end of September 2006) are 1) workable data base with genotypic, phenotypic, and environmental information; 2) draft papers for wheat and maize on useful GxE and QTLxE methodology and results of the application of this methodology.

Maize

Tasks 1, 2 and 3 in the proposed schedule have been largely completed for three important CIMMYT maize populations (C1, C4, C6).

Task 1: The database for maize is operational and ready to use in GxE and QTLxE analysis. All phenotypic and genotypic information has been collated and is ready-to-use, as well as most of the environmental information. Work on selection and inclusion of climatic information has started. Values for some drought stress indices need to be calculated.

Task 2: Inspection of which drought stress indicators to use has been initiated. For both tasks 1 and 2, extensive communication with the data owners/producers took place, leading to a better understanding of the characteristics of the maize (and wheat) data sets.

Task 3: The C1 population has been analysed using a mixed model approach. GxE and QTLxE single trait models were constructed and applied to the C1 population. Furthermore, a multi-trait multi-environment QTL analysis was developed and applied (see ppt slides). Results of these analyses were reported at the "Workshop Gene-Plant-Crops-Relations" held in Wageningen, 23rd to 26th of April, 2006, and two publications in the form of Proceedings chapters were submitted.