



HAL
open science

Genetic variability of the sensitivity of grain number to drought and high temperature in maize

Emilie Millet, Sandra Silvia Negro, Willem Kruijer, Stephane S. Nicolas, Fred van Eeuwijk, Alain A. Charcosset, Claude Welcker, Francois F. Tardieu

► To cite this version:

Emilie Millet, Sandra Silvia Negro, Willem Kruijer, Stephane S. Nicolas, Fred van Eeuwijk, et al.. Genetic variability of the sensitivity of grain number to drought and high temperature in maize. Recent progress in drought tolerance from genetics to modelling, Jun 2015, Montpellier, France. hal-02740735

HAL Id: hal-02740735

<https://hal.inrae.fr/hal-02740735>

Submitted on 2 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Selected talk

Genetic variability of the sensitivity of grain number to drought and high temperature in maize

Millet Emilie^a, Negro Sandra^b, Kruijer Willem^c, Nicolas Stéphane^b, Van Eeuwijk Fred^c, Charcosset Alain^b, Welcker Claude^a, Tardieu François^a

^a INRA - Laboratoire d'Ecophysiologie des Plantes sous Stress Environnementaux

Batiment 7, 2, place VIALA 34060 Montpellier Cedex 02, France

emilie.millet@supagro.inra.fr, claude.welcker@supagro.inra.fr,

françois.tardieu@supagro.inra.fr

**^b INRA - Génétique Quantitative et Evolution - le Moulon
Ferme du Moulon, 91190 Gif-sur-Yvette, France**

ssnegro@versailles.inra.fr, snicolas@moulon.inra.fr, alain.charcosset@moulon.inra.fr

**^c WU Plant Sciences – Mathematical and Statistical Methods
Droevendaalsesteeg 1, 6708PB Wageningen, Nederlands**

willem.kruijer@wur.nl, fred.vaneeuwijk@wur.nl

With climate changes, crops will be subjected to more frequent episodes of drought and high temperature. Plant breeders attempt to maintain or increase grain yield in spite of these conditions. We have considered the possibility that data originating from a network of field experiments may serve for estimating the genetic variability of the sensitivity of yield to temperature and water deficit, provided that they are combined with data originating from a phenotyping platform and with detailed environmental characterization of each field. Here, we have developed a method for deriving the sensitivity of each genotype to temperature and soil water deficit by performing a joint analysis of phenotypic and environmental data. We have analyzed a population of maize hybrids generated by crossing a common flint parent with 250 dent lines. Lines were genotyped with 650K SNPs. Hybrids were phenotyped for grain yield and components in 27 combinations of site x year x treatment involving contrasted water regimes in Europe. Phenology and growth traits of the same hybrids were also measured in the PhenoArch platform. The growth cycle of each hybrid was divided into time intervals from plant emergence to maturity, based on leaf number and ear morphogenesis whose relations with thermal time were established in the phenotyping platform for each hybrid. We have then established the response curves of yield to mean temperature or soil water potential in each time interval for each hybrid. Sensitivities to temperature and water potential were estimated as the slope of these response curves, and analyzed via genome wide association mapping. This study will allow better understanding of mechanisms involved in tolerance to drought and high temperature. It may give way to novels indicators of GxE interactions that might be used in breeding programs to improve the tolerances to conditions associated with climate changes.

Keywords: Maize (*Zea mays*), yield, association mapping, drought, temperature