

EXPLOITABLE FOREGROUND

Implications of Photoperiod sensitivity for developing multi-purpose food/feed/fuel sweet sorghum varieties

Explanation and Purpose

Photoperiod sensitivity is a key adaptive behaviour of sorghum enabling to synchronize flowering time with the end of the rainy season. Where sorghum is rain-fed, farmers are used to 'play' with photoperiod sensitivity to adjust sowing date to the increasingly erratic onset of the rainy season. By this way, crop growth is ensured and grain matures under drier conditions, reducing bird and mold damages. Accordingly, vegetative phase duration and thus plant size and biomass production can strongly vary.

With that respect, we could point out that photoperiod sensitivity is of major interest for enhancing sugar production by sweet sorghum: based on field experiments (in Mali) on a panel of 14, variably sweet and photoperiodic, tropical sorghum accessions, it was shown that early sowing improved considerably sugar production, due to a longer vegetative phase and higher biomass accumulation. Sugar concentration per biomass unit and juiciness were not affected by sowing date.

Exploitation Strategy

This result provides further insight on the traits and the genetic material to be addressed in sorghum (pre)breeding programmes dedicated to sucrose production. It was already used to define research activities in two companion (subsequent) projects of SWEETFUEL, where the genetic diversity of photoperiodic sorghum panels for traits related to biomass production (organ and plant size) and composition (sucrose, juiciness, but also lignocellulose): the French project "Biomass for the Future" (BFF, 2012-2020) and the French-Italian project "Biosorg" (2014-2016).

Further Research

Further researches are needed to unravel the genetic, physiological and environmental control of the complex feedback between whole plant phenology and C allocation to stem (internode) components. This will be performed in BFF and Biosorg projects. It should be reinforced by a common project between CIRAD and Embrapa CNPMS (both partners of SWEETFUEL) dedicated to the valorisation of photoperiod sensitivity for sorghum usage diversification.

Impact of Exploitation

Accepted projects: French project *Biomass For the Future* (<http://www.biomassforthefuture.org>) and BioSorg (Franco-Italian project)

Publications: **S. Gutjahr, M. Vaksman, M. Dingkuhn, K. Thera, G. Trouche, S. Braconnier, D. Luquet**, Grain, sugar and biomass accumulation in tropical sorghums. I. Trade-offs and effects of phenological plasticity, *Functional Plant Biology*, 40 (2013) 342–354.

SWEETFUEL

Sweet Sorghum: an alternative energy crop



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