



Sorghum in the 21st Century Global Sorghum Conference

Resiliency and Sustainability in the Face of Climate Change

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Sorghum ID
Sorghum ID: THE SAYS BY FIVE THE FUTURE



ICRISAT
Centre de Recherche Agronomique
pour l'Amélioration
du Producteur et le Développement



Flowering response to photoperiod combines the effect of the daylength with the effects of the daily changes in sunrise and sunset times and of temperature acclimation

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Sorghum bicolor was domesticated in African savannahs where it co-evolved with its pests and diseases. Consequently, in each place flowering date occurring at the mean date of the end of the rainy season when the global pressure of the pathogens is lower and available soil water reserve ensures grain filling was naturally selected. This synchronism appeared crucial for crop success and its determinism has been extensively studied.

Daylength determines flowering dates of photoperiod-sensitive plants. However, questions remain regarding flowering dates in the natural environment, such as the synchronous flowering of genotypes sown simultaneously at highly contrasting latitudes. The daily change in sunrise and sunset times is the cue for the synchronization of the flowering time of trees and the mating season of birds at the equator. Sunrise and sunset also synchronize the cell circadian clock, which is involved in the regulation of flowering. The photoperiodism model was consequently updated with knowledge acquired since its conception.

A large dataset of flowering records was gathered, including four 2-year series of monthly sowings of 28 sorghum varieties in Mali, a few simultaneous sowings in Mali and France, and data from breeding programs implemented in France, Nicaragua and Colombia.

A unique additive linear model combining daylength and daily changes in sunrise and sunset hours was accurately fitted for any type of response in the duration from sowing to panicle initiation to the sowing date without any temperature input. Simultaneous with the phyllochron, the duration to panicle initiation of field crops acclimated to the mean temperature at seedling emergence within the usual range of mean cropping temperatures. Once calibrated, the model accurately predicted the duration to panicle initiation of a broad set of varieties from the equatorial to the temperate zone.