

### Physiological characterization of sorghum varieties under dry-down experiment

#### Explanation and Purpose

Physio-phenological characterization is needed to better understand the connection between genetics and plant physiology under water stress conditions. For this purpose, six different sorghum varieties were compared in a dry-down experiment. Physiological parameters, like leaf area, transpiration rate, leaf relative water content, gas exchange measurements and chlorophyll fluorescence were monitored continuously during two dry-down pot experiments. Aboveground biomass production and relative tolerance index, drought susceptibility index and relative growth rate were also measured.

This physiological characterization highlighted some interesting and contrasting behaviour among the genotypes. In particular, the tolerant IS22330 genotype, belonging to the durra race adopts a “conservative strategy” reducing leaf area, leaf expansion rate, closing stomata and interrupting photosynthetic rate when the drought stress occurs. The corresponding IS20351 drought susceptible genotype, on the other hand, keeps high leaf expansion and transpiration rates at increasing water stress levels until it sharply decreases. This kind of “productive strategy” is not suitable to drought prone environments. In our experiment we also combined the physiological characterization to molecular biology. Genes previously identified as potentially drought tolerance markers were used to screening the sorghum genotypes.

#### Exploitation Strategy

Our results represent an important step forward in the knowledge of the underlying mechanism that regulates the gene expression. The strong relationship between the physiological traits and the over-expression of some drought related genes represents a good starting point to deepen our knowledge on sorghum drought tolerance. Using genes drought related, previously identified in a microarray experiment, to screen different sorghum varieties could be a smart solution to know in very quick time which genotypes are more tolerant to drought stress. In the early phase of characterization this method could be also useful to avoid waste of water required for field trials.

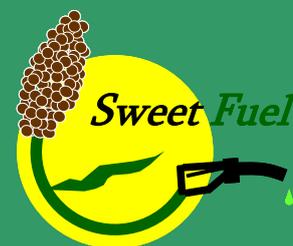
#### Further Research

Further research activities will be carried out to understand the daily course of photosynthesis of the two studied genotypes from the onset of water stress and until severe stress. Knowing how the plants respond to water stress and which is their water use efficiency is important to optimise irrigation.

#### Impact of Exploitation

These results will be published as part of a PhD thesis.

### Sweet Sorghum: an alternative energy crop



#### Contact for Exploitable Result:

**CIRAD, France**  
Delphine Luquet  
delphine.luquet@cirad.fr



#### Project Coordination:

**CIRAD, France**  
Serge Braconnier  
serge.braconnier@cirad.fr



#### Project Dissemination:

**WIP – Renewable Energies, Germany**  
Rainer Janssen  
Dominik Rutz  
rainer.janssen@wip-munich.de  
dominik.rutz@wip-munich.de



**SWEETFUEL Website:**  
[www.sweetfuel-project.eu](http://www.sweetfuel-project.eu)



SWEETFUEL is co-funded by the European Commission in the 7<sup>th</sup> Framework Programme (Project No. FP7-227422)