Investigating Drought Tolerance of Crops: Genomics-based approaches to improve drought tolerance in Bambara Groundnut (Code: Bam1-007)

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Drought is a key constraint to crop yield in farming systems. As water resources for agronomic uses become more limiting, improving drought tolerance is therefore of outmost important for crop breeding and food security. However, drought tolerance is a complex process. Plants respond to drought stress condition via a series of physiological, cellular, and molecular processes. Recently, many drought-inducible genes have been identified by molecular and genomic approaches in various plant species, such as in *Arabidopsis* and rice. Now, more accurate targeting of genes and analysing the functions of the genes are critical to further our understanding of the molecular mechanisms governing plant drought stress response and tolerance, ultimately leading to enhancement of stress tolerance in crops through genetic manipulation.

Bambara groundnut *(Vigna subterranea)* is an underutilised crop grown as secondary food source by subsistence farmers in Africa. Bambara groundnut is a species with potential having excellent nutritional content, ability to fix nitrogen and produce yields in marginal soils and its drought tolerance. Though it is known to be drought tolerant, there is limited information on how Bambara groundnut responds and adapts to drought. This study focuses on the analysis of the drought-response transcriptome, and physiological responses to drought in Bambara groundnut. The main objective of the experiments is to investigate drought tolerance in Bambara groundnut between different landraces at molecular and physiological level. Therefore, the principal focus of the experiments is to profile the response of Bambara groundnut transcriptome to drought stress using a cross hybridising with the soybean GeneChip array; to identify genes of potential importance to drought tolerance; to identify key gene networks that respond to drought stress and relating their regulation to adaptive abilities occurring during drought stress; and to evaluate their effects on plant growth, reproductive development and plant morphology between different landraces.

Outputs / Deliverables

Molecular mechanism for drought tolerance could help in better understanding of the crop. Identifying genetic, morphological and physiological variation for drought response in different landraces of Bambara groundnut will help in identifying a couple of contrasting lines. Newer molecular markers discovered from genomics-based approaches including gene regulated network and QTL could provide to direct the crop breeding of genotypes that provide stable crop yields under widely varied environmental conditions. The data that will be obtained in this research work will build the foundation for a knowledge-based plant breeding, genetics and molecular.